January 9, 2017

Central Coast Regional Water Quality Control Board
895 Aerovista Place, Suite 101
San Luis Obispo, CA. 93401-7906

Sent via electronic mail to: AgNOI@waterboards.ca.gov

RE: Draft Agricultural Order, Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands Order No. R3-2017-0002 and associated Monitoring and Reporting Programs for Tier 1, Tier 2 and Tier3 ranches (R3-2017-0002-01, R3-2017-0002-02, R3-2017-0002-03, respectively)

Dear Mr. Rose, Mr. Robertson, Chair Wolff, Staff and Board Members:

The following comments are made of behalf of Monterey Coastkeeper, a program of The Otter Project, Santa Barbara Channelkeeper, Environmental Justice Coalition for Water, Pacific Coast Federation of Fishing Associations, Institute for Fisheries Resources, and California Sportfishing Protection Alliance. Our groups are very concerned about the economic, environmental, human and social costs of continued agricultural pollution. Collectively, we have been involved in the Central Coast Agricultural Order since 2008 and some organizations since 2004. We appreciate the opportunity to comment on the Draft Agricultural Order, Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands Order No. R3-2017-0002 and associated Monitoring and Reporting Programs for Tier 1, Tier 2 and Tier3 ranches (R3-2017-0002-01, R3-2017-0002-02, R3-2017-0002-03, respectively).

While we recognize the Regional Water Board's attempt to resolve the difficult problem of agricultural discharge and pollution, the Draft Order fails to comply with the law or spirit of the Porter-Cologne Act, Nonpoint Source Policy, Antidegradation Policy, California Environmental Quality Act, California Public Trust Doctrine, and the Human Right to Water Law. The Draft Order makes significant strides toward conforming with basic data transparency standards, but it does not contain enforceable performance standards that are linked to achieving water quality objectives, enforceable timelines and milestones, nor does it place strong enough requirements on the provision of replacement water for residents denied clean drinking water due to agricultural discharges. The fundamental threshold is whether the

Draft Ag Order is in the public interest, and it is not.

Discharges from irrigated agriculture are the largest source of pollution to Central Coast waterways and groundwater. California's agricultural management needs accountability. It is long past time the RWQCB Water Board begin resolving the persistent problems we see throughout our region by relying less on iterative management practices and representative receiving-water monitoring, and start requiring accountability from individual growers.

The Draft 2017 Ag Order is essentially an extension of the current Ag Order and the Central Coast RWQCB staff has stated as much:

> "Staff plans to present a new general waiver for Central Coast Water Board consideration prior to the expiration date. The proposed 2017 ag order (version 3.0) will be largely unchanged from the current order in most aspects, but will have new compliance dates." (July 2016 Board Meeting, Agenda Item 6, Staff Report).

We appreciate some of the minor changes that have been made to monitoring and reporting requirements but at the end of the day, the discharge requirements – the Order itself -- are what matters and, as written, the 2017 Draft Ag Order is a near verbatim copy of the 2012 Ag Order as modified by the State Water Resources Control Board, the same order that was found to be not in compliance with the laws, policies, doctrines and principals stated above and found by a trial court to not be in the public interest (the *Coastkeeper et. al.* opening brief and the trial court's ruling are attached as Attachment 1 and 2 respectively). Because the Draft Order is, "largely unchanged from the current order in most aspects, but [with] new compliance dates," our arguments made in opposition to the existing Order and the trial court's ruling apply today (we recognize the trial court's ruling has been stayed pending appeal).

In its essence, the Draft Ag Order does nothing to regulate the well-monitored and documented over-application of fertilizers and it focuses on, but does nothing to regulate, only two pesticides (chlorpyriphos and diazinon), both of which were falling out of use even before the 2012 Ag Order was passed (Shimek 2015 Declaration Attachment 3).

The Regional Board staff and Board have articulated two separate justifications for advancing an order that does little and is not in compliance with the law:

- Not enough time. Central Coast RWQCB staff brought forward a timeline to create a new Ag Order at the January 30, 2015 Board meeting (agenda item 15). Staff noted that the current (2012) Order expires on March 15, 2017 and estimated that it could take 18 months to two years to develop and pass a new Ag Order. Staff also noted that there were several outstanding issues including the Expert Panel recommendations, East San Joaquin Ag Order petitions, and the *Coastkeeper et. al.* civil case that could potentially guide the new Order. The Agricultural Expert Panel made its recommendations to the SWRCB in September 2014. The trial court ruled the current (2012) Central Coast Ag Order was not in the public interest on August 10, 2015. The East San Joaquin Ag Order is still at the SWRCB and could be adopted in May 2017, but it is common knowledge that the decision will likely be litigated.

Several components of a new Central Coast Ag Order, such as the antidegradation analysis could have been started at any time. Had the Central Coast staff begun working on a new Ag Order in August 2015, it would have had 19 months to complete its work (and I am reasonably certain all parties would have agreed to a five-month extension).

- Unresolved issues. At the July 28, 2016 Board meeting, staff presented their plan for March 2017 renewal of an Ag Order that:

  > "will be largely unchanged from the current order in most aspects, but will have new compliance dates. This proposed 2017 ag order will not address currently unresolved ag-order-related litigation and petitions, as it is not likely that these outstanding issues will be decided with sufficient time to include within the proposed 2017 ag order in March 2017."

  The "ag-order-related" issues listed included East San Joaquin Ag Order petitions (still at the State Board), the State appeal of the trial court's *Coastkeeper et. al.* decision (Fourth District State Court of Appeals), *Zamora* (San Luis Obispo Superior Court), and *Triangle Ranches* (Monterey County Superior Court). No one really knows when East San Joaquin will be decided, and it will surely be litigated. The State's appeal of *Coastkeeper* could take at least another year. *Zamora* has been decided consistent with the environmental justice argument. *Triangle Ranch* has been decided, again consistent with an environmental and environmental justice argument. It must be noted the RWQCB was apparently willing to accept the trial court's guidance in the *Coastkeeper et. al.* case back in January 2015, but has changed its mind and is now waiting for an appellate court decision. The Regional Board is apparently willing to accept the State Board's decision – that is sure to be litigated – on the East San Joaquin. And the Regional Board seems willing to accept a trial court decision on *Zamora* and *Triangle Ranch*. One must ask, "What's the standard: The State Board, trial court, appellate court, or is it entirely arbitrary?"

While the State and Regional Board believe the *Coastkeeper et. al.* trial court decision is "stayed" pending the outcome of an appeal, there is nothing that keeps the Regional Board from addressing the deficiencies in the Order that have become apparent over the past five years; only the trial court's decision is stayed, but not the law itself. As noted above, the trial court ruled the current Central Coast Ag Order was not consistent with the law and was not in the public interest. The Draft East Joaquin Ag Order and the adopted Los Angeles Region Ag Order -- both created after August 2015 -- took the trial court's decision into consideration and frequently referenced the court's judgement. It is inconsistent for the Central Coast RWQCB -- the subject of the trial court's decision -- to say there is not enough time or that there are unresolved issues while other Regions and the State itself have made some (albeit selective) efforts to consider and adjust to the trial court's decision.

The need to act on the following issues became clearer over the last four years of data collection and experience:

- Nutrient balancing. The vast majority of water to irrigate Central Coast crops is pumped from groundwater. Decades of sampling have revealed that groundwater underlying irrigated agricultural lands is heavily polluted by agricultural fertilizers. While there are other sources of nitrogen and nitrates, loading studies show that the vast majority (see Harter Report suggesting over 90%) of the nitrogen pollution is coming from irrigated agriculture. Research conducted by Dr. Michael Cahn and others has documented the over-application of fertilizers to Salinas Valley crops and the ability of crops to utilize nitrogen from groundwater. Despite the availability of nitrogen in groundwater, growers continue to over-apply fertilizers and the over-application leads to compounded contamination. The existing Ag Order (2012) required a subset of Tier 2 and 3 to report applied nitrogen beginning in October 2014, consequently, staff had specific field level data of over-application 30 months before the expiration of the current Order and with ample time to create regulation around the over-application. But it wasn't until March of 2016, 18 months later, but still one year in advance of the expiration of the Order, that staff provided the Board with two years of data. Various agencies, including the RWQCB itself, have called for <u>immediate</u> action to curb the over-application of fertilizers. Instead of taking affirmative action, the Board cut the staff-recommended requirement to balance fertilizer application with crop requirements at the 11th-hour before adoption of the current (2012) Order (Coastkeeper et. al. petition of the 2012 Ag Order (before modification by the State Board) is Attachment 4). Despite having firsthand knowledge of over-application, the Draft Order contains no requirement to balance nitrogen application with crop need all the while thousands of rural residents are drinking nitrate contaminated water, freshwater streams are choked by algal blooms, and (Federal Endangered Species Act listed as threatened) sea otters are dying from Microcystis blooms stimulated by agricultural and other nutrients. A 2004 review of Nitrate toxicity of aquatic animals (Attachment 5) notes:

> "The first indication that relatively low concentrations of nitrate might be harmful to fish came from Grabda et al. (1974). They reported that fry of rainbow trout, exposed to 5–6 mg NO3-N/l for several days, displayed increased blood levels of ferrihemoglobin, alterations in the peripheral blood and hematopoietic centres, and liver damage. In addition, Kincheloe et al. (1979), examining the tolerance of several salmonid species to nitrate toxicity after an exposure of 30 days, reported that developing eggs and early fry stages of O. mykiss, O. tshawytscha and the (Lahontan) cutthroat trout Salmo clarki exhibited significant increases in mortality at nitrate concentrations from 1.1 to 4.5 mg NO3-N/l (Table 3). In the case of the coho salmon Oncorhynchus kisutch, eggs and fry were not affected at the highest nitrate concentration of 4.5 mg NO3-N/l (Table 3). Kincheloe et al. (1979) concluded that a nitrate level as low as 2.0 mg NO3-N/l in surface waters of low total hardness (<40 mg CaCO3/l) would be expected to limit survival of some salmonid fish populations because of impaired reproductive success."

Coho salmon and steelhead (genetically identical to O. mykiss) once thrived in the Salinas River and today Coho have been extirpated and steelhead are rare and are ESA listed as "endangered." The California's salmon industry has an economic impact of $1.4 billion and a jobs impact of 23,000 (Attachment 6).

- A new Ag Order should include a requirement to balance nitrogen applied with crop nitrogen need. Application beyond the published range should be subject to enforcement. Admittedly, there are many crops with no published range of the crop nitrogen requirement, but it has been estimated that published values are available for crops comprising the clear majority of acreage. For the crops with no published range of crop nitrogen need, reporting requirements will quickly establish a normal range and statistical analysis can identify outliers.

- Toxicity. Shortly after the release of the 2010 draft Ag Order there was discussion regarding the inclusion of a broad suite of pesticides known to cause toxicity, or alternatively a focus on just two pesticides. The Board arbitrarily decided to focus on two pesticides, chlorpyriphos and diazinon. Some Board members and stakeholders expressed a concern with the potential for pesticide switching: Switching from a regulated pesticide to a less regulated pesticide to avoid regulation. During the discussion, Board and staff stated that if evidence of switching occurred and surface water toxicity persisted, the Board could "re-open" the order and choose to include additional pesticides. It never happened. Staff was well-aware of the changes in pesticide use: In the February 2015 issue of California Association of Pest Control Advisors magazine (Attachment 7), Central Coast RWQCB staff reported on evidence of growers switching from chlorpyrifos and diazinon to [more persistent and toxic] pyrethroid and noenicitinoid pesticides stating, "As applications of chlorpyrifos and diazinon have decreased, they have been replaced by other pesticides." The Executive Officer report prepared for the RWQCB meeting of May 29, 2015 includes both a reference to the Pest Control Advisor story and includes additional evidence documenting toxicity in Central Coast streams. Clearly, 25 months prior to the March 2017 expiration date of the Ag Order, staff understood the problem of pesticide switching. Growers are aware of creative and inexpensive practices to reduce pesticide (and nutrient) loads in farm runoff; just a few months after the Ag Order was passed by the Regional Board in March 2012, articles began appearing in trade magazines to help growers comply with water quality regulations. Good farm practices are not rocket science but are things like retention basins, vegetated ditches, constructed wetlands, and the use of polymers (One such articles is included as Attachment 8). While relatively simple precautions and practices are well known, there is no regulatory backstop to move growers towards compliance.

    - Any new Ag Order should focus on toxicity instead of specific chemicals. Any detection of toxicity should trigger follow-up monitoring to find the source(s) of the toxic discharge. Testing money could be saved by focusing on toxicity testing and ignoring testing for specific chemicals unless a sample is tested as toxic. When toxicity is determined, the sample can be retested to establish the specific chemical(s) causing the toxicity. In most cases, Department of Pesticide Regulation pesticide use reports can then be consulted to determine likely sources and targets for additional testing. Forensic testing must become common, rapid, and lead to enforcement. In addition, the RWQCB staff should explicitly be required to consult with toxicologists (i.e. Granite Canyon Pollution Control Lab) and the Department of Pesticide Regulation (DPR) to determine if toxicity test methods are adequate to detect new pesticides and if tests are not adequate, immediate adjustments must be required.

- TMDLs. Total Maximum Daily Loads (TMDLs) are pollutant budgets for specific impaired waterbodies. Scores of Central Coast streams are impaired due to agricultural discharges (sometimes mixed with other discharges) and TMDLs are strategies to restore clean water. TMDL implementation is achieved through compliance with existing or new regulation. The Central Coast Board is currently developing a series of agriculture-related TMDLs including TMDLs of biostimulatory substances, nutrients, toxicity, sediment toxicity, cyanobacteria, and turbidity. The TMDL for nutrients in the Pajaro River basin was approved in 2016 and states: "Central Coast Water Board staff proposes that implementation and compliance with the conditions and requirements of the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (Agricultural Order) and any renewals or revisions thereof, would be deemed sufficient evidence that the TMDLs and load allocations for irrigated lands are being implemented." Near identical language is used in the series of TMDLs under development and consideration in 2017. A problem is that the current (2012) and the Draft Ag Orders do not contain any enforceable load allocations, controls, or limits on nutrients, pesticides, or sediment/turbidity or for the TMDLs under development. The TMDLs are entirely hollow without enforceable limits on use or discharge.

  - The Ag Order should not be the implementation mechanism for any TMDL unless there are enforceable use and discharge limitations and enforceable timelines and milestones.

- Photo monitoring. The requirement for photo monitoring has been removed from the Draft Ag Order without any replacement. The intent of the photo monitoring was to document a baseline condition for riparian and wetland areas so that destruction of riparian vegetation and wetlands could be documented and enforced against. While we recognize the photo monitoring as proposed in the current Order may have been an ineffective and burdensome idea, the draft offers no replacement. Wetlands and riparian zones are highly effective for treating and filtering polluted water; water will be cleaner, threatened and endangered species protected, and some fisheries may be restored if wetlands and riparian areas are preserved or restored. High resolution georeferenced aerial photography could entirely replace and improve upon the current photo monitoring program. With the appropriate digital imaging, computer programs can create detailed vegetation maps. It is our understanding that digital maps can differentiate wetland and riparian habitats from irrigated fields, roads, and bare ground. We believe it could also be possible for the computer to compare maps and create a new map of wetland and riparian loss or restoration.

  - Documentation of riparian and wetland loss and restoration is critical to protecting water quality. It is not enough to suggest that staff "will consider" alternatives to the existing photo monitoring. A replacement program must be incorporated into the new Ag Order.

- Representative receiving water Monitoring. The Ag Order relies on improved management practices to bring about improved water quality but the surface water monitoring sites are so far removed from most discharges that it is impossible to determine the efficacy of the management practices. Many Cooperative Monitoring Program sites represent a mix of discharge types including industrial and urban discharges making it impossible to determine agriculture's contribution. While the Order requires testing of wells supplying domestic uses and the primary irrigation well, there is no testing, beyond the thin and infrequent GAMA program, designed to reflect the health of specific aquifers, so the RWQCB has no way of knowing if ambient groundwater conditions are declining or improving. The GAMA program has detected pesticides (dieldrin) and other organic compounds with human health benchmarks in Salinas Valley groundwater, yet the Ag Order does not require testing for these chemicals. The pesticide imidacloprid is extensively used in Central Coast agriculture and is listed on the Department of Pesticide Regulation Groundwater Protection List, yet no testing of groundwater samples for imidacloprid is required.

  - The Draft Ag Order relies on improved management practices to bring about water quality improvements and a monitoring scheme – beyond well testing -- must be designed to test the efficacy of these practices. The testing must be frequent enough and dense enough, given the known variability of the data, to determine changes within the five-year term of the Order. As already noted, forensic testing must become common, rapid, and lead to enforcement.

- Imidacloprid. As noted above, the noenicitinoid imidacloprid has become the largest selling pesticide in the world, is extensively used in Central Coast agriculture, is persistent in the environment, is highly soluble and poses a risk for groundwater contamination, and is of growing concern. Strawberries and wine grapes, important crops of the Central Coast, use imidacloprid extensively. Chlorpyrifos and diazinon use, already declining by 2008, were replaced by pyrethroid pesticides (permethrin) and imidacloprid (attachment 3) -- yet the RWQCB continued to regulate the chemicals no longer in use and has failed to regulate the chemicals replacing them. While the Draft Ag Order finally begins to monitor imidacloprid (in surface water, but not in groundwater), the Order continues failing to regulate imidacloprid despite the documented impairments it is causing. The recent DPR fact sheet on imidacloprid is attached at Attachment 9.

  - Crops and growers using imidacloprid should be considered high-risk and should be placed in higher tiers (or all growers should be treated equally under an entirely new Ag Order). The down-tiering of CSIP growers should be immediately discontinued and growers using these persistent and highly toxic chemicals should not be allowed to leave the Ag Order program for a less regulatory general order.

- Tiering structure. During the development of the current Ag Order a tiering structure was developed to focus on higher risk growers. Tier One was characterized as less regulatory than the failed 2004 Ag Order, Tier Two was characterized as about the same amount of regulation, and Tier Three was characterized as more regulatory. Initially, stakeholders were told that approximately 11% of farms and 54% of the acreage would be within Tier Three. By the time the Ag Order was approved in 2012, those numbers had slipped to 2.3% of farms and 14% of acreage. As of May 2015, those numbers had further slipped to 1.1% of farms and 4.6% of acreage (attachment 3). As of today, only .65% of farms and 4.7% of acreage are within Tier Three (Shimek Declaration 2017 Attachment 10). The tiering structure has entirely collapsed and the net result is that the current and draft Ag Orders are less regulatory than the failed 2004 Ag Order. In other words, we have gone backwards. As documented here, the staff and

Board have been aware of this failure for many years and the Draft Ag Order has failed to correct this egregious error.

- A new Ag Order should treat all farms equally and the level of regulation should be greatly increased.

- "Expert" Panels. There have been five different "expert" panels convened to study the issue of agricultural pollution and sometimes more specifically, nitrates in groundwater. In addition, The Otter Project/Monterey Coastkeeper hired an independent expert to review the SWRCB's expert panel that reported out in 2014. Panels and consulted experts include:

    - The Central Coast Regional Board engaged a number of experts to help craft the February 1, 2010 Preliminary Draft Central Coast Agricultural Order (http://www.waterboards.ca.gov/centralcoast/water_issues/programs/ag_waivers/ag_order.sh tml#feb1) ;
    - An Inter-Agency Nitrates Task Force was created in August 2010 to study and offer recommendations(http://www.waterboards.ca.gov/water_issues/programs/nitrate_project/) (Attachment 11);
    - The UC Davis Harter Report commissioned by the California Legislature was released March 13, 2012 and involved over two dozen experts to study the issues and recommend solutions (http://groundwaternitrate.ucdavis.edu/) that included two appendices of solutions (important note: the Harter Report is exhaustive, huge, and includes a "main report" and 8 technical reports. We trust the Harter Report, in its entirety including technical reports, is in the record for this proceeding and will not be reproduced as attachments);
    - The Governor's Office convened a stakeholder group to offer recommendations (http://www.swrcb.ca.gov/water_issues/programs/groundwater/drinkingwater_stakeholders.shtml) focused on supplying low-income and disadvantaged communities clean drinking water and the costs and funding mechanisms for doing so (Attachment 12);
    - The California Department of Food and Agriculture convened a Nitrates Tracking and Reporting Task Force which reported out in December of 2013 (http://www.cdfa.ca.gov/environmentalstewardship/PDFs/NTRSTFFinalReport122013.pdf) (Attachment 13);
    - Agricultural Expert Panel's deliberations and products (http://www.itrc.org/001/swrcb.htm).
    - Independent review of Agricultural Expert Panel's deliberations and products (Attachment 14)

  Every panel (with the exception of the Governor's Office that avoided the issue) stressed the importance of balancing nitrogen applied with nitrogen removed or required.

- The Human Right to Water. Water Code section 106.3 declares that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes, and requires all relevant state agencies to consider this state policy when revising, adopting, or establishing policies, regulations, and grant criteria. The

State Water Board Resolution No. 2016-0010 identifies the human right to water as a top priority and core value of the state and regional Water Boards, and affirmed the State Water Board's commitment to consider how its activities impact and advance the human right to safe, clean, and affordable water to support basic human needs. Although the 2017 Draft Waiver acknowledge the human right to water, it fails to meaningfully consider the consequences of approving the proposed regulatory program on the safety, cleanliness, and affordability of the water in communities that rely on water that either is or will be contaminated, as a result of the discharges it will allow to occur. (see 2017 Draft Waiver, Attachment A, p. 43.). Literally hundreds of small communities are drinking from water systems contaminated by naturally occurring or anthropogenically caused. The SWRCB created a report, Communities that rely on contaminated groundwater as a source for drinking water (Attachment 15). Of the 680 small community water systems, 205 were contaminated by nitrates above the MCL and 36 systems were contaminated by 1,2-dibromo-3-chlropropane (DBCP), a legacy pesticide. "Communities" captured in the report are the tip of the iceberg; as stated, the report does not include small systems, domestic well, non-community small systems (see definitions with the report). It is very conservative to assume that many tens of thousands of people are drinking tainted water on the Central Coast alone.

Listed above are some of the failures of the Draft Order to adjust to changing conditions and new information. Fundamentally, the current and Draft Order are flawed. Judge Frawley's Superior Court judgement (Attachment 2) begins to enumerate the failures of the present and Draft Orders. The trial court concluded, based on substantial evidence, that the Modified Waiver is inconsistent with the basin plan because it does not include requirements reasonably designed to show measurable progress toward improving water quality in a meaningful timeframe, and is not in the public interest. In reaching this conclusion, the trial court made three key factual findings:

1. The Modified Waiver does not have sufficiently specific, enforceable standards necessary to meet the basin plan's water quality objectives.

2. The Modified Waiver does not contain sufficient feedback mechanisms and monitoring provisions to enable the Board to effectively enforce the Modified Waiver.

3. The Modified Waiver's tier structure does not subject enough growers to requirements that are more stringent than the 2004 Waiver to show measurable progress.

<u>The Draft Agricultural Order Does Not Comply with the Basin Plan</u>

The Basin Plan establishes water quality objectives to protect beneficial uses, including for drinking, recreation, and agriculture; includes an implementation plan to achieve water quality objectives; and incorporates the Nonpoint Source Policy and the Antidegradation Policy. Specifically, the basin plan sets water quality objectives for nitrates, toxicity, pesticides, and sediments. These standards require that nitrate concentrations do not exceed drinking water standards and that pesticide, toxicity, and sediment loadings not harm beneficial uses. Any Waiver approved by the Boards must be "consistent" with these standards.

The Draft Order continues to fail to include "sufficiently specific, enforceable measures and feedback mechanisms needed to meet the Basin Plan's water quality objectives." While we agree that immediate compliance is not possible, even an iterative interim approach must ensure reasonable progress toward the final goal. The Draft Order fails to ensure that implemented management practices – and their iterations – will make "measurable progress toward attaining water quality standards" or achieve "quantifiable reductions in pollutant discharges."

The Draft Order generally requires that dischargers "effectively control individual waste discharges" of various pollutants – such as pesticides and toxic substances, sediment and turbidity, nutrients, and nitrates – without setting any standards for these pollution discharges. Moreover, if a grower's existing management practices do not effectively control discharges, the waiver requires only that the discharger make a "conscientious effort" to identify "improved" management practices – without defining what "improved" means or how it will be measured or enforced. In effect, the Modified Waiver tells dischargers: "If what you are implementing does not work, try something else."

Given the indisputable evidence of severe water quality impairments and mounting public harms, the RWQCB's legal obligation is to ensure that the Order will actually achieve quantifiable pollution reductions on a meaningful timeframe.

Any increased stringency of the current or draft Ag Order is based primarily on the Tier 3 requirements. But, as noted above, Tier Three has entirely collapsed. Thus, only an insignificant fraction of dischargers and irrigated lands are subject to more stringent requirements than under the failed 2004 Waiver and a large proportion of growers are subject to far less stringent requirements.

<u>The Draft Order Does Not Require Adequate Monitoring to Verify that Management Practices Are Effectively Controlling Pollution.</u>

Water Code Section 13269(a)(2) mandates that conditional waivers include monitoring requirements "designed to support the development and implementation of the waiver program, including, but not limited to, verifying the adequacy and effectiveness of the waiver's conditions." Put differently, monitoring provisions "shall include sufficient feedback mechanisms" to ascertain "whether the program is achieving its stated purpose(s)."

The Draft Order does not contain adequate provisions to identify dischargers causing or contributing to exceedances and therefore cannot verify the effectiveness of implemented management practices.

The Draft Order relies on the iterative implementation of management practices to meet water quality objectives. Accordingly, monitoring requirements must be adequate to verify the effectiveness of implemented management practices. Further, the Order must contain adequate standards and enforcement mechanisms to ensure that improved management practices will be implemented when monitoring reveals that existing management practices are not effective.

Here, the monitoring requirements that would verify the effectiveness of management practices – i.e., individual monitoring – apply to an extremely small and fleeting group: only Tier 3 growers with irrigation water or storm water discharges to surface water from an "outfall" (locations where irrigation water and storm water exit a farm or otherwise leave the control of the discharger, after being conveyed by discrete structures or features that transport water, such as pipes, ditches, containment structures, or tile drains). Of the very small group (28) of Tier 3 dischargers, over one-third self-report they have no discharge at all and therefore do not need to comply with individual discharge monitoring. To our knowledge, this has not been verified by RWQCB staff. It is hard to understand how there can be no discharge where fertilizers and pesticides are applied, outdoors, where it rains, and soils are permeable. Regardless, this point underscores the problem of a lack of monitoring.

Receiving water monitoring, as implemented by the Draft Order, fails to identify problem discharges because receiving water monitoring data, submitted in most cases by a cooperative monitoring group, does not identify the individual dischargers that are 'causing or contributing' to the exceedance and neither the Board nor the cooperative monitoring group can identify where the pollution is coming from or whether the grower's management practices are effectively reducing pollution and degradation. For the entire region, nearly 11,274 square miles from San Mateo to Santa Barbara, there are only 48 receiving monitoring sites (averaging one for every 235 square miles).

Regarding groundwater monitoring, the Draft Order is insufficient for verifying the effectiveness of implemented management practices. That is, while individual groundwater monitoring may disclose the condition of the water – whether the pollution is increasing or decreasing – it does not provide information about why a particular result is occurring or whether any implemented practices will contribute to improvement in water quality.

In short, the Draft Order lacks adequate feedback mechanisms to identify problem dischargers or determine if the management practices the Order relies upon are effective.

<u>The Draft Order Is Not Consistent with the Nonpoint Source Policy.</u>

The Nonpoint Source Policy sets out the required elements for any nonpoint source pollution control program, including the Ag Order. As a threshold requirement, the Regional Board can only endorse a program if "there is high likelihood" the program will achieve water quality objectives. There is no evidence the current (2012) Order attained any water quality objectives and therefore there is no evidence the Draft Order will attain any water quality objectives either. The Draft Order thus clearly does not comply with the Nonpoint Source Policy.

Twelve years ago, when the State Board adopted the Policy, the State Board recognized that much is known about the [management practices] that most effectively prevent and control polluted runoff. Further, the State Board already knew then that a successful management practices program typically requires monitoring to assure that practices are properly applied and are effective in attaining and maintaining water quality standards, immediate mitigation of a problem where the practices are not effective, improvement of [management practice] implementation or implementation of additional [management practices] when needed to resolve a deficiency. The Draft

Order fails to follow State Board guidance.

The Nonpoint Source Policy also forbids reliance on ineffective practices, stating "[management practice] implementation never may be a substitute for meeting water quality requirements." And the Policy specifically prohibits polluters from continuing to utilize previously non-effective management practices. The Draft Order contains no numeric water quality requirements and fails to offer any mechanism to measure management practice effectiveness.

To ensure that polluters continue to improve management practices, the Policy requires verification monitoring to determine whether the program is on time and on track in achieving its goals. Recognizing the urgency necessary to comply with the Porter-Cologne Act, the Policy further instructs the Regional Board to have "[a] rigorous dedication to periodic evaluation of all aspects of the program and an adaptive management approach." Twelve years after the 2004 Waiver (and more than three decades since the Regional Board's original irrigated agriculture waivers), we are no longer in the early stages of the program. To comply with the Nonpoint Source Policy's iterative approach at this point, the Modified Waiver must both make and demonstrate progress towards achieving water quality objectives.

<u>The Draft Order Does Not Include the Nonpoint Source Policy's Five Key Elements.</u>

The Policy mandates that Modified Waiver include five "key elements":

1. address nonpoint source pollution in a manner that achieves and maintains water quality objectives;

2. Include a description of management practices, program elements expected to be implemented, and a verification process;

3. Include a time schedule and quantifiable milestones designed to measure progress toward achieving water quality objectives;

4. Include sufficient feedback mechanisms to ensure that the program is achieving its stated purpose, and ascertain whether additional or different actions are required; and

5. State the potential consequences for failure to achieve the program's objectives.

The trial court found the current Order does not satisfy the key elements of the NPS Policy and therefore the Draft Order, with only minor changes, suffers from the same fatal flaws.

Key Element #1

The trial court concluded that the current Order failed to provide sufficient measures to improve water quality and thus does not satisfy the first key element. Moreover, the tier designations fail "to ensure that all the significant sources of the [nonpoint source] discharges of concern are addressed," as the Policy requires. The trial court also found that the current

Order’s tier structure is a “fundamental problem” because “[t]he vast majority of growers . . . will be subject to requirements equal to, or less stringent than, the 2004 Waiver.”

Key Element #2

Without management practices that have a “high likelihood” of meeting water quality requirements, the current Order cannot meet the second key element. This element also mandates that a previously used management practice can only be implemented if it “has been successfully used in comparable circumstances.” The current Order fails to incorporate Element #2 because it contains much of the same structure as the ineffective 2004 Waiver. Not only is it “unreasonable for the Board to keep doing the same things it has been doing and expect different results,” but the Nonpoint Source Policy forbids it.

Key Element #3

The current Order also violates the third key element by failing to include “specific time schedules designed to measure progress toward reaching quantifiable milestones.” Agricultural intervenors admonish the trial court for expecting the waiver to have “a step-by-step time schedule” and a monitoring program to measure compliance with the schedule, but the Policy requires just that. Read together, the third and fourth key elements require “a specific time schedule, and corresponding quantifiable milestones,” as well as a description of “the measures, protocols, and associated frequencies that will be used to verify the degree to which the [management practices] . . . are achieving the program’s objectives.” RB 9419. The trial court correctly found that the current Order lacks those provisions.

Key Element #4

The fourth key element explicitly requires “feedback mechanisms,” so the Regional Board can determine if “additional or different [management practices] or [management practice] implementation measures must be used.” As discussed above and as the trial court found, the current Order does not verify compliance with requirements.

Key Element #5

Lastly, the current Order violates the fifth key element by not including “a description of the action(s) to be taken if verification/feedback mechanisms indicate or demonstrate management practices are failing to achieve the stated objectives.” The Policy instructs that “this element should be written with the objective of creating clear expectations and reinforcing the obligations” of the participants. In addition to failing to create clear expectations for growers, the current Order’s vague “improved” management practices standard also “guarantees that that the Regional Board will not take enforcement action against a discharger as long as the discharger believes it is implementing ‘improved’ management practices, even if the ‘improved’ management practices remain completely ineffective at controlling discharges of waste.”

Ultimately, the State Board did not meet any of the Nonpoint Source Policy’s five requirements. Most importantly, the trial court could not find evidence that the current Order will ever achieve water quality objectives, let alone that it has a "high likelihood" of doing so.

Again, the Draft Order is essentially an extension or copy of the current Order and therefore the trial court's opinion applies to the Draft Order.

The Draft Order Is Not Consistent with the Anti-Degradation Policy.

California's Antidegradation Policy, which is incorporated into the basin plan, prohibits the Boards from allowing an activity that will result in the degradation of high quality waters absent specific findings. The Regional Board has failed to perform an antidegradation analysis consistent with the Policy.

The first step when undertaking an antidegradation analysis is to determine whether there are existing high quality waters that may be affected by a permitted discharge. This process requires the Regional Board to compare baseline water quality – the highest water quality achieved since 1968 – to water quality objectives for receiving waters affected by the discharge. Id. at 1270. "High quality waters" are defined as those waters whose quality has exceeded water quality objectives at any time since 1968. If "baseline water quality" is better than water quality objectives and the permitted activity will result in a discharge of waste, the Policy is triggered, and water quality must be maintained in the absence of additional findings by the Board. Once the Policy is triggered, degradation of the receiving water by the discharge is presumed. Thus, in the absence of evidence to the contrary, the Board may only authorize a discharge to high quality waters if it makes the specific findings set forth in the policy.

Ground water can also not be degraded and routine monitoring of wells is not enough to proactively protect against degradation. The Third District Court of Appeals in *Asociation de Gente Unida por el Agua v. Central Valley Regional Water Quality Control Board* ("AGUA") found monitoring of domestic and agricultural supply wells to be insufficient to detect groundwater degradation, much less prevent it, because wells would not reflect contamination until many years after the initial discharge.

The Regional Board admits that it has failed to conduct the required antidegradation analysis and argues that it no longer has the time before the current Order expires in March, 2017. The problem is that the Regional Board has known since November 2012, when the AGUA decision cleared the appellate court, that the analysis was required. Clearly, the Draft Order does not comply with the States Anti-Degradation Policy.

The Modified Waiver Is Not in the Public Interest Because It Will Not Lead to Quantifiable Improvements in Water Quality.

Under the Porter-Cologne Act, the Regional and State Boards can only issue a waiver when it is "in the public interest." The Legislature specifically clarified this requirement in 2003 to ensure that waivers "actually protect water quality."

With no evidence that the current Order or the Draft Order will lead to quantifiable improvements in water quality or arrest the continued degradation of the Central Coast Region's waters, the trial court was left with only one conclusion – the Draft Order is not in the public interest. Without sufficient water quality protections that safeguard the "health, safety and welfare of the people of the state," a waiver is not in the public interest.

The Draft Order contains many broad proclamations but no enforceable limits, standards, or deadlines. As an example, the Draft Order "requires compliance with water quality standards" but then states that compliance will take many years and provides no measurable or enforceable timeline. In addition, a grower is deemed to be in compliance with water quality standards if they use "improved" management practices. Despite these broad proclamations, we – and the trial court -- believe the waiver to not be in the public interest because it fails to effectively regulate irrigated lands within the Central Coast to protect all beneficial uses. Specifically, the most vulnerable populations will continue to suffer and the environment will be degraded if the 2017 Draft Waiver is approved as proposed.

Of course, the public interest is ultimately about people – in this case, the millions of people who rely on the region's wells for drinking water and use the region's waters for fishing, recreation and ecological services. Supporting that view, in 2012 the Legislature enacted the Human Right to Water Law, which declares that "every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption." The Draft Order's weak provisions will only allow conditions to worsen, which leaves vulnerable communities and future generations to bear the heaviest costs.

All stakeholders recognize that the Central Coast is "one of the most productive and profitable agricultural regions in the nation" and that agriculture drives much of the region's economy. But as the Regional Board admonished in 2010, "[n]o industry or individual has a legal right to pollute and degrade water quality, while everyone has a legal right to clean water." "Resolving agricultural water quality issues," the Board conceded, "will also require changes in farming practices, will impose increasing costs to individual farmers and the agricultural industry . . ., and may impact the local economy." Unfortunately, in preparing the Draft Order, the Regional Board lost sight of its own words, and the public interest.

<u>The Regional Board Has Failed to Comply With CEQA.</u>

CEQA's provision for environmental review is "the heart of CEQA" because it ensures that "the agency has, in fact, analyzed and considered the ecological implications of its actions." CEQA review "protects not only the environment but also informed self-government." To comply with CEQA's mandate, an agency must monitor sources of new information and assess the impacts of changes to a proposed project. As noted throughout this document, there are volumes of new information. As one example of new information that could trigger CEQA: Pesticide use reports indicate that chlorpyrifos and diazinon use has declined and has been replaced by pyrethroids and noenicitinoids, and it is plausible and likely that the 2012 Ag Order was partly responsible for this shift. By failing to adjust the Draft 2017 Ag Order, the RWQCB has contributed to pollution that is more water soluble and more persistent and has led to new impairments. As a second example, we now more fully comprehend the scope of nitrate pollution in groundwater and the RWQCB's collection of data has exposed the sometimes-gross over-application of this pollutant. The data even pinpoints the exact grower who is over-applying. What excuse can there possibly be to ignore these plain facts, which were known since 2014, and avoid creating enforceable regulations to prevent harmful discharges?

When making changes to a program covered by an existing environmental impact report ("EIR"), the acting agency must determine whether the previous environmental document retains any relevance considering the proposed changes and, if so, whether major revisions to the previous environmental document are nevertheless required.

After making the substantial changes that resulted in the current Order, the State Board did not fulfill its duty to make a determination regarding further CEQA review. Instead, the State Board's Order made no independent CEQA findings and only summarized the previous CEQA process. Recognizing this failure, the trial court required the State Board "to consider what, if any, supplemental review may be required to comply with CEQA in connection with the Waiver."

In addition to the State Board's error, the Regional Board is now faced with a plethora of new information that indicates the current and Draft Orders weaken environmental protections by continuing to focus on pesticides no longer in use, ignoring the flight from Tier Three regulation, and more. The Regional Board can no longer claim that the Order is more protective and that CEQA analysis is not required.

The Regional Board is Failing to Protect Public Trust Resources

In California, the waters and streams of the State, and the fish, wildlife, and ecological values they support and sustain, belong to the public and are held in trust by the State for the benefit of the people of California and future generations.

The Public Trust Doctrine creates an affirmative and ongoing fiduciary duty in all California public agencies, including the RWQCB, to protect and preserve these public trust resources for the benefit of the people of California and future generations. By continuing to authorize the discharge of agricultural pollutants at levels that exceed water quality standards and impair beneficial uses, the RWQCB is violating its fiduciary duty to protect and preserve these public trust resources for the benefit of the people of California and future generations.

In Conclusion

Transparency and accountability must become a cornerstone of California's agricultural management. It is time for the RWQCB take meaningful action to address the persistent pollution problems caused by California agricultural practices. We look forward to working with you to reform agricultural pollution management.

Sincerely,

Executive Director, The Otter Project and Monterey Coastkeeper

/s/ Colin Bailey, Executive Director, Environmental Justice Coalition for Water
/s/ Bill Jennings, Executive Director, California Sportfishing Protection Alliance
/s/ Glenn Spain, for Pacific Coast Federation of Fishing Associations and Institute for Fisheries Resources
/s/ Kira Redmond, Executive Director, Santa Barbara Channelkeeper

Attachment 1: *Coastkeeper et. al.* opening brief
Attachment 2: Trial Court Judgement *Coastkeeper et.al.*
Attachment 3: Shimek declaration 2015
Attachment 4: Original Coastkeeper et. al. (some different parties from the eventual lawsuit) petition of RWQCB original Ag Order
Attachment 5: Review of Nitrate Toxicity in Aquatic Animals
Attachment 6: Economic Value of the California Salmon Fishery
Attachment 7: 2015 RWQCB Article in Crop Advisor Magazine
Attachment 8: Creative Solutions to Improve Water Quality, 7/11/2012, from VegetableGrower.com
Attachment 9: Environmental Fate of Imidacloprid
Attachment 10: Shimek Declaration 2017
Attachment 11: Inter-Agency Nitrate Report, 2013
Attachment 12: Governor's Drinking Water Report, 2012
Attachment 13: CDFA Nitrates Tracking, 2013
Attachment 14: Review of SWRCB Agricultural Expert Panel,2014
Attachment 15: Communities that rely on a contaminated groundwater source for their drinking water

Attachment 1

Coastkeeper et. al. Opening Brief

Deborah A. Sivas, CA Bar No. 135446
Alicia E. Thesing, CA Bar No. 211751
Matthew J. Sanders, CA Bar No. 222757
Caroline Parke, CA Certified Law Student No. 36638
Heather Kryczka, CA Certified Law Student No. 36639
Elizabeth Jones, CA Certified Law Student No. 36640
ENVIRONMENTAL LAW CLINIC
Mills Legal Clinic at Stanford Law School
559 Nathan Abbott Way
Stanford, CA 94305-8610
Telephone: (650) 723-0325
Facsimile: (650) 723-4426
E-mail: dsivas@stanford.edu

Attorneys for All Petitioners

Michael L. Meuter, CA Bar No. 161554
Yuchih Pearl Kan, CA Bar No. 294563
CALIFORNIA RURAL LEGAL ASSISTANCE
3 Williams Road
Salinas, CA 93905-2835
Telephone: (831) 757-5221
Facsimile: (831) 757-6212
E-mail: mmeuter@crla.org

Attorneys for Petitioner Antonia Manzo

Helen H. Kang, CA Bar No. 124730
Andrew J. Graf, CA Bar No. 300169
ENVIRONMENTAL LAW AND JUSTICE CLINIC
Golden Gate University School of Law
536 Mission Street
San Francisco, CA 94105-2968
Telephone: (415) 442-6647
Facsimile: (415) 442-2450
E-mail: hkang@ggu.edu

Attorneys for All Petitioners

SUPERIOR COURT OF CALIFORNIA
COUNTY OF SACRAMENTO

MONTEREY COASTKEEPER, a program of THE OTTER PROJECT, a non-profit organization; ANTONIA MANZO, an individual; ENVIRONMENTAL JUSTICE COALITION FOR WATER, a non-profit organization; CALIFORNIA SPORTFISHING PROTECTION ALLIANCE, a non-profit organization; PACIFIC COAST FEDERATION OF FISHERMEN'S ASSOCIATIONS, a non-profit trade association; and SANTA BARBARA CHANNELKEEPER, a non-profit organization, Petitioners, v. CALIFORNIA STATE WATER RESOURCES CONTROL BOARD, a public agency, Respondent, OCEAN MIST FARMS, et al., Respondent-Intervenors.	Case No. 34-2012-80001324 **PETITIONERS' OPENING BRIEF IN SUPPORT OF PETITION FOR WRIT OF MANDATE AND [PROPOSED] ORDER** **Date:** May 15, 2015 **Time:** 10:00 a.m. **Dept.:** 29 **Judge:** Hon. Timothy M. Frawley **Action Filed:** Nov. 29, 2012

TABLE OF CONTENTS

TABLE OF AUTHORITIES

Page(s)

FEDERAL CASES

CALIFORNIA CASES

FEDERAL STATUTES

CALIFORNIA STATUTES

OTHER STATUTES

FEDERAL REGULATIONS

STATE REGULATIONS

OTHER AUTHORITIES

INTRODUCTION

The quality of surface and groundwater in the Central Coast Region of California is at a critical juncture. The Central Coast Regional Water Quality Control Board ("Regional Board") has identified agricultural runoff—laden with nutrients from fertilizers, pesticides, and other wastes—as a "major cause of water pollution in the Central Coast region." RB 4849. Ninety percent of the millions of people who live in the Region get their drinking water from groundwater. If degradation continues unchecked, the groundwater for 80 percent of people in the Salinas Valley and other areas will be undrinkable by 2050. Treating the region's nitrate-contaminated drinking water could cost billions of dollars and raise water bills for low-income households throughout the Region. At the same time, pesticides are rendering more and more surface waters toxic to fish, insects, and other aquatic life. Worsening contamination threatens the Region's exceptional biodiversity and indeed the agricultural industry itself, which depends on clean water for irrigation.

This case raises two questions: how did we get here, and where must we go? After decades of leaving discharges from irrigated agriculture virtually unregulated, in 2004 the Regional Board issued a "conditional waiver" for irrigated agriculture. Under California law, a "waiver" is a general permit for a class of permittees who discharge similar wastes to State waters—in this case the "growers" (or "dischargers") who engage in irrigated agriculture in the Central Coast Region. A waiver must contain all necessary standards, prohibitions, and other requirements needed to meet applicable water quality objectives, as well as monitoring adequate to ensure the waiver is working.

Between 2008 and 2010, the Regional Board came to realize that the 2004 Waiver was, in fact, not working. "[M]any of the same areas that showed serious contamination from agricultural pollutants five years ago, particularly nitrate and toxic pesticides, are still seriously contaminated." RB 4051. Toxicity "remains common," there is "reduced [biological] diversity and few sensitive species," and "we are not seeing widespread improvements in nitrate concentrations" in the worst areas. RB 4051; *see also* RB 3758-64. Acknowledging that agricultural discharges are the sole or a primary contributor to each of these conditions, RB 3764, 4849, the Regional Board implored that "[s]ignificant measures need to be implemented now," RB 4088. "Changes in farming practices," shifts in "who bears the costs and benefits of water quality protection," RB 4860, and a new suite of aggressive measures were necessary to stop growers' continued pollution of water quality:

> The agricultural industry must implement the *most effective management practices* (related to irrigation, nutrient, pesticide and sediment management) *that will most likely yield the greatest amount of water quality protection*, and verify their effectiveness with on-farm data. The [Regional] Board must establish a known and reasonable *time schedule*, with *clear and direct methods of verifying compliance* and monitoring progress over time. . . . To prevent further water quality impairment and impact to beneficial uses, we must take action now.

RB 1129 (emphasis added); *see also* RB 606, 1130. Consistent with these statements and the law, in its initial drafts of a new waiver the Regional Board proposed stringent, enforceable standards and prohibitions along with individual, on-farm monitoring programs. Dischargers had to meet nitrogen reduction targets and decrease toxicity; they had to monitor their individual discharges from their farms; and they faced specific consequences if they failed to comply.

However, between 2010 and 2012, the Regional Board's resolve—and the waiver itself—weakened under growers' constant pressure for less and less regulation. Each time the Regional Board issued a new draft, it took another step back. Then, in reviewing the Regional Board's final waiver, the State Water Quality Control Board ("State Board") made things much worse. In 2013, the State Board ultimately issued a Modified Waiver that replaced many specific, substantive, enforceable water quality standards with vague, weak, unenforceable goals. The State Board also deleted monitoring provisions critical to identifying and eliminating the worst pollution sources. What few real standards and monitoring requirements left in the Modified Waiver were limited to an ever-shrinking group of growers. Agriculture won while everyone else lost.

The new, Modified Waiver for irrigated agricultural discharges is not the one the Regional Board had envisioned or said was required to comply with the California Water Code and the State's policy prohibiting the degradation of its waters. These laws require the State and Regional Boards to issue a waiver that effectively controls the pollution of surface waters and groundwater by growers and restores those waters' high quality and public beneficial uses. The Modified Waiver also fails to comply with the California Environmental Quality Act, which requires meaningful analysis and mitigation of the significant environmental effects that will flow from the State Board's action.

BACKGROUND

I. Legal background

A. Porter-Cologne Act

The regulation of water quality in California involves a federal-state partnership, with the State implementing the permitting provisions of the federal Clean Water Act, 33 U.S.C. § 1251 *et seq.*, and its own more stringent Porter-Cologne Water Quality Control Act ("Porter-Cologne Act"), Cal. Water Code ("Water Code") § 13000 *et seq.*; *see generally Bldg. Indus. Ass'n of San Diego Cnty. v. State Water Res. Control Bd.*, 124 Cal. App. 4th 866, 872-75 (2004). To comply with federal law, the States must set water quality standards that protect the beneficial uses of waters, including public drinking supply, propagation of wildlife, and recreational purposes. 33 U.S.C. § 1313(c). These federal standards set the national floor, with the States free to impose more stringent standards to protect local water quality. 33 U.S.C. § 1370; *Bldg. Indus. Ass'n*, 124 Cal. App. 4th at 881. The Porter-Cologne Act is broader in scope than federal law, regulating both surface water and groundwater and both point and nonpoint sources of pollutants, including runoff from agricultural irrigation. *Compare* Water Code §§ 13050(e), 13369 *with* 33 U.S.C. § 1342(l)(1) (exempting irrigated agriculture from permitting).

Under the Porter-Cologne Act, California is divided into nine regions. Each region is overseen by a Regional Board, which regulates water quality for all basins within its jurisdiction, subject to oversight by the State Board. Water Code § 13200. The Central Coast Regional Board has jurisdiction over a 300-mile long, 40-mile wide segment of the Central Coast, which includes urban and rural areas and the heavily agricultural regions of the Salinas, Santa Maria, and Lompoc Valleys. To protect water resources, the Regional Board has adopted a water quality control plan, called the Central Coast Basin Plan ("Basin Plan"), which establishes water quality objectives to "ensure the reasonable protection of beneficial uses and the prevention of nuisances." Water Code §§ 13240, 13241; 23 Cal. Code Regs. § 3920 *et seq.*; *see also Bldg. Indus. Ass'n*, 124 Cal. App. 4th at 875. Any discharger whose waste "could affect" water quality must obtain a discharge permit—called "waste discharge requirements"—from the Regional Board. Water Code § 13260. Such permits must "prescribe requirements" that both implement Basin Plan standards and protect beneficial uses. *Id.* § 13263.

In lieu of individual permits, the Regional Board may develop discharge requirements for an entire class of similar pollution sources using a "waiver." *Id.* § 13269(a)(1). However misleading its name may be, a "waiver" is simply a general permit; it does not lessen the Board's duty to prescribe whatever requirements are needed to achieve the Basin Plan's water quality objectives. Thus, the Regional Board may issue a waiver only if it is (1) "consistent with" the Basin Plan and (2) "in the public interest." *Id.* Waivers must also include monitoring requirements "designed to support the development and implementation of the waiver program, including, but not limited to, verifying the adequacy and effectiveness of the waiver's conditions." *Id.* § 13269(a)(2). The results of that monitoring must be publicly available. *Id.* These requirements parallel the monitoring and reporting requirements that apply to individual permits, *see* 23 Cal. Code Regs. § 2230, and are intended to ensure that waivers set forth real obligations, not just aspirational goals. As a form of waste discharge requirements, waivers last for five years and "may be terminated at any time." Water Code § 13269(a)(2).

B. Nonpoint Source Policy

The Basin Plan incorporates the State Board's 2004 *Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program* ("Nonpoint Source Policy"). RB 9405-24. The Nonpoint Source Policy requires that nonpoint source programs meet specific "key elements," RB 9417-21, and include "sufficient feedback mechanisms" to enable regulators, dischargers, and the public to "determine whether the program is achieving its stated purpose(s)," RB 9419.

C. Antidegradation Policy

Beyond the requirements of the Porter-Cologne Act, California has adopted a State Antidegradation Policy modeled after (but more protective than) the similar federal policy. *See* State Water Res. Control Bd., *Resolution No. 68-16: Statement of Policy with Respect to Maintaining High Quality Waters in California* (1968) ("State Antidegradation Policy"), RB 9377-78; 40 C.F.R. § 131.12. Under the State Antidegradation Policy, waters that meet or are below water quality objectives must be maintained or improved, and waters that are cleaner cannot be degraded at all. Thus, the State Policy requires the State to achieve "'the highest water quality consistent with maximum benefit to the people of the state.'" *Asociacion de Gente Unida por El Agua v. Central Valley Regional Water*

Quality Control Board, 210 Cal. App. 4th 1255, 1259 (2012) ("*AGUA*") (quoting State Antidegradation Policy) (invalidating conditional waiver for dairy farms for noncompliance with Policy); *see also* State Water Res. Control. Bd., *Admin. Procedures Update 90-004: Antidegradation Policy Implementation for NPDES Permitting*, 1-4 (July 2, 1990) ("APU 90-004");[1] *Cal. Sportfishing Prot. Alliance v. Cal. Reg'l Water Quality Control Bd., Central Valley Region*, Cal. Sup. Ct. No. 34-2012-80001186 (Consolidated No. RG12632180) (May 21, 2013) (invalidating conditional waiver for irrigated agriculture for noncompliance with State Policy).

II. Factual background

The Salinas Valley is a long swale between the Gabilan and Santa Lucia Mountain ranges. Its hundreds of miles of rivers and streams once twisted through a mosaic of salt ponds, grasslands, and wetlands—now mostly irrigated agriculture—before percolating into underground aquifers or spilling into Monterey Bay. Water is the lifeblood of the Valley and of the entire Central Coast Region: deep municipal supply wells and shallow domestic wells supply 90 percent of the drinking water for the Region's millions of residents. RB 8506; SB 3180. River and streamside habitats support some of the most significant biodiversity of any temperate region in the world, including some of the last remaining populations of the California sea otter, endangered steelhead, endangered coho salmon, and other imperiled species. RB 8506.

The Valley's extensive drainage and irrigation systems also sustain a multi-billion dollar agricultural industry. *Id*. The industry's intensive use of fertilizers and pesticides increasingly threatens the Salinas Valley's water resources, and the industry's landscape alterations exacerbate that threat. In 2011, the Regional Board reported that "many of the same areas that showed serious contamination from agricultural pollutants five years ago, particularly nitrate and toxic pesticides, are still seriously contaminated," and a number of sites "appear to be getting worse." RB 5464.[2] Over a third of groundwater wells are now contaminated with dangerously high nitrate concentrations, in some

---

[1] *Available at* http://www.swrcb.ca.gov/water_issues/programs/npdes/docs/apu_90_004.pdf. All websites were last visited December 18, 2014.

[2] Petitioners urge the Court to read the Regional Board's candid assessments of water quality in the Central Coast Region, and of agricultural dischargers' impacts on water quality, in two documents accompanying the Board's early proposed waivers: Staff Report (RB 4843-4900) and Appendix G (RB 5444-5512). Earlier versions of these reports are at RB 3725-65 and RB 4032-97.

cases exceeding federal drinking water standards by an order of magnitude. RB 2879. If degradation continues at the present rate, the groundwater for 80 percent of people in the Salinas Valley (and other areas) will be undrinkable by 2050. SB 3173. In addition, nearly every water body in the lower Valley is listed by the State and the U.S. Environmental Protection Agency ("EPA") as "impaired" for harmful pollutants associated with agriculture like nutrients, pesticides, and sediment. RB 5448-49.

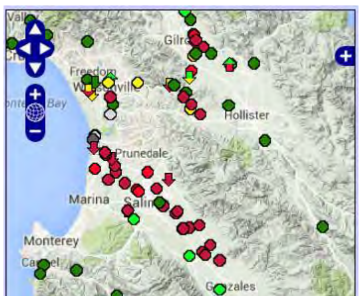


Figure 1. Surface water nitrate pollution. Colored dots indicate degree of degradation below beneficial use thresholds (green best, dark red worst).

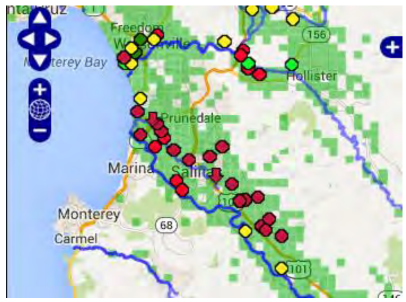


Figure 2. Invertebrate survival in water. Colored dots indicate degree of degradation; green layer indicates agricultural pesticide use.

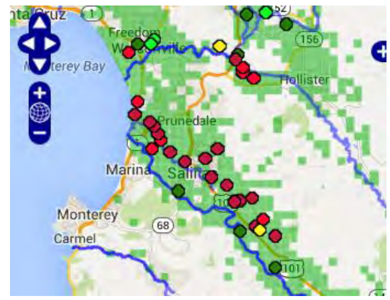


Figure 3. Invertebrate survival in sediment. Colored dots indicate degree of degradation; green layer indicates agricultural pesticide use.

Nitrates in groundwater. Nitrates are chemical byproducts of nitrogen-based fertilizers that dissolve easily in water, where they pose "arguably the most serious and widespread of all pollution problems in the Central Coast Region." RB 5449. According to one study, "up to approximately 50 percent of the wells surveyed [in portions of the Salinas Valley] had concentrations above the nitrate drinking water standard, with average concentrations nearly double the standard." RB 8512-13; *see also* SB 3173 (57 percent of population uses a water system with nitrate concentrations that have exceeded the drinking water standard at least once between 2006 and 2010). EPA has set the drinking water standard at 45 mg/L nitrates as nitrates (10 mg/L nitrates as nitrogen)[3] to protect people—particularly infants, pregnant women, and the elderly—from diseases like "blue baby syndrome," cancer, Parkinson's disease, and diabetes. RB 5495-96, 8513, 9199.

[3] There are two equivalent ways to express nitrate concentrations in water: nitrates as nitrates and nitrates as nitrogen. The first measures the weight of the nitrogen and oxygen in a nitrate molecule, while the latter only measures the weight of the nitrogen. For the sake of consistency, we have converted all nitrate concentrations to the nitrates as nitrates standard.

Over the last 30 to 40 years, nitrate data show a clear pattern of degradation, from nitrate levels better than the relevant standard to worse than the relevant standard. *See* RB 8467 ("pollution gets substantially worse each year"); SB 3173 ("Nitrate contamination is widespread and increasing."). Specifically, the mean concentration in nearly every aquifer and sub-basin studied now exceeds the drinking standard. In the Valley generally, the mean concentration has increased from 36 mg/L in 1993 to 56 mg/L in 2007:[4]

Aquifer or Sub-Basin	**1978 Mean (Median)**	**1987 Mean (Median)**	**1993 Mean**	**2007 Mean (Median)**
Pressure 180'	19.9 (6.9)	29.4 (9.0)	19.5	**49** (20)
Pressure 400'	N/A	N/A	10.8	12 (3)
Pressure Deep	N/A	N/A	N/A	1 (1)
East Side	40.2 (28.0)	**80.3** (**55.9**)	**85.1**	**106** (**63**)
Forebay	38.1 (33.8)	**54.4** (42.7)	42.5	**79** (**54**)
Upper Valley	28.3 (26.0)	**51.7** (**47.5**)	**67.5**	**90** (**78**)
Total	N/A	N/A	36.1	**56** (20)

Table 1: Mean and median nitrate concentrations in aquifer and aquifer sub-basins throughout the Salinas Valley. Values are expressed in mg/L; those in **bold** are above the 45 mg/L drinking water standard.

The people most affected by nitrate contamination are residents of rural communities who drink from shallow domestic wells in the Salinas Valley. *See* RB 8506 (as of 1990, there were 40,000 permitted private wells in entire Central Coast Region, and this number is increasing). Many households may not be aware that their tap water is contaminated. RB 5502. Those who are aware may not be able to afford water treatment; at least 23,215 people who get their drinking water from small water systems in the Salinas Valley alone face higher per capita costs for treatment. SB 3215. Treating the region's nitrate-contaminated drinking water could cost "billions of dollars" and raise water bills for low-income households throughout the Region. RB 5502, 8514; SB 3215-19, 6139.

There is no question as to the source of the contamination: cropland fertilizers account for 78 to 96 percent of the estimated nitrate loading to groundwater in the Salinas Valley. RB 8466-67; SB 3185-86. Tens of millions of pounds of nitrate—37.5 percent of the nitrogen fertilizer applied

[4] Data compiled from RB 2879, 17719, 17836; *see also* SB 3157-3248, 3329-4802 (providing detailed assessment of increasing groundwater nitrate contamination in the Salinas Valley).

annually and roughly equal to 2,000 dump truck loads—leach into the water supply each year. RB 8466, 5484.

Nitrates in surface waters. Nitrate contamination is also widespread aboveground. Fifteen water bodies in the lower Salinas Valley (47 in the Central Coast Region generally) are impaired by nitrate pollution. RB 1154. Of 250 surface water sites evaluated for the Central Coast Ambient Monitoring Program[5] and Cooperative Monitoring Program,[6] 30 percent exceed the 45 mg/L drinking water standard, in some cases by fivefold or more. RB 5451; *see also* Figure 1, *supra* p. 6. In addition, approximately 60 percent have concentrations above 4.43 mg/L, the Basin Plan's aquatic life standard. RB 5450, 11471. Concentrations above this level are directly toxic to salmon and trout and can stimulate algal blooms that consume oxygen and kill aquatic organisms. RB 5450, 10139-40, 11471.

Many of the nitrate-laden rivers and creeks in the Salinas Valley are deteriorating. The Regional Board has singled out the rivers and creeks in the Tembladero Slough and lower Salinas River as "some of the most seriously polluted." RB 4894. Of the 26 monitoring sites in these systems, only two have never had concentrations exceeding the human heath standard, and most sites with concentrations higher than the standard are either not improving or getting worse. *See supra* n.5 (data showing that mean nitrate concentrations at Gabilan Creek and the Salinas Reclamation Canal have increased above 45 mg/L).

About 60 percent of the water bodies on the Central Coast Region's 2010 list of impaired waters identify agriculture as a potential source of impairment. RB 8517. Most of the worst water quality sites for nitrates are in areas dominated by or downstream from row crop agriculture. RB 16867. In contrast, nitrate levels rarely exceed 4.43 mg/L in areas where significant agricultural activity is absent, even in heavily urbanized creeks. RB 8518, 16864.

---

[5] The Central Coast Ambient Monitoring Program is "the Central Coast Regional Water Quality Control Board's regionally scaled water quality monitoring and assessment program." The information on the Central Coast Ambient Monitoring Program website, http://www.ccamp.org, is part of the record in this case. *See* Regional Board Record Index Files 197, 479-80.

[6] The Cooperative Monitoring Program is composed of farmers who have opted not to conduct their own individual monitoring. Preservation, Inc., monitors the 50 receiving water sites in the Cooperative Monitoring Program and makes the data from those sites available on the Central Coast Ambient Monitoring Program website.

Pesticides and toxicity. In addition to fertilizer, farmers in the Central Coast agricultural areas apply pesticides to kill insects that could damage their crops. *See, e.g.*, RB 16924. Pesticide residues combine with each other and other chemicals to poison organisms that ingest or otherwise come into contact with them. *See generally* RB 10092-118. Toxicity measures the harm that water laced with such mixtures causes to the environment and human health. RB 9196. The Central Coast has both the highest percentage of "toxic sites" and the highest percentage of "highly toxic sites" (22 percent of all sites tested) in California. RB 5455, 7746. Twenty-nine water bodies are on the 2010 List of Impaired Waters because they are so toxic that fish and other organisms cannot survive in them. RB 5452-53. The majority of these listings are in the lower Salinas Valley. RB 1157.

The water quality objective for toxicity is narrative: "all waters shall be maintained free of toxic substances in concentrations which are toxic to . . . life." RB 9196. The Central Coast Ambient Monitoring Program uses an 80 percent survival rate to quantify this objective. Most Salinas Valley sites in the program are "severely impacted" (dark red) or "impacted" (red) because the mean survival rate at these sites is less than 80 percent. *See* Figures 2-3, *supra* p. 6. Alarmingly, at some sites, including Chualar Creek at Chualar River Road and Quail Creek at Highway 101, the majority of samples showed a zero percent invertebrate survival rate (that is, 100 percent mortality) in water. There are also some sites, including the Blanco Drain, where very few or none of the samples were toxic until sometime in the last few years. *See supra* n.5; RB 5452 ("The levels of toxicity found in ambient waters of the Central Coast far exceed anything allowed in permitted point source[ ] discharges. . . . We have drainages in agricultural areas of the Region that are toxic virtually every time they are measured.").

The toxicity problem in the Salinas Valley is directly related to the region's high pesticide use rates and in-stream pesticide concentrations. Two of the most toxic pesticides, diazinon and chlorpyrifos, have a long history of use in the Salinas Valley, and a 2006 study found that pyrethroid use in the Valley was higher than in any other region studied. RB 8521-22, 11698, 16874-75, 16929. Rigorous monitoring is essential to ensure that pesticide concentrations do not continue to build up, as a growing body of evidence indicates that pesticides can attack developing brains and lead to neurological diseases later in life. RB 5500. One 2009 study, for example, reported that residents who drink from wells near fields sprayed with the insecticides propargite or chlorpyrifos were 90 percent more likely to develop Parkinson's disease than those drinking from uncontaminated wells. *Id.* Toxicity has been "documented in some areas of intensive agricultural operations [and] traced to currently applied pesticides." RB 10.

Habitat degradation and erosion. Many waterways are also damaged by intentional landscape alterations. Over the last several decades, the pace of riparian and wetland area alteration has accelerated as operators remove vegetation to plant cultivated crops and keep out deer and other wildlife. RB 4897, 5511. These changes make existing pollution problems even worse. Landscape loss destroys the watershed functions that maintain high water quality and critical habitat—by filtering pollutants, providing shade for wildlife, preventing soil erosion, recharging aquifers, and providing flood storage capacity. RB 5507-11.

Consider the problem of increased water temperature. When riparian habitat is destroyed, critical shade disappears and water temperatures increase. RB 5510, 8527. The result is lower oxygen levels, less protection for insects and fish, and poorer watershed health. RB 3763, 4896, 5570. Temperatures in some denuded water bodies of the Central Coast exceed 68 degrees Fahrenheit, rendering some of the only rearing and migration habitat for endangered salmonids uninhabitable. RB 4894, 8506, 8528.

Soil erosion and the resulting sediment loading are also longstanding problems. Sediment loading can lead to sustained levels of high turbidity. Turbidity measures material suspended in water, and all turbidity levels above 25 "nephalometric turbidity units" further increase water temperatures, decrease the amount of sunlight available for aquatic plants, and make it difficult for fish to feed, breathe, and reproduce. RB 8524, 21039-40. Many sites in the Salinas watershed exceed 100 units, which is 20 times the median turbidity of most other sites on the Central Coast. RB 2236. As for erosion, high levels of runoff not only impact aquatic organisms directly, they also carry nutrients downstream and mobilize pesticides. Nutrient loading to the Monterey Bay has led to large algal blooms that kill aquatic life and sea birds. RB 8526.

In short, the water quality situation in the Salinas Valley is abysmal. Nitrate and pesticide pollution continues at an alarming rate, and unchecked landscape alterations exacerbate longstanding problems. The 2004 Waiver did not move the region into compliance with water quality objectives, and the full extent and speed of degradation is still unknown due to widespread data monitoring and reporting gaps. Nonetheless, "[t]he water quality impairments [in the Central Coast] are well documented, severe, and widespread . . . and many (not all) agricultural waste discharges continue to . . . impose certain risks and significant costs to public health, drinking water supplies, aquatic life, and valued water resources." RB 4849.

III. The Modified Waiver Administrative Process

After decades of minimally regulating one of the worst water pollution sources in the Central Coast, the Regional Board issued a conditional waiver for agricultural dischargers in 2004 ("2004 Waiver").[7] This waiver, however, failed to stop the continuing degradation of water quality. Thus, from 2008 to 2012, the Regional Board developed a new waiver aimed at actually complying with water quality standards, but, as it developed, the waiver became weaker and weaker under intense pressure from agricultural growers. In 2013, the State Board modified the already-weakened Regional Board's waiver, further diminishing its effectiveness. The final Modified Waiver will not abate the continued pollution of Central Coast waters by agricultural dischargers.

2004 Waiver. The 2004 Waiver aimed to "achieve and maintain" beneficial uses through education; voluntary, unspecified management practices; and limited, general water quality data gained through cooperative monitoring. RB 71-72, 1128-29, 1184-92. The 2004 Waiver did not require dischargers to meet specific targets, timelines, or monitoring requirements. RB 1128-29. The Regional Board conducted limited review under the California Environmental Quality Act ("CEQA"), Cal. Pub. Res. Code § 21000 *et seq.* RB 22-57.

2012 Waiver: 2008-2011 drafts. The Regional Board determined that water pollution continued unabated under the 2004 Waiver. RB 1000, 1130, 3767; *see generally* RB 3725-65, 4032-97. Thus, "immediate and effective action" was "necessary to improve water quality protection and resolve the widespread and serious impacts on people and aquatic life." RB 1126.

---

[7] Original agricultural waste discharge waivers were adopted in 1983, under which "water quality . . . has been shown to be impaired by such constituents as pesticides and nutrients, lending further urgency to the need to adopt additional requirements for irrigated operations." RB 9.

Accordingly, the Regional Board intended that the new waiver would establish "specific requirements, time schedules, milestones, and verification monitoring" to ensure that dischargers:

- Eliminate toxic discharges of agricultural pesticides to surface waters and groundwater;
- Reduce nutrient discharges to surface waters to meet nutrient standards;
- Reduce nutrient discharges to groundwater to meet groundwater standards;
- Minimize sediment discharges from agriculture lands; and
- Protect aquatic habitat (riparian areas and wetlands) and their buffer zones.

RB 606. Agricultural representatives opposed the Board's "regulatory" focus, favoring instead reprising the 2004 Waiver's educational focus. *See, e.g.,* RB 965-66, 969 (opposing the Board's "major philosophical shift" from an educational to a regulatory focus; expressing concern about the "policy shift from collaboration to regulation"; and asserting that the Board "urgently needed to move the agency's approach . . . away from regulation").

In February 2010, the Regional Board issued a new draft waiver. Unlike the 2004 Waiver, the February 2010 draft: imposed explicit discharge prohibitions to reduce nutrient, sediment, and pesticide pollution (including a prohibition on "excessive use or over-application of fertilizer"); updated management practices under Farm Plans[8] with scheduling, reporting, and implementation requirements; protected aquatic habitats; and enhanced surface water, groundwater, and compliance monitoring. RB 1143-44, 1182-89, 1191-92, 1251. The Board declared that "individual on-farm water quality monitoring is critical to . . . protect water quality."[9] RB 1219. Growers responded by proposing the 2004 scheme again, including reducing Farm Plan requirements and eliminating public reporting requirements. RB 2143, 2261-67, 2492. Regional Board staff determined that the proposals failed to include the targets, schedules, and monitoring requirements necessary to achieve water quality objectives. RB 2143-44.

In November 2010, the Regional Board issued a revised draft ("2010 Draft") that retained much of the earlier draft but introduced categorizing dischargers into three tiers, corresponding roughly to the size of farm operation, proximity to an impaired watercourse, use of chemicals, and type of crops.

[8] Farm Plans are "tool[s] to identify the management practices that have been or will be implemented to protect and improve water quality," and "contain a schedule for implementation of practices and an evaluation of progress in achieving water quality improvement." RB 8532.

[9] This draft included requirements for Individual Discharge Characterization Monitoring, Individual Discharge Monitoring, Watershed (receiving water) Monitoring, and "Additional Monitoring." RB 1192-93.

RB 3733. Tier 3 dischargers were subject to the most stringent regulation, one of which would have required reducing excess nitrogen. RB 3733, 3789-93. The Board remained adamant that the new waiver "must" include individual monitoring to "enable the regulated community and stakeholders to understand when Dischargers are in compliance." RB 3736, 3748; *see also* RB 4850, 5480.

The California Farm Bureau Federation and other growers again opposed the Regional Board's proposed standards and individual monitoring. *See, e.g.*, RB 4737, 4740, 4745. In response, the Board issued a weakened draft in March 2011. That draft narrowed Tier 3 to those dischargers using two specific pesticides: diazinon and chlorpyrifos. RB 4871. As a result, over 100 high-risk pesticides were excluded, including malathion, a pesticide that growers can substitute for diazinon to evade Tier 3's requirements. RB 1230-32. Growers then advanced another proposal to eliminate the waiver's few remaining standards and prohibitions, and the Board issued yet another weakened draft that, among other things, lessened restrictions on excess nitrogen. *See* RB 6408-17, 6571-79, 6620-44, 6755-66.

2012 Waiver. In March 2012, the Regional Board issued a final waiver ("2012 Waiver") that further weakened the improvements which the Board previously determined were necessary. RB 8465-8558. For example, despite the Board's emphasis on the need for individual monitoring, the 2012 Waiver allowed groups of dischargers to use self-formulated group monitoring. RB 8468-69; *see also* RB 8259-60, 8301-02. This change eliminated the Board's ability to identify the worst pollution at the specific source. The Board also added a provision allowing dischargers to move to a lower tier through group monitoring. RB 8478-79; *see also* RB 8260. Finally, the Board significantly weakened nitrate management; instead of requiring dischargers to actually reduce excess nitrogen, the Waiver required them only to "report progress towards" reductions or "implement an alternative," unspecified management practice. RB 8493-94; *see also* RB 8327. By the Board's own admission, RB 7744, the 2012 Waiver advanced the regulation of agricultural pollution by a relatively small degree. Such regulation fell far short of what was required of other industries, even though agricultural pollution poses the highest degree of water quality impacts in the region. RB 7744 (Figure 1, reproduced as Figure 4 below).

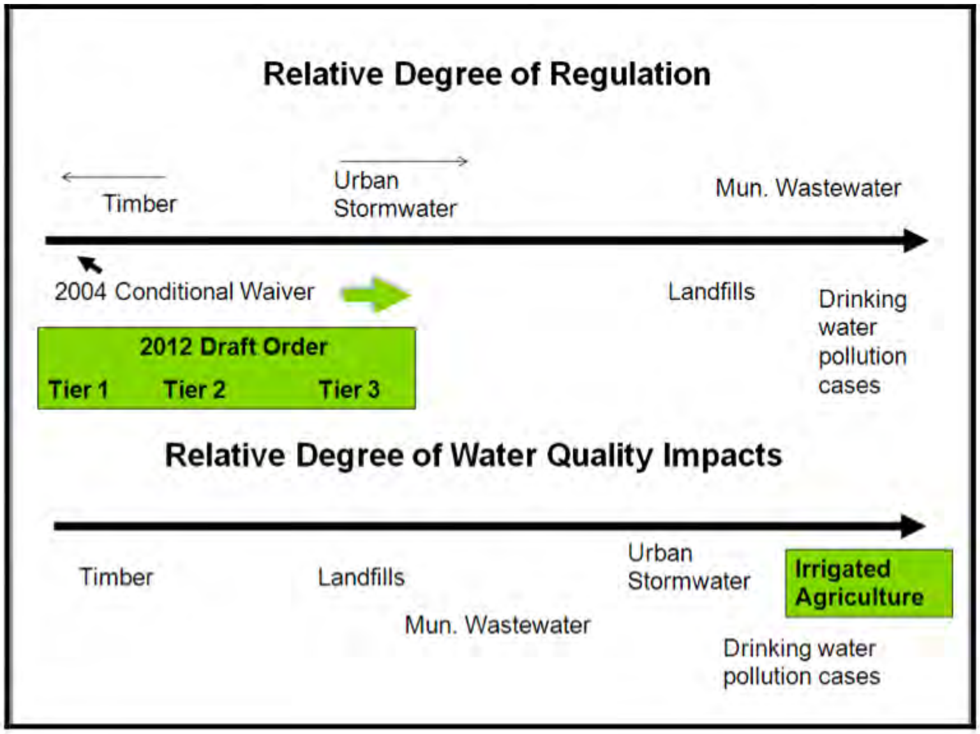


Figure 4. Relative Degree of Water Quality Regulation for Different Activities. RB 7744.

The Regional Board made these final changes a day after researchers at the University of California-Davis published a study on groundwater nitrate contamination in the Central Coast ("U.C. Davis Report"). SB 3157-4802. In the Report, 26 scientists analyzed nitrate data from nearly one hundred thousand well samples, traced pollution sources, and evaluated and recommended various management techniques. *See* SB 3157-76, 3197-3201. Though the Regional Board declined to consider the U.C. Davis Report while preparing the 2012 Waiver, the Regional Board asked the State Board to consider it in their review of the 2012 Waiver. RB 8131; SB 7163 n.2.

Finally, to comply with CEQA, the Regional Board issued a Subsequent Environmental Impact Report along with the 2012 Waiver. RB 8977.

2013 Modified Waiver. Intervenors, Petitioners, and other parties challenged the 2012 Waiver in petitions to the State Board. *See* Water Code § 13320; SB 1-1646. In June 2013, the State Board issued a draft waiver that gutted what was left of the 2012 Waiver's monitoring and nitrate pollution reduction requirements. In particular, the draft deleted the requirement to simply *calculate* excess nitrogen; limited Tier 3 individual surface water monitoring to "outfalls" (pipes and ditches); and relaxed group monitoring requirements. SB 5657, 5675, 5685-86.

The State Board issued further drafts in August and September 2013, each of which further weakened the 2012 Waiver. These drafts added Provision 87.5, which allowed dischargers to implement vague "modified" management practices when their first efforts failed; all dischargers had to do was make a "conscientious effort" to stop polluting. SB 6204-05, 6414-15, 7186. On September 24, 2013, the State Board incorporated all of these changes into its final Water Quality Order No. WQ 2013-0101 ("Modified Waiver"). SB 7162-7234.[10] As weak as the Regional Board's 2012 Waiver was, the Modified Waiver was far worse. It weakened management practice implementation and evaluation processes, eliminated requirements for nitrate reduction and monitoring at the source and reporting, and relaxed group monitoring requirements. In issuing the waiver, the State Board refused to consider the U.C. Davis Report, SB 7163 n.2, and failed to conduct any additional CEQA review.

STANDARD OF REVIEW AND BURDEN OF PROOF

The Court must determine whether the agency prejudicially abused its discretion. Cal. Code Civ. Proc. § 1094.5(b). An agency abuses its discretion when it (1) proceeds contrary to the law, (2) issues an order or decision unsupported by its findings, or (3) makes findings unsupported by the evidence. *Id.* In reviewing the record evidence for the conditional waiver, the Court must exercise its independent judgment. Water Code § 13330(e). Under this independent judgment standard, a prejudicial abuse of discretion exists where the "weight of the evidence" does not support the agency's findings. Cal. Code Civ. Proc. § 1094.5(c); *see also Silva v. Superior Court*, 14 Cal. App. 4th 562, 582 (1993) ("weight of the evidence" is "synonymous with" preponderance of the evidence).[11] Independent judgment review is "a kind of limited trial de novo, using the existing administrative record." *Int'l Bhd. of Elec. Workers v. Aubry*, 42 Cal. App. 4th 861, 868 (1996). Thus, "in order to uphold the [State] Board, the court would have had to be convinced *by the weight* of the evidence that the Board's decision was correct. Simply put, the superior court would have had to agree with the Board, on the

---

[10] The State Board's modifications to the 2012 Waiver—and thus the 2013 Modified Waiver itself—are more clearly reflected in clean and redline versions of the 2012 Waiver found at SB 7235-7531. For the sake of consistency and convenience, Petitioners cite to the redline version of the 2012 Waiver (SB 7329-69) where possible.

[11] With respect to the CEQA claim only, an agency abuses its discretion when substantial evidence reveals significant unanalyzed environmental effects that will result from project changes. *Am. Canyon Cmty. United for Responsible Growth v. City of Am. Canyon*, 145 Cal. App. 4th 1062, 1072 (2006).

basis of the record," not "merely . . . determine whether there was substantial evidence in the record . . . to support the Board's determination." *Marina Cnty. Water Dist. v. State Water Res. Control Bd.*, 163 Cal. App. 3d 132, 138 (1984). Likewise, "[i]t is the court, rather than the agency, that has 'final responsibility for the interpretation of the law.'" *AGUA*, 210 Cal. App. 4th at 1267-68.

Moreover, the State Board, through its administrative record, must "bridge the analytic gap between the raw evidence and ultimate decision or order." *Topanga Ass'n for a Scenic Cmty. v. Cnty. of Los Angeles,* 11 Cal. 3d 506, 515 (1974); *see also id.* at 516 (explaining that the findings requirement "minimize[s] the likelihood that the agency will randomly leap from evidence to conclusions"). Boilerplate findings are insufficient to satisfy this requirement. *Glendale Memorial Hosp. v. Dep't of Mental Health,* 91 Cal. App. 4th 129, 140 (2001). In this case, the State Board must "bridge the analytic gap" between the evidence in the record and the Board's conclusions that: (1) the Modified Waiver is consistent with the Basin Plan and is in the public interest (under Water Code section 13269(a)(1)); (2) the Waiver's monitoring program is sufficient to verify the adequacy and effectiveness of the Waiver's conditions to meet water quality standards (under Water Code section 13269(a)(2)); and (3) the Waiver complies with the State Antidegradation Policy. As we explain in Sections I, II, and III below, the State Board has not met its burden.

ARGUMENT

I. The Modified Waiver Violates Water Code Section 13269(a)(1) Because It Is Not Consistent with the Basin Plan or In the Public Interest.

The Porter-Cologne Act requires that all conditional waivers be "consistent with any applicable state or regional water quality control plan and . . . in the public interest." Water Code § 13269(a)(1). The weight of the evidence shows that the 2013 Modified Waiver is not consistent with the Basin Plan because it: (1) lacks the specific, enforceable standards and prohibitions needed to meet the Basin Plan's water quality objectives and protect beneficial uses; (2) does not require adequate monitoring of water quality or management practices; and (3) fails to comply with the Nonpoint Source Policy or the State Antidegradation Policy.

Similarly, the State Board cannot demonstrate that the Modified Waiver is in the public interest because the Board made no findings to that effect. In particular, the Board fails to find or show that the

Modified Waiver will in fact lead to significant, quantifiable improvements in the quality of waters upon which the people of the Central Coast Region rely. Even if it had made the necessary findings, the Waiver is not in the public interest because it: (1) does not comply with the Basin Plan's objectives; (2) does not comply with California's Human Right to Water Law, and (3) does not satisfy the Regional and State Boards' obligations under the public trust doctrine.

A. The Modified Waiver Is Not Consistent with the Basin Plan.

1. The Central Coast Basin Plan Sets Forth Mandatory Water Quality Objectives to Protect Beneficial Uses.

The Central Coast Basin Plan "show[s] how the quality of the surface and ground waters in the Central Coast Region should be managed to provide the highest water quality reasonably possible." RB 9165. To that end, the Basin Plan establishes "water quality objectives," or those "limits or levels of water quality constituents or characteristics" that will protect present and future beneficial uses and prevent nuisance. Water Code §§ 13241, 13050(h); RB 9194. "Beneficial uses" "include, but are not limited to, domestic, municipal, agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves." Water Code § 13050(f). As relevant here, the Central Coast Basin Plan sets forth the following objectives:

- <u>Nitrates</u>: "Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses." RB 9195. For municipal and domestic water supplies, the Regional Board has converted this narrative standard into a numeric one: 45 mg/L nitrates as nitrates. RB 5450, 9199, 11477. For aquatic life, the Board "designate[s] water bodies as impaired for aquatic life use when nitrate concentrations exceed" 4.43 mg/L. RB 11471; *see also* RB 5450.

- <u>Toxicity</u>: "All waters shall be maintained free of toxic substances in concentrations which are toxic to, or which produce detrimental physiological responses in, human, plant, animal, or aquatic life." RB 9196.

- <u>Pesticides</u>: Toxicity is related to pesticides, which shall not "reach concentrations that adversely affect beneficial uses." RB 9196.

- <u>Sediment</u>: "The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses." RB 9195.

- Temperature: "Natural receiving water temperature of intrastate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Board that such alteration in temperature does not adversely affect beneficial uses." RB 9196.
- Habitat: The Basin Plan contains requirements to protect aquatic habitat, and the Regional Board has interpreted the Plan to "require[ ] the protection of riparian habitat and the maintenance of adequate buffer zones . . . . [R]emoving riparian habitat and buffer zones on and around irrigated agricultural fields . . . is a direct violation of the Basin Plan." RB 608; *see also* RB 9262-64.

The Basin Plan includes a "program of implementation" to meet these objectives. RB 9209-347; Water Code § 13242. The program consists of "a description of the nature of actions which are necessary to achieve the objectives," a "time schedule for the actions to be taken," and enforcement mechanisms "to determine compliance with objectives." RB 9209. "Control measures implemented by the Regional Board must provide for the attainment of this Basin Plan's beneficial uses and water quality objectives." RB 9211. Further, actions to achieve the Total Maximum Daily Loads in certain areas to protect drinking water supplies specifically rely on the irrigated agricultural conditional waiver. RB 9310.

2. The Modified Waiver Does Not Contain the Specific, Enforceable Standards or Prohibitions Needed to Comply with the Basin Plan.

The Modified Waiver does not meet the Basin Plan's objectives or constitute the comprehensive and urgent action that the Regional Board initially determined was necessary to address declining water quality on any meaningful timeframe. Chief among the Modified Waiver's deficiencies is its lack of enforceable standards, which the Regional Board found were essential to filling the gaps left by the 2004 Waiver, and which the Board included in its original drafts. The Board originally resisted deleting such provisions, but eventually caved under the pressure of the interests the Board was trying to regulate. The State Board further weakened the waiver, with no articulation of how and when it would achieve the Basin Plan's objectives.

a. The Modified Waiver Deletes Key Provisions for Reducing Nitrate Pollution.

The Regional Board has identified nitrate pollution as a critical problem in the Central Coast Region. RB 1126-27, 1136-37, 1156, 3731, 3760, 4052-53, 4859-60; 4874; 5450-51, 11471; *see also* SB 7236, 7330. The Modified Waiver is key to addressing that problem because "fertilizer from irrigated agriculture is the largest primary source of nitrate pollution in drinking water wells," SB 7236, 7330, and because the Regional and State Boards are the principal regulators of such pollution, RB 4858. Since 90 percent of the Region's people rely on shallow wells for drinking water, the Basin Plan sets a low nitrate standard (45 mg/L) and accords certain areas special protection because of threats to drinking water supplies. SB 3180; RB 8506, 9199, 9309.

Accordingly, the Regional Board's 2010 Draft Waiver proposed requiring Tier 3 dischargers to meet nitrogen balance ratio targets. RB 8327 (Provision 47). Nitrogen ratios allow agricultural dischargers to balance fertilizer application with how much fertilizer crops actually need, and the use of targets would bring those ratios progressively closer to 1:1. *See* RB 3789-90; *see also* RB 3928-29. At growers' insistence, however, the Regional Board replaced "meet" with "report progress towards," and "targets" with "milestones," in its 2012 Waiver. RB 8327 (Provision 78). Then, in the Modified Waiver, the State Board deleted even the requirement just to *calculate* nitrogen ratios, SB 7359-60, claiming that they are "speculative and overly simplistic," SB 7216. Not only did the Board cite no evidence for this assertion, but all the available evidence indicated otherwise. The Regional Board recognizes such ratios as a common measure of cropland nitrogen use efficiency, and the U.C. Davis Report commissioned for the State Board used ratios extensively in its analysis. RB 3789-90, 4071; SB 7210-11, 3197-3202, 6303. Even the State Board admitted the "necessity of providing targets to encourage and measure progress in reducing pollutant discharges." SB 7215-16.

The State Board deleted other important nitrate requirements. The 2012 Waiver would have required Tier 3 dischargers with high nitrate loading risk to annually report the nitrogen needs of crops, the balance of nitrogen applied compared to those needs, and estimates of nitrate loading to water and reductions under the Waiver. RB 8493-94; SB 7209-10, 7212-15. The Modified Waiver deletes all this accounting and requires dischargers to report only how much nitrogen they apply and existing soil and water conditions.[12] SB 7210-14, 7359-60, 7510-12, 7516-20. The State Board reasoned that a "more nuanced calculation" was necessary and that total nitrogen applied would allow the regulator to "easily identify outliers in nitrogen application." SB 7210-11. Even if those assertions were true, the State

[12] The Modified Waiver also eliminated individual monitoring on the grounds that it would be too "ambitious and costly." SB 7206, 7211.

Board eliminated any requirement for even a rough calculation of how much fertilizer is used versus how much crops need—information essential to understanding and minimizing excess use.

The State Board's skepticism about the reliability of nitrogen balancing and reporting might pass muster had the Board adopted other enforceable standards or prohibitions for nitrates. The State and Regional Boards are the agencies with authority to regulate nitrate discharges to groundwater, RB 1128, 3735, and a conditional waiver, thus far, is the only means by which the Boards have chosen to exercise their authority. But as a result of the Boards' actions, there is not a single enforceable standard or prohibition in the Modified Waiver that requires agricultural dischargers to apply measurably less nitrogen. The waiver therefore will not achieve the Basin Plan's objectives on a meaningful timeframe, and nitrate contamination will continue to worsen. *See* RB 607 (Regional Board in 2008 calling for "aggressively address[ing] these problems"); *supra* pp. 6-8 (discussing worsening contamination). Adopting a waiver that has no reasonable chance of complying with the law is an abuse of discretion. *Cf. Hall v. EPA*, 273 F.3d 1146, 1159 (9th Cir. 2001) (under the Clean Air Act, agency "must determine the extent of pollution reductions that are required and determine whether the emissions reductions effected by the proposed revisions will be adequate to the task").

b. The Waiver's Farm Plan, Pesticide Controls, and Other Compliance Provisions Are Too Weak to Satisfy the Basin Plan.

Apart from nitrogen balancing and reporting, the Regional and State Boards also deleted several provisions that were critical to ensuring that dischargers take measures to actually reduce pollution. In this section we discuss four of many examples.

The first such provision concerns dischargers' Farm Plans. The Regional Board initially required Farm Plans to "[d]emonstrate that discharges do not cause or contribute to exceedances of water quality standards . . . by including methods and results to evaluate progress and effectiveness of water quality management practices, treatment or control measures, or changes in farming practices implemented to achieve compliance with this Order." RB 3786; *see also* RB 1184 ("must focus on resolving priority water quality issues related to individual operations"). The Regional Board later weakened these provisions, requiring only a "[d]escription and results of methods used to verify practice effectiveness and compliance with this Order," such as "water quality sampling, discharge characterization, reductions in pollutant loading." RB 8486; *see also* RB 8532. The State Board then replaced this already-weakened provision with one that requires only a "description of the method and schedule for assessing the effectiveness of each management practice, treatment, and control measure." SB 7190.

In other words, the requirement went from (1) dischargers having to show that their discharges do not impair water quality to (2) dischargers having only to describe their effectiveness verification methods and resulting outcomes and, finally, to (3) dischargers having merely to provide a description of the methods for evaluating whether their discharges impair water quality—with no need to demonstrate compliance or even provide results of verification efforts. Concomitantly, the "methods" that dischargers were expected to describe shifted from action-forcing techniques like discharge sampling and calculated pollutant reductions to "visual inspections, photographs, soil nutrient testing, soil moisture measurements, and recordkeeping." SB 7190 ("use of advanced methods" such as sampling "is not required"). As a result of these changes, a substantive standard the Regional Board said was necessary became one purely about disclosures of "standard farming practices." *Compare* RB 1129 *with* SB 7188.

Pesticide controls and vegetation buffers met a similar fate. In its initial draft waiver, the Regional Board would have required all dischargers to (1) "eliminate or minimize the discharge of pesticides to meet water quality standards using best practicable treatment or control," (2) avoid applying any of over 100 pesticides with "high potential to degrade/pollute surface water" near any water body, and, ultimately, (3) "eliminate toxicity in irrigation runoff or eliminate the discharge of irrigation runoff" within two years. RB 1258-59; *see also* RB 1230-32. The Board deleted these requirements, however, in favor of regulating pesticides and toxicity only indirectly, by imposing minimal requirements on Tier 2 and Tier 3 growers.[13] As a result, under the Modified Waiver: no pesticide targets or significant prohibitions exist; all growers, regardless of tier, now must monitor for only 27 pesticides of the hundreds available, SB 7404-05, 7455-56, 7525-26; and only two pesticides will force a grower into Tier 2 or 3: diazinon and chlorpyrifos, RB 8481; SB 7345-46. These

[13] Not even the requirement for Tier 3 growers to prepare vegetative buffer plans requires controlling pesticides. *See infra* p. 21.

provisions run counter to the Regional Board's acknowledgment that "[c]ontrol measures . . . must provide for the attainment of this Basin Plan's beneficial uses and water quality objectives." RB 9211.

As for vegetation buffers, which serve critical ecological functions, RB 607-08, 5510-11, 8525, 8527, growers are increasingly destroying such buffers, leading to a cascading collapse of ecosystems and of the beneficial uses they support, RB 608, 3763, 5511-12, 8520-31, 21039-40. For these reasons, the Regional Board has interpreted the Basin Plan to prohibit growers from destroying riparian habitat and to require the maintenance of adequate buffer zones. RB 608. The Board initially included provisions mirroring the Basin Plan's requirements for all growers, requiring them to protect 50-, 75-, or 100-foot buffers (depending on stream flow) or otherwise prepare a robust Riparian Function and Restoration Plan. RB 1265-67; *see also* RB 5511 ("Staff expects that growers will continue to alter riparian and wetland areas due to food safety pressures, unless regulatory agencies successfully apply sufficient pressure in the opposite direction."). However, in the 2012 Waiver, the Board required only a small group of growers—a subset in Tier 3—to submit a 30-foot buffer plan, or simply prepare a plan with no specific requirements. RB 8494-95 (Provision 80); RB 8618-19 (Tier 3 MRP, Part 7). The State Board upheld this provision despite recognizing that protecting natural vegetation "is one of the most effective practices for protecting the[ ] most vulnerable waterways." SB 7218.

The 2013 Modified Waiver also fails to regulate some of the most heavily polluted discharges such as tile drains, which are subsurface pipes or tubes that collect irrigation water and discharge it to surface waters. RB 8556. The Regional Board reports that "tile drain water with elevated nitrate levels has been found draining into surface water bodies," leading to significant pollution. RB 3764; *see also* SB 7189 n.71 ("Discharges from tile drains carry pollutants to surface waters and are appropriate for management practice implementation."). The Modified Waiver makes a general claim to regulate tile drains, SB 7241, but admits that it "focus[es]" on "non-tile drain discharges," SB 7275; RB 8505, and merely "encourages dischargers to coordinate implementation of management practices with other dischargers discharging to common tile drains" (without requiring dischargers to actually adopt any such practices), RB 8469; SB 7333; *see also* SB 7351 (requiring only *reporting* of practices adopted); *cf. Bayview Hunters Point Cmty. Advocates v. Metro. Transp. Comm'n,* 366 F.3d 692, 698 (9th Cir. 2004) (in the context of air pollution reduction plans, distinguishing between establishing general goals and actual requirements to meet them). Instead, the Regional Board punted to a "subsequent" waiver any additional efforts "to address tile-drain discharges." RB 8556; *see also* SB 7189 n.71. Once again, the Modified Waiver will not achieve compliance with the Basin Plan's water quality objectives on a meaningful timeframe.

Underlying many of the Modified Waiver's inadequacies is the State Board's decision to defer many necessary enforceable standards and timelines to a future waiver, and to ask an "Expert Panel" to conduct more analysis in the meantime. *See* SB 7165 & n.8 (describing Expert Panel and issues posed to it). This deferral was unnecessary: the administrative record and the U.C. Davis Report provided ample direction for how to craft an effective waiver, and the Regional or State Board could have convened any necessary panel in 2004, or 2008, or 2010. Worse, this deferral was unlawful: an outside panel's recommendations for some future agency action cannot satisfy the State and Regional Boards' legal obligation to adopt, *at this point in time*, a conditional waiver that will achieve compliance with the Basin Plan. The State Board's pleas that it was faced with "a water quality issue that has few immediate and easy solutions," SB 7216 n.112, and that the Modified Waiver is "only an interim determination," SB 7165, ring hollow.

c. Provision 87.5—Regarding "Improved Practices"—Fails to Ensure That Dischargers Will Comply with the Basin Plan.

The heart of the 2013 Modified Waiver's "iterative" approach to Basin Plan compliance is Provision 87.5 (83.5 in the edited version), which reads in full:

> To comply with Provisions 22, 23, 33, and 84-87 of this Order, Dischargers must (1) implement management practices that prevent or reduce discharges of waste that are causing or contributing to exceedances of water quality standards; and (2) to the extent practice effectiveness evaluation or reporting, monitoring data, or inspections indicate that the implemented management practices have not been effective in preventing the discharges from causing or contributing to exceedances of water quality standards, the Discharger must implement improved management practices.

SB 7187. According to the State Board, this provision "make[s] explicit the [Regional Board's] intent that implementation of increasingly more effective management practices in an iterative manner as necessary constitutes compliance with" the Waiver's general prohibition against exceedances of water quality standards and with the Waiver's milestones. SB 7186.

Provision 87.5 weakens what few substantive provisions the Modified Waiver contains. First, the Regional Board will not be able to determine whether "management practices have not been effective in preventing the discharges from causing or contributing to exceedances of water quality standards" because the Modified Waiver's monitoring program is inadequate to that task. *See infra* pp. 26-27, 31-36. The Regional Board cannot require improved practices if it does not know whether existing practices are failing. Second, even presuming the Regional Board had the monitoring information it needed, Provision 87.5 provides no standards against which to measure existing practices—"have not been effective" is not a useful measure. *Cf. AGUA*, 210 Cal. App. 4th at 1277 (absence of "mandatory standards" guiding exercise of discretion rendered provision for additional monitoring deficient). Third, dischargers need only adopt "improved" practices where existing ones are failing. According to the State Board, "improved" means that "[d]ischargers must make a conscientious effort to identify and implement management practices that effectively address the relevant water quality issue." SB 7186. But a "conscientious effort" to do better next time will not achieve the Basin Plan's water quality objectives. Finally, the Waiver's weak monitoring program will not allow the Regional Board (let alone the public) to determine whether "improved" practices are actually working.

In short, by inserting Provision 87.5, the State Board gave dischargers a free pass. If dischargers' initial management practices are not "effective" in "reduc[ing]" pollution (a low and vague measure of progress the Regional Board will not be able to assess), they suffer no penalty. Instead, dischargers just have to adopt unspecified new practices they believe will work better (which neither the Regional Board nor the public will be able to review). "Try something, and if it doesn't work, try something else" is not a prescription for improving water quality or satisfying Basin Plan standards. *Cf.* EPA, Approval and Promulgation of Implementation Plans; California; San Joaquin Valley; Contingency Measures for the 1997 $PM_{2.5}$ Standards, 79 Fed. Reg. 29,327, 29,346 (May 22, 2014) (in the federal Clean Air Act context, emission reductions to be achieved are "practically enforceable" if the requirement "contains a clear statement as to applicability; specifies the standard that must be met; states compliance timeframes sufficient to meet the standard; and specifies sufficient methods to determine compliance, including appropriate monitoring, record keeping and reporting provisions").

d. Most of the Modified Waiver's Substantive Provisions Apply Only to Tier 3 Growers, a Small and Dwindling Group.

It is true that the Modified Waiver imposes its most stringent requirements on Tier 3 growers. *See, e.g.*, SB 7199-7200 (individual monitoring of some discharges). However, as discussed above, these requirements are not stringent enough to comply with the Basin Plan. In any event, the number of Tier 3 growers is small and getting smaller. The Regional Board's early proposals would have placed 11 percent of dischargers and 13 percent of "operations covering 54% of the total irrigated crop acres" in Tier 3, RB 4863-64, while the 2012 Waiver (and the Modified Waiver) placed only three percent of dischargers and 14 percent of irrigated acreage in Tier 3. RB 7760, 7779; *see also* RB 5740, 5762. That is, 97 percent of dischargers escape the Modified Waiver's most stringent requirements, such as they are.

But even three percent is an overestimate. A discharger is subject to Tier 3 only where the discharger (1) grows crops with a high potential to discharge nitrogen to groundwater on more than 500 acres, or (2) applies diazinon or chlorpyrifos and discharges runoff to an impaired waterbody. RB 8481; SB 7346. If the first condition is not met, all a discharger need do to escape Tier 3 is switch pesticides (something Petitioners believe is already occurring). Dischargers can also evade Tier 3 by applying for a tier change with a cooperative group. SB 7175-76. And the State Board made tier changes even easier; whereas the Regional Board would have required applicants to propose a management practice that "demonstrate[s] a reasonable chance of eliminating toxicity" within five years, as well as meaningful monitoring, the State Board settled for management practices that, on any timeline, "demonstrate a reasonable chance of improving water quality and/or reducing pollutant loading" and monitoring that "will provide indicators of" such improvement or reduced loading. RB 8479; SB 7175. This attrition in the number of growers governed by Tier 3's requirements is significant because the Modified Waiver is more stringent than the 2004 Waiver *only* because of those requirements. RB 4854, 7756, 7779 (explaining that Modified Waiver imposed "fewer" requirements for Tier 1 growers, and "comparable" requirements for Tier 2 growers, compared to 2004 Waiver). The State Board fails to show how the Modified Waiver's few additional requirements for a tiny subset of dischargers can succeed in achieving the Basin Plan's objectives where the 2004 Waiver failed.

3. The Modified Waiver Does Not Provide for Adequate Monitoring of Discharges, Water Quality, or Management Practices.

Robust monitoring is a cornerstone of an effective waiver. With it, the Regional Board can ensure that dischargers are complying with the waiver's conditions, implement enforcement measures when they are not, and modify the waiver where it is not working. Without it, the Regional Board and the public cannot determine water quality or ensure that pollution is being abated. Accordingly, the Porter-Cologne mandates that every waiver contain monitoring requirements "designed to support the development and implementation of the waiver program, including . . . verifying the adequacy and effectiveness of the waiver's conditions." Water Code § 13269(a)(2). The Board may waive monitoring requirements only "for discharges that it determines do not pose a significant threat to water quality." *Id.* § 13269(a)(3).

The 2013 Modified Waiver's monitoring requirements fall far short of these requirements. As we explain more fully in Section II below, the Modified Waiver does not require most dischargers to monitor surface water discharges, which the Regional Board insisted was "the necessary next step" to resolve the water quality crisis. RB 4850; *see also* RB 1219 ("[i]ndividual on-farm water quality monitoring is critical"). Instead, the Waiver tracks water quality only by testing receiving waters downstream of multiple discharge points for most dischargers. SB 7390-91, 7435-36, 7496-97; SB 7513-15 (requiring monitoring only for Tier 3 outfalls and containment structures instead of all discharge points). To make matters worse, the Modified Waiver allows dischargers to join cooperative monitoring groups in lieu of conducting individual monitoring. These groups can then establish "alternative[s]" to the Waiver's receiving water monitoring requirements, so long as the alternatives just "track progress in small sub-basins." SB 7174-76 & n.37, 7342-43 (Provision 11). The combined effect of these provisions is to anonymize pollution—to shield discharge points, and therefore dischargers, from Board oversight. The Regional Board will be unable to determine which discharges are problematic, which practices are working, and which individual waters are improving or worsening.

The Modified Waiver's groundwater monitoring program is equally meager. The Waiver requires individual monitoring of "primary irrigation well[s] and all wells that are used or may be used for drinking water." SB 7396, 7441, 7502. But Tier 1 and 2 growers can just submit "existing groundwater quality data" or rely on studies instead of submitting new sampling data. SB 7396-97, 7442. Alternatively, any and all growers may join cooperative groups and rely on "existing data" or even just "statistically valid projection[s]." SB 7194, 7399, 7444, 7505. Finally, growers can simply avoid identifying their wells as "drinking water" sources to avoid having to do anything besides "characterize" groundwater aquifers. SB 7397, 7442, 7503. Even if dischargers choose to monitor individually, they need do so only infrequently, if at all. SB 7396-97, 7441-42, 7502. Finally, monitoring supply wells alone is inadequate because nitrate contamination can take some time to manifest in the wells. *AGUA*, 210 Cal. App. 4th at 1275.

Infecting both surface water and groundwater monitoring in the Modified Waiver is the State Board's decision to delete nitrogen balance reporting, which is the best available tool for dischargers to balance how much fertilizer they apply with how much fertilizer their crops actually need. *See* RB 3789-90; SB 3197-202. And compounding all of these problems is the Modified Waiver's lack of any meaningful public disclosure of monitoring compliance. *See* SB 7190 (Farm Plan effectiveness reporting deleted); SB 7187 (Provision 87.5 requiring unspecified management practices); SB 7362 (Provision 83.5 in redline); RB 1128-29, 3736, 3738 (Regional Board's insistence on greater public transparency).

4. The Modified Waiver Does Not Comply with California's Nonpoint Source Policy or Antidegradation Policy.

The Basin Plan incorporates the State Board's Nonpoint Source Policy. RB 9405-24. The Policy requires that any program to control nonpoint sources (such as diffuse agricultural runoff) include "sufficient feedback mechanisms" for determining the program's efficacy. RB 9419. The Regional Board acknowledges that it has "primary responsibility" for ensuring that the Policy be implemented, RB 4176, and that such responsibility entails achieving water quality objectives and "antidegradation requirements." RB 8508. Nonpoint programs must include "management practices" that permit the Regional Board to "determine that there is a high likelihood the implementation program will attain the [Regional Board's] stated water quality objectives," quantifiable requirements and a specified time schedule, and "sufficient feedback mechanisms" to show that requirements are in fact being met. RB 9417-21.

The State Board did not meet any of these requirements. As discussed, the Board fails to demonstrate how the Modified Waiver will achieve the water quality objectives, let alone create a "high likelihood" of doing so. Moreover, its monitoring program lacks "sufficient feedback mechanisms" to evaluate the Waiver's efficacy. The State Board's only response is to claim that the Waiver does everything it needs to do for the time being, without any findings of fact connecting the evidence to the Nonpoint Source Policy's requirements. SB 7186 n.64, 7216 n.112.

Nor does the State Board demonstrate compliance with the State Antidegradation Policy, which is incorporated by reference in the Nonpoint Source Policy and the Basin Plan. RB 9409, 9418. The Antidegradation Policy prohibits the degradation of "high quality" waters absent specific findings and requires the maintenance or restoration of waters that have been degraded. RB 9377; *AGUA*, 210 Cal. App. 4th at 1260-62. As discussed in Section III below, the State Board has not demonstrated that the Modified Waiver will prevent continued degradation of high quality waters, and the Boards have not made the findings required to allow such degradation.

5. Ultimately, the Modified Waiver is Only Marginally Stronger Than the 2004 Waiver, and Not Strong Enough to Comply with the Basin Plan.

The 2012 Waiver and 2013 Modified Waiver are premised on a candid admission: the 2004 Waiver was woefully inadequate at stopping agricultural pollution, as evidenced by ever-declining water quality in the Central Coast Region. *See* RB 1128-30, 3767. The Regional Board knew significant changes were required to comply with the Porter-Cologne Act and restore water quality. RB 1129 ("The agricultural industry must implement the most effective management practices . . . that will most likely yield the greatest amount of water quality protection, and verify their effectiveness with on-farm data."); *see also* RB 606, 1130 ("Protecting water quality and the environment while protecting agricultural benefits and interests will require change and may shift who bears the costs and who reaps the benefits.").

Unfortunately, the Regional Board and the State Board ended up issuing a final waiver that ignored their own directives. The Court need not take Petitioners' word for it: the Regional Board itself has admitted that the March 2011 draft of the 2012 Waiver—which would have been more stringent than *both* the 2012 Waiver and the final, 2013 Modified Waiver—imposed "fewer" requirements than the 2004 Waiver for Tier 1 dischargers (55 percent of dischargers and 39 percent of the irrigated acreage in the as Valley) and "comparable" requirements for Tier 2 dischargers (42 percent of dischargers and 47 percent of irrigated acreage). RB 4854, 7779-80. The only group with arguably more stringent requirements—dischargers in Tier 3—include at best just three percent of dischargers and 14 percent of irrigated acreage.

B. The Modified Waiver Is Not in the Public Interest.

The Porter-Cologne Act precludes the Regional and State Boards from issuing waivers unless they are "in the public interest."[14] Water Code § 13269(a)(1). The Regional Board opined that it satisfied this requirement because the 2012 Waiver (1) requires compliance with water quality standards, (2) includes conditions that are intended to eliminate, reduce and prevent pollution and nuisance and protect beneficial uses, (3) is better than the 2004 Waiver, mirrors municipal stormwater permits, efficiently allocates Board resources, and focuses on high-priority waters, and (4) provides "reasonable flexibility" and "a reasonable time schedule" for dischargers. RB 8511. Regarding the substantially weaker 2013 Modified Waiver, the State Board added only that an iterative approach to Basin Plan compliance "consistent with the public interest in addressing a water quality issue that has few immediate and easy solutions." SB 7186, 7216 & nn.64, 112.

Such "conclusory findings without reference to the record" are not enough. *AGUA*, 210 Cal. App. 4th at 1280-81. First, they are not *evidence* that the Modified Waiver will serve the public interest, which the State Board might show through quantifiable improvements in water quality. But

[14] This language reflects a deliberate shift by the California legislature to make waivers meaningful tools of regulation. The Legislature specifically voted for a shift from "not against the public interest" to "in the public interest," on the ground that "the conditions under which waivers of [waste discharge requirements] are granted" should "actually protect water quality." S.B. 923, 2003-2004 Assemb. (Cal. 2003). Notably, the Legislature was specifically concerned about agriculture when it amended section 13269. *See id.* (legislators pinpointing "polluted runoff" from "Irrigated Agriculture" as "the major source of contamination of the state's waters" and "the main reason that hundreds of California water bodies are not fit for drinking, fishing, swimming, or other uses").

even if the State Board's findings qualified as such evidence, the weight of the evidence contradicts them. As shown, the Modified Waiver fails to set out a program for complying with the Basin Plan objectives on any meaningful timeframe. The Regional and State Boards deleted or weakened nearly every substantive standard, pollution prohibition, and monitoring provision needed to protect water quality in favor of "flexibility" for growers. True, the Modified Waiver "contains more specific and more stringent conditions . . . compared to the 2004 [Waiver]," SB 7281, but that is an exceptionally low bar and, in any event, is true only for the very small and shrinking subset of Tier 3 growers. By the Regional Board's own admission, the 2012 Waiver advanced the regulation of agricultural pollution by a relatively small degree. *See* RB 7744 (Figure 1); *supra* pp. 13-14, 29. The 2013 Modified Waiver undermined even that small gain. And, as discussed fully in Section III, the Modified Waiver allows the continued degradation of waters in violation of the State Antidegradation Policy, which requires "the highest water quality consistent with maximum benefit to the people of the state." *AGUA*, 210 Cal. App. 4th at 1258.

Ultimately, of course, the public interest is about *people*—in this case, the millions of people who rely on the Region's wells for drinking water and use the Region's waters for fishing, recreation and ecological services. The Regional Board, at least initially, recognized these interests as the driving force behind a new waiver. *See* RB 1128-29. Supporting that view, in 2012 the California Legislature enacted the Human Right to Water Law, which declares that "every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption." Water Code § 106.3(a); *see also* RB 3736 ("Among the highest priorities [of the Board] is to ensure that agricultural dischargers do not continue to impair Central Coast communities' and residents' access to safe and reliable drinking water.").

The 2013 Modified Waiver will not serve the public's right to clean drinking water. Despite the State Board's claims, *see* SB 7228-29, the Modified Waiver's weak provisions will only allow conditions to worsen (or at least not materially improve), leaving future generations to bear the heaviest costs. *See* RB 5502-04, 8514 *and* SB 3215, 6139 (all discussing the inordinate costs of groundwater treatment and unfair burden imposed on low-income communities); SB 5814 (without adequate action now, 80 percent of the Salinas Valley and other areas will be compromised by nitrate contamination).

Nor will the Modified Waiver adequately protect the other beneficial uses set out in the Basin Plan, which will further "limit the future of the Central Coast Region's water resources." RB 3736.

Petitioners recognize that the Central Coast Region is "one of the most productive and profitable agricultural regions in the nation" and that agriculture drives much of the Region's economy. RB 1126-27, 8506. But as the Regional Board admonished in 2010, "[n]o industry or individual has a legal right to pollute and degrade water quality, while everyone has a legal right to clean water." RB 3737. "Resolving agricultural water quality issues," the Board conceded, "will also require changes in farming practices, will impose increasing costs to individual farmers and the agricultural industry . . ., and may impact the local economy." *Id.*; *see also* RB 8505 ("Dischargers are responsible for the quality of surface waters and ground waters that have received discharges of waste from their irrigated lands."). Those changes must come from the Regional and State Boards, who have primary authority to regulate discharges of pollutants to waters of the State. RB 1128, 3735. Unfortunately, in preparing the Modified Waiver, the Regional and State Boards lost sight of their words, their role, and the public interest.[15]

II. The Modified Waiver Violates Water Code Section 13269(a)(2) Because Its Monitoring Provisions Are Inadequate.

A. The Modified Waiver Fails to Include Monitoring Adequate to Verify Its Effectiveness.

A waiver's monitoring provisions must "be designed to support the development and implementation of the waiver program, including, but not limited to, verifying the adequacy and effectiveness of the waiver's conditions." Water Code § 13269(a)(2).[16] The provisions "shall include sufficient feedback mechanisms" to ascertain "whether the program is achieving its stated purpose(s)."

---

[15] The public interest also required the Boards to consider and satisfy their duties under the public trust doctrine. That doctrine imposes an affirmative duty on all public agencies "to protect the people's common heritage of streams, lakes, marshlands and tidelands." *National Audubon Soc'y v. Superior Court*, 33 Cal. 3d 419, 441 (1983); *see also Marks v. Whitney,* 6 Cal. 3d 251, 259-60 (1971) (public trust protects environmental uses). The Central Coast Region has significant navigable waterways, including 2,360 miles of streams, 25,040 acres of lakes, 8,387 acres of wetlands and estuaries, and 3,559 square miles of groundwater basins. RB 9166. The public interest in protecting trust resources requires a waiver with enforceable standards and timelines and adequate monitoring.

[16] The California Legislature specifically added this requirement in 2003 to address the inefficacy of previous agricultural waivers. S.B. 923, 2003-2004 Assemb. (Cal. 2003) (finding that "farm runoff [had] contaminate[d] drinking water supplies for millions of Californians"). Section 13269(a)(2) was designed to ensure that subsequent waivers would "actually protect water quality." *Id.*

RB 9419. Additionally, "monitoring results shall be made available to the public." Water Code § 13269(a)(2). The Regional Board may waive monitoring requirements *only* "for discharges that it determines do not pose a significant threat to water quality." *Id.* § 13269(a)(3).

In *AGUA*, the most recent case addressing monitoring provisions in conditional waivers, the Court struck down a monitoring program that was limited in size, frequency, and constituents tested, and that was unable to identify pollution sources in a timely fashion. *AGUA*, 210 Cal. App. 4th at 1275. The monitoring program failed to pinpoint actual sources of pollution, making it impossible to determine whether the Waiver is improving water quality. *Id.* at 1275-78. The Modified Waiver suffers from these and other problems.

Surface water monitoring. The Modified Waiver's surface water monitoring program has two fatal flaws. First, the Modified Waiver does not require most growers to monitor their discharges. Rather, the Waiver simply requires Tier 1, Tier 2, and many Tier 3 dischargers to gather samples of receiving waters downstream from discharge points. Surface waters that must be monitored include listed major waterbodies and sites most directly affected by "agricultural discharge (including areas receiving drain discharges)." SB 7393, 7438, 7499 (Part 1, Section A.9, of Tiers 1, 2 & 3 MRPs) (requiring monitoring of listed major waterbodies and sites most directly affected by agricultural dischargers); *see also* RB 8571. Receiving water monitoring is no substitute for discharge monitoring because it: (1) does not indicate whether specific discharges are worsening and (2) describes pollution concentrations only in areas downstream (sometimes far downstream) from the actual sources. Without that information, the Board cannot identify where pollution is coming from or how to mitigate problems. *See* RB 4850 (evaluating "the relative contribution of pollution from individual dischargers is the necessary next step to resolve the severe water quality problems"); *see also* RB 1128-29, 3749-50, 3762.

Second, dischargers may join cooperative monitoring groups in lieu of conducting individual monitoring. SB 7353 (Provision 52). That is, dischargers can collect and report aggregated, rather than individual, receiving water data. SB 7342-44 (Provision 11). Groups can also create their own alternative monitoring programs that need only "provide indicators of water quality improvement and/or pollutant load reduction" and "be on a scale sufficient to track progress in small sub-basins and be sufficiently representative of conditions in small sub-basins." SB 7343; *see also* SB 7175-77. Characterizing surface water quality on an aggregated, regional level fails to identify localized pollution problems and precludes holding individual dischargers accountable. *See, e.g.,* RB 4850 (Regional Board insisting that new waiver "provide[ ] [for] complete identification of individual operations responsible for discharge" and "allow[ ] for immediate management of known discharges"); RB 5480 ("Without an appropriate level of fertilizer application reporting and tracking on an individual grower or crop basis, determining local and regional reductions in fertilizer use and increased efficiency is virtually impossible."); *see also* RB 7740 ("[a]ggregation of data cannot be used to cover up or obscure the sources and amounts of pollution being discharged"); SB 7198 (State Board lionizing self-enforced group monitoring); SB 2052 (noting that, without adequate enforcement and consequences, self-reported monitoring is not effective).

True, the Modified Waiver requires *some* Tier 3 dischargers to individually monitor *some* discharges. *See* SB 7513-16 (Part 5 of Tier 3 MRP). However, Tier 3 includes at most three percent of dischargers, who can escape Tier 3 by switching pesticides or joining cooperative monitoring groups. *See supra* p. 25. For those who remain in Tier 3, the Modified Waiver requires individual monitoring only of dischargers with "outfalls"—locations where water leaves control of a discharger "after being conveyed by pipes, ditches, constructed swales, tile drains, containment structures, or other discrete structures or features that transport the water." SB 7513-14 (Part 5 of Tier 3 MRP). Moreover, the Modified Waiver does not require individual monitoring of irrigation runoff from fields, drainage water, or tailwater, or of leakage from "containment structures" (water retention ponds) with water that will be re-used for irrigation. SB 7335, 7515 (Part 5, Section A.7, of Tier 3 MRP).

Groundwater monitoring. The Modified Waiver's groundwater monitoring program is also insufficient to verify the Waiver's effectiveness, for three reasons. First, the Waiver requires dischargers to individually monitor only "the primary irrigation well and all wells that are used or may be used for drinking water purposes." SB 7396, 7441, 7502 (Part 2, Section A.2, of Tier 1, 2, & 3 MRPs). Thus, dischargers without "drinking water wells"—or those who choose not to identify their wells as "drinking water" wells—must monitor only one well on their property, which may be far removed from the area where most of the percolation and groundwater contamination is occurring.

Moreover, individual wells may not indicate contamination until several years after discharges of nitrates or pesticides occur. *See AGUA*, 210 Cal. App. 4th at 1275.[17]

Second, dischargers can conduct group instead of individual monitoring. SB 7343 (Provision 11), 7352 (Provision 51), SB 7397-7400, 7442-45, 7503-06 (Part 2, Section A.6, of Tier 1, 2, & 3 MRPs). Group monitoring programs need only "include sufficient monitoring to adequately characterize the groundwater aquifer(s) in the local area . . . , characterize the groundwater quality of the uppermost aquifer, and identify and evaluate groundwater used for domestic drinking water purposes." SB 7397, 7442, 7502. Group monitoring can be based on existing data or "a statistically valid projection of groundwater quality at the location of the well" instead of direct sampling of *actual drinking water sources*. SB 7399, 7444, 7505.

Third, the frequency of groundwater monitoring is inadequate. Tier 1 and 2 dischargers must conduct only two rounds of groundwater monitoring within the first year and once every five years after that. SB 7396-97, 7441-42 (Part 2, Section A.3, of Tiers 1 & 2 MRPs). Only Tier 3 dischargers must conduct annual testing. SB 7502 (Part 2, Section A.3, of Tier 3 MRP). Even annual sampling is too infrequent to detect trends in groundwater quality or tie them to changing management practices. (The frequency differences between Tiers 1 and 2 and Tier 3 also do not make sense; similar practices could similarly affect drinking water sources, no matter the size of an agricultural operation.) Even wells that are severely contaminated are subject to inadequate monitoring. Although the State Board requires additional individual monitoring of drinking water wells with nitrate levels between 50 and 80 percent of the human health standard, these wells need be tested only once per year. SB 7399-7400, 7444-45, 7505-06 (Part 2, Section A.6(h), of Tier 1, 2 & 3 MRPs); SB 7193 (admitting that such wells have potential to exceed the human health standard "in a short time frame"). The Board assures us that "in most cases, the Executive Officer would require repeat sampling," SB 7193, but provides "no mandatory standards governing the exercise of the Executive Officer's discretion." *AGUA*, 210 Cal. App. 4th at 1277.

---

[17] The *AGUA* court cited a report explaining that, "unlike monitoring wells[,] . . . agricultural supply wells are typically screened well below the water table and across substantial vertical distances . . . . In many cases, it will be difficult to determine[ ] whether elevated nitrate levels are due to on-site or off-site activities." *AGUA*, 210 Cal. App. 4th at 1275.

Nitrate monitoring of all waters. As discussed above, because nitrogen uptake varies widely based on crop type and local circumstances, it is necessary to measure both the total nitrogen applied and the amount that will be absorbed to identify which dischargers are over-applying nitrogen. RB 3789-90, 3928-29; SB 3197-201, 6303, 7210-11. Nonetheless, the State Board struck the requirement to calculate nitrogen balance ratios, even though the Regional Board has found that more and more growers are over-applying nitrogen and polluting the Central Coast Region's waters. SB 7211; *see also* RB 4071-72 (in 2009, lettuce growers in Monterey County over-applying fertilizer lost an estimated 2,670 to 3,544 tons of nitrogen to groundwater leaching, at a cost of $3.2 to $4.3 million).

Compliance monitoring. For any waiver to be "effective[ ]," Water Code § 13269(a)(2), it must do more than monitor discharges; it must also track whether management practices are achieving compliance with water quality standards. *See* RB 9413 (Nonpoint Source Policy stating that "successful [monitoring program] implementation typically requires . . . monitoring to assure that practices . . . are effective in attaining and maintaining water quality standards.").

Despite these requirements, the State Board deleted the 2012 Waiver's Provision 44(g), which would have required dischargers to report the "results of methods used to verify practice effectiveness" when implementing management practices. RB 8486; SB 7190. The State Board also deleted the requirement to report the results of implementing nutrient management practices, instead substituting only a request for a "qualitative assessment of the discharger's experience." SB 7212-14. Worst of all, the Board introduced Provision 87.5, which requires dischargers to implement "improved" management practices when existing practices are not working. SB 7187. There are no requirements for dischargers to specify, get approval of, or monitor results of these "improved" practices; instead, dischargers simply must make a "conscientious effort" to do better. SB 7186. The resulting lack of compliance targets and source-level monitoring data make it impossible for the Regional Board or the public to verify whether management practices are improving water quality. *Cf.* S. Rep. No. 92-414 (Oct. 28, 1971), *reprinted in* 1972 U.S.C.C.A.N. 3668, at 3728, 3748 (monitoring requirements are "necessary" under the federal Clean Water Act and "should reveal violations" with little factual complexity).

B. The Waiver Fails to Disclose Adequate Monitoring Data to the Public.

The Porter-Cologne Act provides that "monitoring results shall be made available to the public." Cal. Water Code § 13269(a)(2). The State Legislature specifically added this requirement in light of widespread agricultural pollution. S.B. 923, 2003-2004 Assemb. (Cal. 2003).

Monitoring data collected under the Modified Waiver are so minimal that they do not meaningfully disclose water quality information to the public. The Modified Waiver measures receiving water pollution concentrations rather than actual individual discharges, monitors aquifers in place of individual wells, allows dischargers to engage in aggregated group monitoring, and lacks meaningful management practice monitoring. Neither the Board nor the public can know which dischargers, or practices, are causing pollution or curbing it. This outcome is precisely what the Regional Board had criticized at the beginning of the waiver revision process:

> Currently, information that provides evidence of on-farm improvements and reductions in pollution loading from farms is not required, and therefore probably does not exist for most farms. The public, including those who are directly impacted by farm discharges, and the Water Board, do not have the necessary evidence of compliance or improvements. This is unacceptable given the magnitude and scale of the documented water quality impacts and the number of people directly affected.

RB 1129; *see also* RB 3736, 3738.

III. The Modified Waiver Violates the State Antidegradation Policy.

In addition to violating section 13269 of the Water Code, the 2013 Modified Waiver and underlying 2012 Waiver fail to comply with the State Antidegradation Policy. Under that Policy, which is incorporated into the Basin Plan, any Board issuing a waste discharge requirement or waiver must prevent pollution of high quality waters and improve waters whose quality has fallen below applicable water quality objectives.

The Regional and State Boards gave the State Antidegradation Policy only brief mention before adopting the 2012 Waiver and 2013 Modified Waiver. In the 2012 Waiver, the Regional Board said only that the waiver was "consistent" with State Antidegradation Policy. RB 8509, 8527. During the 2013 Modified Waiver process, the State Board asserted that the 2013 Modified Waiver was "consistent" with State Antidegradation Policy, and would not "lead to any . . . lowering of water quality." SB 7230; *see also* SB 7234. The State Board further said it was "cognizant of the important mandate to carry out an appropriate antidegradation analysis prior to water boards' regulatory actions," and yet declined to fulfill its duty to assist the Regional Board in conducting an "appropriate analysis." SB 7230-31. Instead, the State Board elected to delay any analysis until the next iteration of the Waiver is developed. SB 7231.

This record does not elucidate "the analytic route the administrative agency traveled from evidence to action." *Topanga*, 11 Cal. 3d at 515. Rather, the record shows that Modified Waiver will not prevent agricultural dischargers from continuing to degrade surface waters and groundwater in the Central Coast Region, in violation of the State Antidegradation Policy.

A. The State Antidegradation Policy Sets Strict Requirements that the State and Regional Boards Must Follow In Issuing a Conditional Waiver.

The federal antidegradation policy was first established to help achieve the Clean Water Act's mandate to "restore and maintain the chemical, physical and biological integrity of the Nation's waters." 33 U.S.C. § 1251. The federal policy divides waters into "tiers," and tasks each State with developing an antidegradation policy that is consistent with the federal policy. 40 C.F.R. § 131.12(a). California has chosen to adopt a policy with higher protections than federal policy: The State Policy applies to surface *and* ground waters, protects existing *and* anticipated beneficial uses, and considers water quality levels since 1968 rather than 1975. APU-90-004 at 37, 9, 4. In addition, for "high quality" waters (discussed further below), the State Policy imposes significant obstacles to allowing any degradation. *See* RB 9377.

The Regional Board must classify waters into Tier 1 or Tier 2 based on (1) their "baseline" quality and (2) whether that baseline is above, at, or below the Basin Plan's water quality objectives. *See* APU-90-004 at 4; Water Code § 13241.[18] If baseline water quality is *equal to* or *less* than

[18] Baseline quality is "the best water quality of the receiving water that has existed since 1968 [under the State Policy] . . ., or since 1975 under the federal policy." APU-90-004 at 4. Baseline determinations are made on a water body-by-water body basis and, in the case of groundwater aquifers, on a sub-section basis. *AGUA*, 210 Cal. App. 4th at 1271 n.10 (citing St. Water Res. Control Bd., Guidance Memorandum, 4 (Feb. 16, 1995)). One section of an aquifer may be high quality while another is not. In addition, the Regional Board must determine the baseline quality "for each constituent in the discharge which is likely to degrade water quality," as waters can be of high quality for one constituent but not another. APU-90-004 at 4.

Note that there is a third tier—Tier 3—which includes waters of such exceptional quality that they "constitute an outstanding National resource." 40 C.F.R. § 131.12(a)(3). California has only two Tier 3 waters (Lake Tahoe and Mono Lake), which are not at issue in this case.

applicable water quality objectives, the water is Tier 1, the federal policy applies, and water quality must be maintained or improved, respectively. 40 C.F.R. § 131.12(a)(1); APU-90-004 at 4. If the baseline water quality is *better* than the water quality objectives, the water is Tier 2, or "high quality," and the State Policy's higher protections kick in. Such water's high baseline water quality must be maintained, and there is a presumption that any activity that allows a discharge of waste will unlawfully degrade water quality. *AGUA*, 210 Cal. App. 4th at 1272.

California courts have interpreted the State Antidegradation Policy strictly. In *AGUA*, the Court of Appeal held that a dairy farm waiver violated the Policy by unlawfully allowing degradation of high quality waters by means of a waiver that lacked enforceable standards and adequate monitoring. *Id.* at 1261, 1272-78. And in *California Sportfishing Protection Alliance*, *supra*, this Court applied *AGUA* to invalidate an interim conditional waiver for irrigated agricultural discharges for similar reasons. May 21, 2013, Order at 19-20.

B. The 2013 Modified Waiver Will Allow Continued Degradation of High Quality and Tier 1 Waters.

Degradation of high quality waters. The first step in an antidegradation analysis is to determine whether there are high quality waters that may be affected by discharges authorized under the waiver. *See AGUA*, 210 Cal. App. 4th at 1270-71. In this case, the Regional and State Boards failed to explicitly make this determination or include any information in the waiver about the baseline water quality levels throughout the Central Coast Region, and thus abused their discretion. Despite this failure, and despite the widespread pollution caused by irrigated agriculture over the past decades, the record shows that there are still a number of high quality waters in the Region, including in the Salinas Valley. These waters are "high quality" because their quality is currently better than water quality objectives, or was better than water quality objectives at some point after 1968.

For example, groundwater samples collected throughout the Salinas Valley in 1978 had mean nitrate concentrations far below the 45 mg/L drinking water standard. As displayed in Table 1, *supra* p. 7, the mean nitrate concentration in 1978 was 19.9 mg/L at Pressure 180', 40.2 mg/L at East Side, 38.1 mg/L at Forebay, and 28.3 mg/L at Upper Valley. There are also several surface water bodies that are high quality for nitrates, toxicity, and pesticides. At least eight sites have water quality that is currently better than the nitrate drinking water standard,[19] and both the Blanco Drain and Alisal Slough had toxicity levels low enough between 2005 and 2007 that invertebrate survival rates ranged from 80 to 100 percent, indicating that the waters met the narrative water quality objective requiring that they be "maintained free of toxic substances." *See supra* n.5; RB 9196. Many other sites are also probably high quality for surface water constituents but samples were not collected before the late 1990s, making it is impossible to know the water quality between 1968 and the first sampling dates.

Once high quality waters are known to exist, the State Antidegradation Policy applies so long as there is an activity that will discharge waste into the receiving water. The Policy "presumes . . . that the quality of the receiving water will be degraded by the discharge of waste" unless the Board shows otherwise. *AGUA*, 210 Cal. App. 4th at 1272. The Boards declare in Finding 22 of the 2012 Waiver that discharges will not lead to degradation because dischargers must implement management practices or control measures when they are "causing or contributing to exceedances of applicable water quality standards." RB 8509; SB 7279. However, it is not enough to make "circular" assertions or issue "conclusory findings without reference to the record." *AGUA*, 210 Cal. App. 4th at 1280-81. No provisions effectuate the boilerplate promises of Finding 22, and neither the Regional nor the State Board affirmatively shows how discharges will not degrade receiving water quality. *See Topanga*, 11 Cal. 3d at 515 (agency must draw a rational connection between the facts found and decision made); *Glendale Memorial Hosp.,* 91 Cal. App. 4th at 140 (boilerplate findings cannot satisfy *Topanga*'s requirement).

For example, the 2012 Waiver and 2013 Modified Waiver identify regulated agricultural entities as waste "dischargers" throughout, and impose no actual prohibition on such discharges to high quality waters. Provision 44, which outlines the minimum Farm Plan requirements for all regulated farms, asks dischargers to describe only the management practices they plan to implement and the methods they plan to use to assess practice effectiveness. RB 8485-86; SB 7350-51. The provision does not provide sufficient criteria or standards to ensure that adopted practices will actually prevent discharge or that assessment methods will actually verify practice effectiveness. In fact, the only real discharge prohibition—nitrogen balancing—was excised. All of the other provisions in the Waivers are simply

[19] Those sites are 309SSP, 309SAC, 309LOK, 309SAG, 309GRN, 309SAS, 309RTA, and 309GAB.

aspirational or "standard farming practices," SB 7188; they are not mandatory, enforceable standards or prohibitions. Finally, the Modified Waiver's most stringent requirements, such as they are, apply to at most three percent of dischargers; the Waiver regulates few pesticides; and some of the most polluting discharges (*e.g.*, from tile drains) are not covered by the Waiver at all. *See supra* pp. 21-22, 25; *AGUA*, 210 Cal. App. 4th at 1273-74.

Equally problematic are the Modified Waiver's monitoring and enforcement provisions. In order to declare that the waste discharges will not lead to degradation, the Waiver's monitoring program must be sufficient to alert the Boards if an agricultural discharger is degrading water quality, and the enforcement program must be sufficient to stop degradation once detected. *AGUA*, 210 Cal. App. 4th at 1273-78. Yet the Waiver's programs are insufficient to do either of these things. Regarding monitoring, the State Board eliminated Provision 44(g), which would have required dischargers to report "results of methods used to verify practice effectiveness and compliance," making it impossible to determine whether a particular practice is actually maintaining high quality waters. SB 7189-90. The State Board also eliminated the requirement that dischargers complete nitrogen reporting plan effectiveness forms with oversight by a qualified professional. SB 7209-15. The Modified Waiver has a host of other monitoring problems that preclude the Regional Board from ascertaining whether or why degradation is occurring. *See supra* pp. 26-27, 31-36.

As for enforcement, the Regional Board Executive Officer has discretionary authority to impose "additional management practices" on cooperative groups if a project is "not effective in achieving water quality standards." SB 7344 (Provision 11). But it is entirely unclear when that authority kicks in or how the Executive Officer will exercise it. *See AGUA*, 210 Cal. App. 4th at 1277 (enforcement provisions deficient because there were "no mandatory standards governing the exercise of the Executive Officer's discretion"). Similarly, Provision 19 allows the Executive Officer to elevate a discharger to a higher tier if the discharger poses a "higher threat to water quality" based on monitoring and reporting that, as discussed, will not actually indicate whether a discharger's practices are working to meet water quality objectives. SB 7346-47. Finally, even if the Regional Board could determine that a discharger is not complying with its obligations, Provision 87.5 ensures that all the Board can do is ask dischargers to make a "conscientious effort" to implement "improved" practices. SB 7186-87.

Under *AGUA*, there is a presumption that any activity that allows a discharge of waste will unlawfully degrade water quality. *AGUA*, 210 Cal. App. 4th at 1272. The absence of any actual prohibitions or standards, the use of monitoring insufficient to show whether or how water quality is changing, and the vague hope that dischargers will try better next time do nothing to rebut this presumption.

Findings required to allow degradation of high-quality waters. The only way the Regional and State Boards can permit discharges of waste into high quality waters is to find that further degradation (1) is "consistent with maximum benefit to the people of the State," (2) will not unreasonably affect beneficial uses, (3) will not violate water quality standards, and (4) will "meet waste discharge requirements which will result in the best practicable treatment or control" of the discharge. RB 9377-78.[20]

Just as in *AGUA*, the State and Regional Boards did not make these findings, and instead relied on the "circular," boilerplate claim that no findings were needed because the Waiver prohibits further water quality degradation. *AGUA*, 210 Cal. App. 4th at 1260, 1280. For instance, although the Boards said that, under the Modified Waiver, "[d]ischargers must . . . maintain the highest water quality consistent with the maximum benefit to the people of the State," RB 8509; SB 7279, the Boards conducted no "socioeconomic impact[ ]" analysis to support that statement, APU-90-004 at 5; *AGUA*, 210 Cal. App. 4th at 1279 (discussing St. Water Res. Control Bd., Guidance Memorandum, 4-5 (Feb. 16, 1995)). Similarly, the Boards failed to find that further degradation would not violate water quality standards. Given the vague enforcement mechanisms of the 2013 Modified Waiver, it is likely that sufficient water quality control measures will be imposed on agricultural polluters only *after* water quality has fallen below relevant standards (or perhaps not even until there is a new waiver). *AGUA*, 210 Cal. App. 4th at 1277. As a final example, the Boards failed to find that agricultural dischargers degrading water quality would be subject to "best practicable treatment and control" to ensure that no pollution or nuisance will occur, and that the highest water quality consistent with the "maximum benefit to the people" of the state will be maintained. RB 9377; *AGUA*, 210 Cal. App. 4th at 1282.

[20] The federal policy also requires a finding that degradation is "necessary to accommodate important economic or social development in the area in which the waters are located." 40 C.F.R. § 131.12(a)(2).

Maintaining and improving Tier 1 waters. The State Antidegradation Policy also requires the Regional and State Boards to protect Tier 1 waters—those with a baseline quality equal to or less than applicable water quality objectives. If current water quality meets water quality objectives, the Boards must adopt measures sufficient to maintain that quality; if current quality is below levels needed to meet water quality objectives, the Boards must adopt measures to improve it. APU-90-004, at 4.

The Regional Board has not chronicled the baseline quality of the waters in the Salinas Valley. Despite that failure, information available on the Ambient Monitoring website shows that there are many Tier 1 waters in the Valley. Several municipal supply sites, including Alisal Creek, Alisal Slough, Quail Creek, and Merritt Ditch, continue to have nitrate concentrations more than twice the human health standard. *See supra* n.5. In addition, over 70 percent of the Salinas Valley sites monitored for toxicity levels within the last two years had at least one sample with an invertebrate survival rate worse than 80 percent, in violation of the Basin Plan objective that "all waters be maintained free of toxic substances." *Id.*; RB 9196. Some of these sites barely exceed the objectives, with only a few samples that have survival rates indicating that the water and sediment is toxic.[21] *See supra* n.5. Other sites, including Chualar Creek at Chualar River Road and Quail Creek at Highway 101, have survival rates so low they appear uninhabitable. *Id.*

As explained above, the Modified Waiver does not prohibit waste discharges to these or other Tier 1 waters. These discharges are presumed to degrade water quality unless the Boards demonstrate otherwise. *Cf. AGUA*, 210 Cal. App. 4th at 1272 (making this presumption for Tier 2 waters). The Boards fail to do so, and there is no reason to believe that degradation that continued under the 2004 Waiver will reverse course under the Modified Waiver.[22]

The Modified Waiver also fails to *improve* low quality Tier 1 waters to levels that achieve water quality objectives. The Regional Board claims that the 2012 Waiver would "restore waters that have already experienced some degradation," and the State Board all but agreed. RB 8509; SB 7230. But

[21] For example, sites 309SAG, 309GRN, 309BLA, 309 SAC, 309BLA, 309ASB.

[22] For example, at Natividad Creek the average nitrate concentration has increased from about 124 mg/L in 2005 to 168 mg/L in 2011, and the number of samples exceeding the human health standard increased from 67 to 86 percent over the same period. At Merritt Ditch the average concentration increased from about 75 mg/L in 2005 to 133 mg/L in 2011, and the number of samples exceeding the standard increased from 83 to 100 percent. *See supra* n.5.

this assertion is unwarranted given the absence of real prohibitions and adequate monitoring in the 2012 Waiver and 2013 Modified Waiver. For example, the U.C. Davis Report advises that site-specific remediation projects are necessary to reduce nitrate pollution, SB 3198, yet the Modified Waiver does not provide adequate verification, monitoring or enforcement to ensure that individual Farm Management Plans are implemented. Likewise, restoring streamside plant buffers would help reduce pesticide and sediment loading, yet the Modified Waiver requires no more than three percent of the Salinas Valley farms to submit a Water Quality Buffer Plan. RB 7779; SB 7360. There is, in sum, no rational connection between the facts found and the conclusion that the Modified Waiver will improve water quality.

IV. The State Board Unreasonably Excluded the U.C. Davis Report Under Water Code Section 13320 and Government Code Section 11513.

The California Legislature has recognized a pressing need "to protect public health by preventing or reducing the contamination of groundwater." SBX2-1, 2007-2008 Cal. Stat., 2d Ex. Sess. § 6 (codified at Water Code § 83002(b)(2)). To that end, the Legislature appropriated two million dollars to study causes of and solutions for nitrate contamination in the Salinas and Central Valleys. Water Code § 83002(b)(2)(D). In June 2010, the State Board selected nitrate experts at the University of California, Davis, to conduct the study. SB 2257-58.

Under the direction of Professors Harter and Lund, 26 scientists assembled and analyzed nitrate data from "nearly two dozen agencies," with data points comprised of "100,000 samples from nearly 20,000 wells." SB 3173. The scientists traced nitrates from Salinas Valley aquifers back to their sources, connecting the well sampling data to hydrology, land use, fertilizers, nitrogen uptake, and a host of other variables. SB 3183-97. This analysis showed not only a marked upward trend in nitrate pollution over time, but also a distinct source: 96 percent of nitrate contamination in the region is traceable to fertilizer applied to irrigated croplands.[23] SB 3171. The scientists then evaluated potential solutions based on cost, scalability, and political feasibility. SB 3176; SB 3197-3202. Independent

[23] The U.C. Davis report also identifies 4,634 Salinas Valley residents currently at risk of drinking water contaminated with nitrates in excess of the maximum contaminant level. SB 4602. Another 120,000 Salinas Valley residents pay higher water rates because their drinking water providers must blend or treat their water to lower nitrate levels under the maximum level. *Id.*

scientific experts and the State Board reviewed the final Report.[24] The State Board acknowledged the Report's importance and "relied on [it] as a foundation" for its own report to the Legislature on groundwater pollution in the Salinas and Central Valleys.[25]

Though the final Report was published on March 13, 2012, the Regional Board had received a draft of the Report in February, a full month before it issued the 2012 Waiver. When Petitioner Monterey Coastkeeper attempted to introduce the Report during the March 15, 2012, public hearing on the 2012 Waiver, the Regional Board declined, saying the administrative record had already been finalized. RB 8130-32. After Petitioners and Intervenors filed their petitions to the State Board, however, the Regional Board formally requested that the State Board consider the U.C. Davis Report in its review of the 2012 Waiver. SB 7163 n.2. The State Board acknowledged that the Report was prepared specifically for its benefit and recognized the Report's "high significance . . . in understanding the impact of nitrate on drinking water and potential solutions to that issue." SB 7163. Nonetheless, the State Board refused to consider the Report on the ground that "the administrative record already before us contains sufficient evidence of the impact of agricultural practices on drinking water . . . as well as practices that may ameliorate the problem." *Id.* The State Board also said it would ask the Expert Panel to "consider the findings" of the Report for a subsequent waiver. *Id.*

The State Board's decision to exclude the U.C. Davis Report was unreasonable under section 13320(b) of the Porter-Cologne Act, which provides that "[t]he evidence before the state board shall consist of the record before the regional board, and any other relevant evidence which, in the judgment of the state board, should be considered to effectuate and implement the policies of" the water quality provisions of the Act. Water Code § 13320(b); *see also* 23 Cal. Code Regs. § 2050.6 (implementing § 13320(b)). Although section 13320(b) vests the State Board with discretion to decide whether to review additional evidence, the State Board has a duty to exercise that discretion reasonably. *See Cal. Ass'n of Sanitation Agencies v. SWRCB*, 208 Cal. App. 4th 1438, 1461-62 (2012) (Water Boards' authority under the Porter-Cologne Act is not a grant of "unfettered discretion").

---

[24] Questions and Answers, U.C. Davis Report for the SWRCB SBX2 1 Report to the Legislature, *available at* http://groundwaternitrate.ucdavis.edu/q-and-a/.

[25] SWRCB Report to the Legislature, *Recommendations Addressing Nitrate in Groundwater* 5 (2013), *available at* http://www.waterboards.ca.gov/water_issues/programs/nitrate_project/docs/nitrate_rpt.pdf.

The State Board did not exercise its discretion reasonably here. The U.C. Davis Report was not cumulative because, unlike other evidence in the record, it (1) conclusively identified irrigated agriculture as the single worst contributor to nitrate contamination in the Salinas Valley, SB 3185; (2) systematically evaluated predictions of the cost of reducing on-farm nitrate leaching in the Valley, SB 3907-35; (3) provided a cost-benefit analysis of several technological and policy strategies for achieving nitrate reductions, enabling it to single out the most promising solutions, SB 3204-06, 3231-32; (4) provided new data on pollutant saturation from hundreds of test points and generates new solutions for implementing appropriate on-farm management strategies, SB 3173, 3176; and (5) uniquely proposed use of a nitrogen fee in conjunction with other management techniques, SB 3235-41. In addition, the U.C. Davis Report represented the *most current scientific information available*; by the time the State Board issued the Modified Waiver in 2013, several years had passed since much of the data and the analyses upon which it relied were gathered and prepared. *See Sierra Club v. EPA*, 671 F.3d 955, 963-68 (9th Cir. 2012) (EPA acted unreasonably in refusing to consider most current information); *Ass'n of Irritated Residents v. EPA*, 686 F.3d 668, 677 (9th Cir. 2012) (same).

The State Board's decision to exclude the U.C. Davis Report was also unreasonable under Government Code section 11513(f). In an adjudicative proceeding, such as the hearing through which the State Board reviewed the 2012 Waiver,[26] "[a]ny relevant evidence shall be admitted if it is the sort of evidence on which responsible persons are accustomed to rely in the conduct of serious affairs." Cal. Gov't Code § 11513(c). The State Board may only "exclude evidence if its probative value is substantially outweighed by the probability that its admission will necessitate undue consumption of time." *Id.* § 11513(f). Although it is not binding, courts look to the Evidence Code in interpreting section 11513. *McCoy v. Bd. of Ret.*, 183 Cal. App. 3d 1044, 1054 (1986) (applying Evidence Code section 210's definition of "relevance").

Section 11513(c) sets a low bar for admissibility, and the U.C. Davis Report clears it easily. In *McCoy*, the agency violated section 11513(c) by excluding stipulations entered into by an employee

[26] *See* Michael A.M. Lauffer, *Summary of Regulations Governing Adjudicative Proceedings Before the California Water Boards*, 2 (2006), *available at* http://www.swrcb.ca.gov/laws_regulations/docs/adjudicative_hearing_process.pdf (conditional waivers are issued through adjudicatory hearings). The State Board conducts adjudicative proceedings pursuant to section 11513. 23 Cal. Code Regs. § 648.5.1.

and his employer in a previous hearing. 183 Cal. App. 3d at 1055. Those stipulations, though not binding and not expert opinions, nevertheless satisfied section 11513(c) because they could have helped the Board of Retirement assess conflicting expert testimony. *Id.*; *see also Lake v. Reed*, 16 Cal. 4th 448, 460-61, 467 (1997) (holding that even unsworn police reports and forensic reports are relevant under section 11513(c)). Here, the U.C. Davis Report was prepared by experts for the State Board; the Report would have enabled the Board to review the 2012 Waiver fully and prescribe the practices best suited to protecting water quality. Those practices included a "suite" of methods, based on detailed "vulnerability assessments," for reducing nitrate loading from irrigated cropland. *See* SB 3176, 3197-3202-06, 3231-32, 3235-41, 3907-35.

In short, the U.C. Davis Report contained unique, highly relevant, current information and analysis indispensable for addressing groundwater contamination in the Salinas Valley. The State Board's refusal to consider the Report enabled the Board to issue a conditional waiver that fails to address that contamination adequately.

V. The State Board Violated CEQA by Failing to Conduct Supplemental Review of the Modified Waiver.

Environmental Impact Reports are "the heart of CEQA." *Cnty. of Inyo v. Yorty*, 32 Cal. App. 3d 795, 810 (1973). They "protec[t] not only the environment but also informed self-government." *Laurel Heights Improvement Ass'n v. Regents of Univ. of Cal.*, 47 Cal. 3d 376, 392 (1988). CEQA requires that environmental reviews remain up-to-date and that agencies prepare supplemental reviews where, among other things, "substantial changes are proposed in the project" which "will require major revisions of the previous EIR or negative declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects," or "new information, which was not known and could not have been known at the time the environmental impact report was certified as complete, becomes available." Cal. Pub. Res. Code § 21166; 14 Cal. Code Regs. § 15162(a)(1). As pertinent here, new information includes information which demonstrates that a project will have significant effects not previously reviewed or that effects examined in the previous EIR will be substantially more severe than anticipated. 14 Cal. Code Regs. § 15162; *Am. Canyon*, 145 Cal. App. 4th at 1083-84.

In its subsequent Environmental Impact Report for the 2012 Waiver, the Regional Board concluded that, "[e]ven if the effects could be more severe [than those of the 2004 Waiver], they can be mitigated due to actions by dischargers" pursuant to the 2012 Waiver. RB 8848. In conducting this analysis, the Regional Board recognized that substantial changes to the Waiver's provisions, possible new effects, and new information warranted updated environmental review. Yet when the State Board substantially modified the 2012 Waiver, and was presented with new information in the form of the U.C. Davis Report, the Board decided to forego further environmental review. This decision is not supported by substantial evidence.

The Modified Waiver substantially alters critical provisions of the 2012 Waiver, and those changes will lead to new significant effects. Consider three examples. In the 2012 Waiver, Provision 11 required dischargers to demonstrate "a reasonable chance of eliminating toxicity" within five years and "water quality improvement and the efficacy of a project." SB 7342-43. The Modified Waiver now requires dischargers only to demonstrate "a reasonable chance of improving water quality and/or reducing pollutant loading" and "provide indicators of water quality improvement" and efficacy. *Id.* In addition, dischargers now need only monitor "on a scale sufficient to track progress in small sub-basins." SB 7343. Likewise, Provision 44(g) of the 2012 Waiver required that each farm have a Farm Plan containing a "[d]escription and results of methods used to verify practice effectiveness and compliance with this Order." SB 7190. The Modified Waiver revises 44(g) to require only a description of the "method and schedule for assessing the effectiveness of each management practice," and "advanced methods"—like actual sampling—are not required. *Id.*; SB 7351.

Finally, in the form of Provision 87.5, the Modified Waiver gives dischargers an escape valve from the Waiver's general requirements. *See supra* pp. 23-24. Under that provision, dischargers may simply assert that they are "implement[ing] management practices" and, if those practices do not work, that they are "implement[ing] improved management practices." SB 7187; SB 7362. Taken together with the other changes we have discussed in this brief, these modifications by the State Board will lead to decreased accountability, increased pollution, and other new significant effects. Supplemental CEQA analysis was, therefore, required. *See Laurel Heights*, 47 Cal. 3d at 435 (supplemental review required for alterations not included in the initial EIR for a planned development, including increases to square footage and occupancy); *Am. Canyon*, 145 Cal. App. 4th at 1083 (supplemental review required for blanket changes to project's scope and nature, including the addition of multiple "super centers"); *Cnty. of Amador v. El Dorado Cnty. Water Agency*, 76 Cal. App. 4th 931, 951 (1999) (supplemental review required where local water agency predicated EIR on draft of general plan instead of finalized plan).

Apart from the State Board's substantial changes to the 2012 Waiver, the Board was presented with new information warranting further environmental review. When the Regional Board prepared the Environmental Impact Report for the 2012 Waiver, the U.C. Davis Report was not yet available. Thus, the EIR was based on documents that did not reveal the full extent of the damage from agricultural pollution or how best to ameliorate it. When the State Board was preparing the Modified Waiver, the U.C. Davis Report was available. For the same reasons that the State Board was required to consider the U.C. Davis Report under the Water and Government Codes (the Report provided unique and critical information), the Report was new information tending to show that the Modified Waiver will have significant effects not already reviewed under CEQA. 14 Cal. Code Regs. § 15162(a)(3); *see also Moss v. Cnty. of Humboldt*, 162 Cal. App. 4th 1041, 1061 (2008) (supplemental review of development project required to account for new scientific study of potentially affected trout populations); *Cnty. of Amador*, 76 Cal. App. 4th at 951 (agencies abuse the CEQA process when they rely on inaccurate or incomplete information to reach their conclusions).

CONCLUSION

For the foregoing reasons, Petitioners respectfully request that the Court issue a writ of mandate: (1) finding that the State Board's 2013 Modified Waiver violates California Water Code sections 13269 and 13320, the State Antidegradation Policy, Government Code section 11513, and CEQA; (2) directing the State Board to prepare a new conditional waiver for irrigated agricultural discharges in the Central Coast Region consistent with the Court's decision in this case; (3) ordering that the 2013 Modified Waiver remain in place until the State Board files a return to the writ; and (4) conduct supplemental environmental review under CEQA, as appropriate. To ensure timely compliance with the State Board's legal obligations, Petitioners also request that the Court direct the Board to file a return to the writ within one year.

Date: December 19, 2014

Respectfully submitted,

Deborah A. Sivas, CA Bar No. 135446
Alicia E. Thesing, CA Bar No. 211751
Matthew J. Sanders, CA Bar No. 222757
Caroline Parke, CA Certified Law Student No. 36638
Heather Kryczka, CA Certified Law Student No. 36639
Elizabeth Jones, CA Certified Law Student No. 36640
ENVIRONMENTAL LAW CLINIC
Mills Legal Clinic at Stanford Law School
559 Nathan Abbott Way
Stanford, California 94305-8610
Telephone: (650) 723-0325
Facsimile: (650) 723-4426

Michael L. Meuter, CA Bar No. 161554
Yuchih Pearl Kan, CA Bar No. 294563
CALIFORNIA RURAL LEGAL ASSISTANCE
3 Williams Road
Salinas, California 93905-2835
Telephone: (831) 757-5221
Facsimile: (831) 757-6212

Helen H. Kang, CA Bar No. 124730
Andrew J. Graf, CA Bar No. 300169
ENVIRONMENTAL LAW AND JUSTICE CLINIC
Golden Gate University School of Law
536 Mission Street
San Francisco, California 94105-2968
Telephone: (415) 442-6647
Facsimile: (415) 442-2450

Attorneys for PETITIONERS

[PROPOSED] ORDER

Having fully considered the parties' pleadings and arguments at hearing(s), the administrative record, and all other papers in this case, IT IS HEREBY ORDERED THAT THE WRIT OF MANDATE IS GRANTED. The Court declares that, in preparing and issuing Water Quality Order No. WQ 2013-0101 ("2013 Modified Waiver"), Respondent State Water Resources Control Board ("State Board") violated California Water Code sections 13269 and 13320, the State Antidegradation Policy, Government Code section 11513, and the California Environmental Quality Act. The Court further orders Respondent State Board to:

1. Prepare a new conditional waiver for irrigated agricultural discharges in the Central Coast Region consistent with the Court's decision and final judgment in this case;

2. Conduct supplemental environmental review under the California Environmental Quality Act, as appropriate; and

3. Keep the 2013 Modified Waiver in place until Respondent State Board files a return to the Writ of Mandate.

4. File a return to the Writ of Mandate within one year of the date of the Writ, demonstrating compliance with the Court's decision and final judgment in this case.

The Court retains jurisdiction for purposes including, but not limited to, evaluating the return to the Writ and issue any orders necessary to enforce the Court's decision and judgment.

DATE: ______________________ ____________________________________
Hon. Timothy M. Frawley

PROOF OF SERVICE

LYNDA F. JOHNSTON declares:

I am over the age of eighteen years and not a party to this action. My business address is 559 Nathan Abbott Way, Stanford, California 94305-8610.

On December 19, 2014, I served the foregoing **PETITIONERS' OPENING BRIEF IN SUPPORT OF PETITION FOR WRIT OF MANDATE AND [PROPOSED] ORDER** on all persons named below by placing true and correct copies thereof for Federal Express next-business-day delivery at Stanford, California, addressed as follows:

Kamala D. Harris
Attorney General of California
Tracy L. Winsor
Supervising Deputy Attorney General
Matthew J. Goldman
Deputy Attorney General
1300 I Street, Suite 125
P. O. Box 944255
Sacramento, California 94244-2550

Attorneys for Respondent California State Water Resources Control Board

Theresa A. Dunham, Attorney at Law
Nicholas A. Jacobs, Esq.
Richard Deitchman, Esq.
SOMACH SIMMONS & DUNN
500 Capitol Mall, Suite 1000
Sacramento, California 95814-4742

Attorneys for Respondent-Intervenors Grower Shipper Association of Central California, et al.

Jason E. Resnick, General Counsel
WESTERN GROWERS
17620 Fitch Street
Irvine, California 92614-6022

Attorney for Respondent-Intervenors Grower Shipper Association of Central California, et al.

Nancy N. McDonough, Attorney at Law
Kari E. Fisher, Attorney at Law
Jack L. Rice, Esq.
CALIFORNIA FARM BUREAU FEDERATION
2300 River Plaza Drive
Sacramento, California 95833-4236

Attorneys for Respondent Intervenors California Farm Bureau Federation

William J. Thomas, Esq.
Wendy Y. Wang, Attorney at Law
Stephanie R. Straka, Attorney at Law
BEST BEST & KRIEGER LLP
500 Capitol Mall, Suite 1700
Sacramento, California 95814-4756

Attorneys for Respondent-Intervenors Ocean Mist Farms and RC Farms

I declare under penalty of perjury (under the laws of the State of California) that the foregoing is true and correct, and that this declaration was executed December 19, 2014 at Stanford, California.

Lynda F. Johnston

LYNDA F. JOHNSTON

Attachment 2

Coastkeeper et. al. Trial Court Decision

SUPERIOR COURT OF CALIFORNIA

COUNTY OF SACRAMENTO

MONTEREY COASTKEEPER, et al. **v.** **CALIFORNIA STATE WATER RESOURCES CONTROL BOARD** **OCEAN MIST FARMS, et al.**	Case Number: 34-2012-80001324 **RULING ON SUBMITTED MATTER** Date: May 15, 2015 Time: 10:00 a.m. Dept.: 29 Judge: Timothy M. Frawley

I.
Introduction

On March 15, 2012, the Central Coast Regional Water Quality Control Board (Regional Board) adopted a Conditional Waiver of Waste Discharge Requirements (Order No. R3-2012-0011) and related Monitoring and Reporting Program (Order Nos. R3-2012-0011-01, R3-2012-0011-02, and R3-2012-0011-03) governing discharges from irrigated agricultural lands in the Central Coast region. The "Waiver" waives the requirement for dischargers to file a "Report of Waste Discharge" and obtain "Waste Discharge Requirements" (a permit) for surface and ground water discharges from irrigated lands, provided dischargers comply with certain specified conditions.

Respondent California State Water Resources Control Board (State Board) received five petitions for review of the waiver. One of the petitions was filed by Petitioners Monterey Coastkeeper and Santa Barbara Channelkeeper (among others). Petitioners are non-profit corporations seeking to protect and enhance the State's water resources. The other four petitions were filed by entities representing farmers or agricultural interests, including the Respondent-Intervenors in this action. Together, the five petitions alleged over forty deficiencies in the Regional Board's proposed Waiver. The State Board accepted the petitions for review and elected to review the Regional Board's proposed Waiver.

On September 24, 2013, the State Board adopted an Order (Order WQ 2013-0101), resolving the petitions for review and making amendments to the Waiver. Regional Board staff subsequently incorporated the State Board's amendments into a final "Modified Waiver."

This action followed. Petitioners Monterey Coastkeeper, Antonia Manzo, Environmental Justice Coalition for Water, California Sportfishing Protection Alliance, Pacific Coast Federation of Fishermen's Association, and Santa Barbara Channelkeeper seek a peremptory writ of mandate finding that the Modified Waiver violates the California Water Code, the Regional Basin Plan, the State Antidegradation Policy, Government Code § 11513, and CEQA; and commanding the Board to set aside the Waiver and prepare a new waiver after supplemental environmental review under CEQA. The court shall grant the petition and issue a peremptory writ of mandate commanding Respondent State Board to reconsider the Waiver.

II.
Background Law

The Porter-Cologne Water Quality Control Act is the principal law governing water quality regulation in California. Enacted in 1969, the Porter-Cologne Act establishes as state policy that "the quality of all waters of the state will be protected for use and enjoyment by the people of the state." (Water Code § 13000.) The Act provides that "activities and factors which may affect the quality of the waters of the state shall be regulated to attain the highest water quality which is reasonable, considering all demands being made and to be made on those waters and the total values involved, beneficial and detrimental, economic and social, tangible and intangible." (*Ibid.*)

The Legislature designated the State Board and nine regional water quality control boards (regional water boards) as the agencies with primary responsibility for the regulation of water quality under the Porter-Cologne Act. (Water Code § 13001.) The State Board formulates and adopts state-wide policy for water quality control, allocates funds, and oversees the activities of the regional water boards. (Water Code §§ 13140, 13320.) Each regional water board is responsible for, among other things, water quality protection, permitting, inspection, and enforcement actions within its region. (Water Code § 13225(a).)

A. Central Coast Basin Plan

The Porter-Cologne Act requires each regional water board to adopt a "water quality control plan" (also called a "basin plan") for areas within its region. (Water Code § 13240.) In the basin plan, a regional water board is required to identify and designate the "beneficial uses" of each water body in the region. (Water Code §§ 13050(j), 13240.) Among the beneficial uses that can be designated for a water body are: municipal water supply, contact recreation, non-contact recreation, warm water habitat, cold water habitat, and agricultural supply.

Basin plans also are required to establish "water quality objectives" (aka, "water quality standards"). Water quality objectives are numeric or narrative standards that must be met in order to ensure water bodies will be suitable for their particular beneficial uses and will not constitute a nuisance. (Water Code § 13241.) Factors a regional water board must consider in establishing water quality objectives include, but are not limited to, the following:

(a) Past, present, and probable future beneficial uses of water.
(b) Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto.
(c) Water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area.
(d) Economic considerations.
(e) The need for developing housing within the region.
(f) The need to develop and use recycled water. (Water Code § 13241.)

Basin plans also must contain an implementation plan that describes the actions necessary to achieve the relevant water quality objectives. (Water Code § 13242.) An implementation plan must include "a description of the nature of the actions which are necessary to achieve objectives," a time schedule for the actions to be action, and a description of monitoring activities that will be used to determine whether water quality objectives are being achieved. (*Ibid.*)

Basin plans distinguish between "point sources" of pollution, which are discharges that come from specifically identifiable sources such as waste water treatment facilities, industrial drain pipes, and municipal storm drains, and "nonpoint sources," which are discharges from diffuse, land-use driven sources such as agricultural runoff, road construction, and logging. Nonpoint sources of water pollution are not as easily regulated or controlled as point sources.

The relevant basin plan is the Central Coast Water Quality Control Plan (the "Basin Plan"), which was adopted by the Regional Board in 1975. The Basin Plan has been amended many times over the years and is subject to regular review every three years. Consistent with the Porter-Cologne Act, the primary objective of the Basin Plan is to show how the quality of the surface and ground waters in the Central Coast should be managed to provide the highest water quality reasonably possible. (RB 9165.)

As required by the Porter-Cologne Act, the Basin Plan establishes beneficial uses for water bodies in the Central Coast region, identifies water quality objectives to protect the established beneficial uses, and includes a program of implementation that describes the actions necessary to achieve the objectives. (RB 9173-209.) The implementation program includes a description of the nature of actions necessary to achieve the objectives, a time schedule for the actions to be taken, and a description of monitoring to be undertaken to determine compliance with the objectives.

B. The Nonpoint Source (NPS) and Antidegradation Policies

Basin plans must be consistent with state water quality policies. (Water Code § 13146.) Two water quality policies are relevant to this case: the State Board's Policy for Implementation and Enforcement of Nonpoint Source Pollution Control Program, also known as the "NPS Policy", and the Statement of Policy with Respect to Maintaining High Quality of Water, Resolution No. 68-16, which is commonly referred to as the "Antidegradation Policy."

The State Board adopted the NPS Policy in 2004. The NPS Policy guides regional water boards regarding nonpoint sources of pollution, consistent with the legislative direction in Water Code § 13369. The NPS Policy has the force and effect of a regulation.

The NPS Policy requires that nonpoint source pollution control programs contain five "key elements." In particular, a nonpoint source pollution control program must (1) explicitly address nonpoint source pollution in a manner that achieves and maintains water quality objectives; (2) include a description of management practices and program elements expected to be implemented; (3) include a time schedule and quantifiable milestones designed to measure progress towards achieving water quality objectives; (4) include sufficient feedback mechanisms to ensure that the program is achieving its stated purpose, and ascertain whether additional or different actions are required; and

(5) state the potential consequences for failure to achieve the program's objectives. (RB 9417-20.)

The NPS Policy recognizes that nonpoint source pollution control is a complicated endeavor that addresses longstanding problems and that achieving objectives will take a significant amount of time. (RB 9422.) The NPS Policy recognizes that implementing management practices may be an effective way to control nonpoint source pollution. (RB 9413.)

The State Board adopted the Antidegradation Policy in 1968. The Antidegradation Policy applies whenever (a) there is high quality water, and (b) an activity which produces or may produce waste or an increased volume or concentration of waste that will discharge into such high quality water. The Antidegradation Policy provides, in relevant part:

> Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies.
>
> Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained. (RB 9377.)

High quality waters are determined based on specific properties or characteristics. Because the determination is made on a constituent by constituent basis, waters can be considered high quality for some constituents, but not for others. (*Asociacion de Gente Unida por el Agua v. Central Valley Regional Water Quality Control Bd.* ["*AGUA*"] (2012) 210 Cal.App.4th 1255, 1271.)

By its terms, the Antidegradation Policy seems to require a comparison of existing water quality to water quality objectives as of the date on which those water quality objectives were established. Such an interpretation prevents the Policy from being triggered when existing water quality is equal to or less than the water quality objectives as of the date those objectives took effect, even if historically water quality exceeded applicable objectives.

However, courts and the State Board have interpreted the phrase "existing quality of water" to mean "baseline water quality," which, in turn, is defined as the "best quality that has existed" since the Antidegradation Policy took effect in 1968, unless subsequent lowering was due to regulatory action consistent with state and federal antidegradation policies. (*Id.* at p.1270; see also Administrative Procedures Update 90-004, pp.4-5 [providing guidance in implementing the policy as part of the NPDES permitting process].)

Thus, when undertaking an antidegradation analysis, the regional water board must determine the baseline water quality, and compare that baseline water quality with current water quality objectives. If the baseline water quality is equal to or less than the objectives, the water is not "high quality" and the Antidegradation Policy is not triggered. The relevant water quality objectives govern the water quality that must be maintained or achieved. . (*AGUA, supra,* at p.1270.) But if the baseline water quality is better than the water quality objectives, the Policy is triggered and the baseline water quality must be "maintained" unless the water board makes the findings required to permit degradation.[1] (*AGUA, supra,* at p.1270.)

To permit a proposed discharge that will degrade "high quality" water, a regional water board must find that the discharge (1) will be consistent with maximum benefit to the people of the State; (2) will not unreasonably affect present and anticipated beneficial use of the water; and (3) will not result in water quality less than that prescribed in water quality plans and policies. In addition, the board must ensure the discharge is utilizing the "best practicable treatment or control (BPTC)" to ensure pollution or nuisance will not occur and that the highest quality consistent with the maximum benefit to the people of the State will be maintained. (RB 9377-78.)

Any actions that can adversely affect high quality surface waters are also subject to the federal antidegradation policy developed under the Clean Water Act. (40 C.F.R. § 131.12.) Where the federal antidegradation policy is applicable, the State Board has interpreted its Antidegradation Policy as incorporating the federal policy. (See State Water Board Order WQ 86-17, pp.16-19.)

[1] Under this interpretation, use of the term "maintained" might be a misnomer because actual, current water quality will in some cases have degraded below applicable water quality objectives. In such instances, the water is considered "high quality" only in the sense that its quality was, at some point between 1968 and the present, better than current water quality objectives.

C. Waste Discharge Requirements

Under the Porter-Cologne Act, anyone discharging or proposing to discharge waste that could affect water quality must file a report (aka, a "Report of Waste Discharge") and obtain either a permit (aka, "Waste Discharge Requirements") or a waiver (aka, a "Conditional Waiver of Waste Discharge Requirements").[2]

Waste Discharge Requirements can be issued to an individual discharger who has filed a Report of Waste Discharge and requested the permit. (Water Code § 13260). Alternatively, a regional water board may issue Waste Discharge Requirements for a group of dischargers if the board determines that (i) the discharges are produced by the same or similar operations, (ii) the discharges involve the same or similar types of waste, (iii) the discharges require the same or similar treatment standards, and (iv) the discharges are more appropriately regulated under general discharge requirements than under individual discharge requirements. (Water Code § 13263(i).)

Waste Discharge Requirements must be consistent with any applicable state and regional water quality control plans (basin plans) and policies. When issuing Waste Discharge Requirements, regional water boards are required to consider a number of factors, including the beneficial uses to be protected, the water quality objectives reasonably required for that purpose, other waste discharges, the need to prevent nuisance, and the provisions of Water Code section 13241.

Waste Discharge Requirements may contain any number of conditions, including effluent limitations, treatment standards, monitoring requirements, and a compliance schedule. (Water Code § 13263.) However, water boards generally may not specify the design, location, type of construction, or particular manner of compliance with the requirements. (Water Code §13360; *Tahoe-Sierra Pres. Council v. State Water Res. Control Bd.* (1989) 210 Cal.App.3d 1421, 1438 ["Section 13360 is a shield against unwarranted interference with the ingenuity of the party subject to a waste discharge requirement . . . . It preserves the freedom of persons who are subject to a discharge standard to elect between available strategies to comply with that standard."]

[2] The federal Clean Water Act also requires a permit to discharge pollutants from point sources to surface waters. These permits are known as National Pollutant Discharge Elimination System (NPDES) permits. Congress has delegated to states with approved water quality programs, like California, the authority to issue NPDES permits. (Water Code § 13374.) Hence, Waste Discharge Requirements issued by regional water boards ordinarily also serve as federal NPDES permits. (Water Code § 13374; *Waterkeepers Northern California v. State Water Resources Control Bd.* (2002) 102 Cal.App.4th 1448, 1452.) Nonpoint source discharges to surface waters, and discharges to groundwater, are exempt from the permitting provisions of the Clean Water Act.

D. Conditional Waivers of Waste Discharge Requirements

The Porter-Cologne Act authorizes a water board to waive Waste Discharge Requirements for a specific discharge or specific type of discharge if the board determines that a waiver is consistent with any applicable state or regional water quality control plan (basin plan) and is in the public interest. (Water Code § 13269.) Waivers must have conditions and persons subject to the waiver must comply with such conditions. (*Ibid.*) Thus, in practical terms, Conditional Waivers operate in the same manner as Waste Discharge Requirements: the discharger is permitted to discharge waste provided the discharger meets the conditions specified in the Waiver.

Such conditions generally "shall" include, but are not limited to, individual, group, or watershed-based monitoring requirements, unless the board determines that the discharges at issue do not pose a significant threat to water quality. When imposed, monitoring requirements must be designed to support the development and implementation of the Waiver program, including verifying the adequacy and effectiveness of the Waiver's conditions. In establishing monitoring requirements, the water board may consider the volume, duration, frequency, and constituents of the discharge; the extent and type of existing monitoring activities; the size of the project area; and other relevant factors. Monitoring results must be made available to the public. (*Ibid.*)

Conditional Waivers are limited to five-year terms, but subject to renewal. As with Waste Discharge Requirements, a water board may issue an individual or a group Waiver.

III.
Background Facts and Procedure

The Central Coast region has approximately 435,000 acres of irrigated land and approximately 3000 agricultural operations generating discharges of waste.[3] It also has more than 17,000 miles of surface waters and approximately 4000 square miles of groundwater basins that may be affected by discharges of waste from irrigated lands.

Because agricultural discharges are non-point source discharges, historically they have been subject to minimal regulation. Regulatory authorities instead focused on addressing point source discharges such as wastewater treatment plants and industrial dischargers. However, agricultural discharges have not been exempt from regulation.

---

[3] In 2004, the region had approximately 600,000 acres of irrigated crop land, but only about 2,500 agricultural operations. (See RB 60.)

The Regional Board first approved a "blanket" waiver of waste discharge requirements for irrigation return flows and stormwater runoff in 1983. The 1983 waiver was not especially demanding: the waiver did not require any monitoring or reporting of wastewater discharges.

At the time the 1983 waiver was adopted, the Water Code allowed water boards to approve a waiver provided it was "not against the public interest." (Former Water Code § 13269.) The Legislature subsequently amended the Water Code to require that waivers be consistent with applicable water quality control plans (basin plans), include monitoring provisions, and expire after a five-year term. The legislation also provided that waivers in effect on January 1, 2000, if not specifically renewed, would sunset on January 1, 2003.

In response to the change in the law, on July 9, 2004, the Regional Board adopted Order No. R3-2004-0117, a conditional waiver of waste discharge requirements for discharges from irrigated lands in the Central Coast region (the "2004 Waiver").[4] In adopting the 2004 Waiver, the Regional Board found that water quality in the Central Coast region "has been shown to be impaired by such constituents as pesticides and nutrients, lending . . . urgency to the need to adopt additional requirements for irrigated operations." (RB 9.)

The 2004 Waiver classified dischargers into one of two tiers, and imposed the following conditions: completion of 15 hours of farm water quality education; development of a farm water quality management plan (that addresses, at a minimum, erosion control, irrigation management, nutrient management, and pesticide management); implementation of management practices in accordance with the Farm Plan; surface receiving water quality monitoring (individual, group/cooperative, or watershed-based); and reporting. (RB 60 et seq.) The Waiver did not require any groundwater monitoring.

The Waiver included a time schedule and milestones to achieve compliance with the conditions of the Waiver, but the time schedule and milestones only covered reporting and monitoring.

The goal of the 2004 Waiver was to improve and protect water quality by providing a program to manage discharges from irrigated lands that cause or contribute to exceedances of water quality standards. The Waiver sought to achieve this goal through education and by requiring dischargers to prepare and implement farm water

---

[4] The 2004 Waiver also waived the requirement for a Report of Waste Discharge if dischargers submit a "Notice of Intent" to comply with the conditions of the 2004 Waiver.

quality management plans (Farm Plans). A Farm Plan is a document that, among other things, identifies practices that are or will be implemented to manage discharges of pesticides, nutrients, and other pollutants, to protect water quality. In adopting the 2004 Waiver, the Regional Board hoped to improve irrigation efficiency and minimize fertilizer applications, by ensuring that growers evaluate crop nutrient requirements and consider the nitrate content of their irrigation water and soil in making fertilizer decisions. (RB 73.)

Regional Board staff recognized that the goal of achieving water quality standards represents a "long-term" effort that "cannot be achieved" during the five-year waiver term. (RB 15, 62.) The intent of the program during the first five-year cycle was to enroll growers in the program, educate growers about management practices, improve management practices and recordkeeping, gather information, and improve water quality. Staff indicated that few, if any, enforcement actions would be initiated based on water quality data, unless there was clear evidence of a flagrant or deliberate attempts to degrade water quality. (RB 17.)

The 2004 Waiver took effect on July 9, 2004, and had a term a five years, meaning it was due to expire on July 9, 2009. In anticipation of the expiration of the 2004 Waiver, Regional Board staff initiated a stakeholder process in December 2008, and extended the 2004 Waiver for one additional year, until July 10, 2010, to afford the stakeholder process time to reach a consensus.

Unfortunately, the stakeholder process was not successful. Thus, in February 2010, the Regional Board released a preliminary draft waiver to replace the 2004 Waiver (the "2010 Draft Waiver"), along with a corresponding staff report. (RB 1194-1272.)

The staff report explains the rationale behind the recommendations contained in the 2010 Draft Waiver as follows:

> The intent of the 2004 Conditional Waiver was to regulate discharges from irrigated lands to ensure that such dischargers are not causing or contributing to exceedances of any Regional, State, or Federal numeric or narrative water quality standard. The requirements of the 2004 Conditional Waiver focused on enrollment, education and outreach, the development of Farm Water Quality Management Plans (Farm Plans), and receiving (watershed-scale) water quality monitoring. However, substantial evidence indicates discharges of waste are causing significant exceedances of numeric and narrative water quality standards resulting in negative impacts on beneficial uses. (RB 1131; see also RB 1140.)

The staff report indicates that agricultural discharges "continue to contribute to already significantly impaired water quality and impose certain risk and massive costs to public health, drinking water supplies, aquatic life, and valued water resources." (RB 1130.) It concludes that while the 2004 Waiver was a significant step, the 2004 Waiver "lacks clarity and focus on water quality requirements and does not include adequate compliance and verification monitoring." (RB 1141.) "At a minimum, agricultural discharges continue to severely impact water quality in most receiving waters." Thus, achievement of desired water quality outcomes is "uncertain and unmeasured." (*Ibid.*)

Building upon the 2004 Waiver, the 2010 Draft Waiver retained the requirement that dischargers prepare a Farm Plan (with corresponding management practices), and it retained the 2004 Waiver's surface receiving water monitoring requirements. However, to further reduce or eliminate waste discharges, the 2010 Draft Waiver proposed to impose new, more stringent monitoring and reporting requirements, with an emphasis on "high risk" dischargers in the most severely impaired areas. (RB 1142, 1246 et seq.)

Unlike the 2004 Waiver, the 2010 Draft Waiver proposed to require all farm operations to conduct individual surface water discharge monitoring of their farm operation. If discharge monitoring demonstrates the discharge is impairing or has the potential to impair surface waters, the Draft Waiver required that discharge to be eliminated or treated/controlled to meet water quality standards. (RB 1144-45.)

In addition, the Draft Waiver required all dischargers to conduct annual groundwater monitoring of all irrigation and drinking water wells, and develop a plan to monitor and characterize groundwater quality in the area.

The 2010 Draft Waiver required dischargers to identify, select, and implement management practices to meet water quality standards, maintain existing high quality water, and achieve compliance with the Waiver. (RB 1256.) It also required dischargers to update their Farm Plan at least annually, with monitoring and site evaluation results. (RB 1248, 1255.)

The 2010 Draft Waiver included new requirements for pesticide runoff, nutrient and salt management, sediment/erosion control, and aquatic habitat protection (including minimum riparian buffer widths for streams). (RB 1265.) And it prohibited application of fertilizer "in excess of crop needs." (RB 1251.)

The 2010 Draft Waiver included a time schedule for compliance. Under the Draft Waiver, irrigation runoff either must be eliminated within two years, or the following pollutants must be eliminated or treated/controlled to meet applicable water quality standards by the specified dates: toxicity (within two years); turbidity (within three years); nutrients (within four years), and salts (within four years). (RB 1147, 1267 et seq.) Additionally, the Draft Waiver required dischargers to implement management practices to reduce pollutant loading to groundwater. (*Ibid.*)

Staff acknowledged that to "fully control" all discharges and achieve compliance with water quality standards would take longer than the five-year period of the Waiver, but staff recommended adoption of the Draft Waiver as a reasonable starting point to improve water quality. (*Ibid.*)

After holding public workshops and receiving comments, Regional Board staff released further revised versions of the draft order in November 2010, March 2011, July 2011, and August 2011.[5] (RB 3766-4213, 4901-5700, 6388-6555; SB 7337.) Ultimately, on March 15, 2012, the Regional Board adopted Order No. R3-2012-0011, renewing and revising the 2004 Waiver. (RB 8465-628.) (For ease of reference, the court shall refer to the Regional Board's Order approving a Conditional Waiver of Waste Discharge Requirements and Report of Waste Discharge, and the related Monitoring and Reporting Programs, as the "2012 Waiver").

In adopting the 2012 Waiver, the Regional Board made a number of findings, including the following:

> 5. **Since the issuance of the [2004 Waiver], the Central Coast Water Board has compiled additional and substantial empirical data demonstrating that water quality conditions in agricultural areas of the region continue to be severely impaired or polluted by waste discharges from irrigated agricultural operations and activities that impair beneficial uses, including drinking water, and impact aquatic habitat on or near irrigated agricultural operations. The most serious water quality degradation is caused by fertilizer and pesticide use, which results in runoff of chemicals from agricultural fields** into surface waters and percolation into groundwater. . . . [¶]

[5] The Board also extended the 2004 Waiver, several times, through September 30, 2012, to allow further time to develop a new conditional waiver.

6. **Nitrate pollution of drinking water supplies is a critical problem throughout the Central Coast Region. Studies indicate that fertilizer from irrigated agriculture is the largest primary source of nitrate pollution** in drinking water wells and that significant loading of nitrate continues as a result of agricultural fertilizer practices. Studies indicate that irrigated agriculture contributes approximately 78 percent of the nitrate loading to groundwater in agricultural areas. Hundreds of drinking water wells serving thousands of people throughout the region have nitrate levels exceeding the drinking water standard. This presents a significant threat to human health as pollution gets substantially worse each year, and the actual numbers of polluted wells and people affected are unknown. Protecting public health and ensuring safe drinking water is among the highest priorities of this Order. This Order prioritizes conditions to control nitrate loading to groundwater and impacts to public water systems. . . . [¶]

7. **Agricultural use rates of pesticides in the Central Coast Region and associated toxicity are among the highest in the State. Agriculture-related toxicity studies conducted on the Central Coast since 1999 indicate that toxicity resulting from agricultural discharges of pesticides has severely impacted aquatic life in Central Coast streams**. Some agricultural drains have shown toxicity nearly every time the drains are sampled. Twenty-two sites in the region, 13 of which are located in the lower Salinas/Tembladero watershed area, and the remainder in the lower Santa Maria area, have been toxic in 95% (215) of the 227 samples evaluated. This Order prioritizes conditions to address pesticides that are known sources of toxicity and sources of a number of impairments on the 2010 List of Impaired Waterbodies, specifically chlorpyrifos and diazinon. . . . . [¶]

8. Existing and potential water quality impairment from agricultural waste discharges takes on added significance and urgency, given the impacts on public health, limited sources of drinking water supplies and proximity of the region's agricultural lands to critical habitat for species of concern.

10. This Order requires compliance with water quality standards. Dischargers must implement, and where appropriate update or improve, management practices, which may include local or regional control or treatment practices and changes in farming practices to effectively

control discharges, meet water quality standards and achieve compliance with this Order. **Consistent with the Water Board's Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program (NPS Policy, 2004), dischargers comply by implementing and improving management practices and complying with the other conditions, including monitoring and reporting requirements. This Order requires the discharger to address impacts to water quality by evaluating the effectiveness of management practices (e.g., waste discharge treatment and control measures), and taking action to improve management practices to reduce discharges**. If the discharger fails to address impacts to water quality by taking the actions required by this Order, including evaluating the effectiveness of their management practices and improving as needed, the discharger may then be subject to progressive enforcement and possible monetary liability.

14. Dischargers have the option of complying with surface receiving water quality monitoring conditions identified in MRP Order No. R3-2012-0011, either individually or through a cooperative monitoring program. **The Central Coast Water Board encourages Dischargers to participate in a cooperative monitoring program** to comply with surface receiving water quality monitoring conditions.

16. Many owners and operators of irrigated lands within the Central Coast Region have taken actions to protect water quality. In compliance with the 2004 Agricultural Order, most owners and operators enrolled in the 2004 Agricultural Order, implemented the Cooperative Monitoring Program (CMP), participated in farm water quality education, developed farm water quality management plans and implemented management practices as required in the 2004 Agricultural Order. The 2004 Agricultural Order did not include conditions that allowed for determining individual compliance with water quality standards or the level of effectiveness of actions taken to protect water quality, such as individual discharge monitoring or evaluation of water quality improvements. This Order includes new or revised conditions to allow for such evaluations. Many owners and operators of irrigated lands within the Central Coast Region have taken actions to protect water quality. In compliance with the 2004 Agricultural Order, most owners and operators enrolled in the 2004 Agricultural Order, implemented the Cooperative Monitoring Program (CMP), participated in farm water

> quality education, developed farm water quality management plans and implemented management practices as required in the 2004 Agricultural Order. **The 2004 Agricultural Order did not include conditions that allowed for determining individual compliance with water quality standards or the level of effectiveness of actions taken to protect water quality, such as individual discharge monitoring or evaluation of water quality improvements. This Order includes new or revised conditions to allow for such evaluations.** (See RB 8299-303 [emphasis added].)

The 2012 Waiver was similar to the 2004 Waiver in that it required farm water quality education and farm water quality management plans (or an approved alternative water quality improvement program), required dischargers to implement management practices, required surface receiving water quality monitoring and reporting, imposed time schedules and milestones, and required compliance reporting. Like the 2004 Waiver, the 2012 Waiver encouraged "cooperative" monitoring and reporting efforts.

The 2012 Waiver was more demanding than the 2004 Waiver. The 2012 Waiver (1) classified dischargers into three tiers based on criteria intended to assess a discharger's threat to water quality; (2) required groundwater monitoring and reporting; (3) required maintenance of riparian/vegetative cover in aquatic habitat areas; (4) required the installation of back flow prevention devices; and (5) imposed heightened requirements on the dischargers posing the biggest threats to water quality, including nitrogen balance ratios, irrigation and nutrient management plans, water quality buffer plans, individual surface discharge water quality monitoring and reporting, photo monitoring, total nitrogen reporting, and annual compliance forms.

But some provisions of the 2012 Waiver were less demanding than the 2010 Draft Waiver. For example, the 2010 Draft Waiver required all dischargers within 1000 feet of any surface waterbody to implement management practices sufficient to eliminate discharge of nutrients and salts within four years, and required all dischargers to meet this standard within six years. The 2010 Draft Waiver required the nutrient management element of the Farm Plan to include an estimation of the amount of fertilizer applied in excess of crop needs (if applicable) and an estimation of excess/residual fertilizer/nutrients in the root zone at the end of the growing season. (RB 1259-60.)

Under the 2012 Waiver, only "Tier 2 and 3" dischargers determined to have high nitrate loading risks were subject to additional nutrient management practices. Only Tier 3 dischargers were required to initiate individual surface water discharge monitoring and reporting, and only Tier 3 dischargers with high nitrate loading risk farms were required to determine crop nitrogen uptake values and report progress toward nitrogen balance ratio targets. Only Tier 3 dischargers with farms adjacent to an impaired waterbody were required to prepare and implement a Water Quality Buffer Plan.

The 2012 Waiver required dischargers to comply with water quality standards and with the Regional Basin Plan, and to "effectively control" discharges of pesticides, toxic substances, sediment, turbidity, and nutrients, within specified time lines, but staff acknowledged that, in practice, staff would withhold enforcement if dischargers were meeting conditions of the Waiver regarding implementation, monitoring and reporting. (See SB 2345-46.)

To comply with CEQA, the Regional Board prepared a Subsequent Environmental Impact Report ("SEIR"). The SEIR originally was based on the 2010 Draft Waiver. On August 10, 2011, the Regional Board issued an Addendum to the SEIR to reflect the subsequent revisions to the Draft Waiver and the Board's conclusion that a new SEIR was not required. The Board ultimately concluded that the proposal to "renew" the 2004 Waiver, with "clarifications and new conditions," might have significant environmental effects on biological resources. Thus, the Board adopted a Statement of Overriding Considerations with respect to biological resources. In all other respects, the Board concluded that the 2012 Waiver would not have any new significant environmental effects that had not already been evaluated in the Negative Declaration for the 2004 Waiver.

Five parties petitioned the State Board for review of the Regional Board's 2012 Waiver. (SB 1-1646; see also SB 7164.) One of the five petitions was filed by Petitioners Monterey Coastkeeper and Santa Barbara Channelkeeper (as well as San Luis Obispo Coastkeeper). The other four petitions were filed by entities representing agricultural interests, including Respondent-Intervenors.

In their petition for administrative review, Petitioners argued that the Regional Board had "substantially weakened" staff's proposed controls on nitrate pollution, removing any "firm targets" for nitrate discharges. In the 2010 Draft Waiver proposed by staff, dischargers were required to calculate and "meet" nitrogen balance ratio targets. However, in the 2012 Waiver, the Regional Board revised this requirement to require only that dischargers "report progress towards" achieving nitrogen balance ratio "milestones." Petitioners argued that the revisions rendered the Waiver's controls on nitrate pollution "too weak" to achieve compliance with the Basin Plan, in violation of Water Code section 13269. Thus, Petitioners urged the State Board to reject the

Regional Board's revision "eliminating nitrate ratio balance targets" for Tier 3 dischargers.

The agricultural interests raised a variety of procedural and substantive challenges to the 2012 Waiver. Among other things, they argued that the Waiver's conditions are unreasonable and excessive and inconsistent with the Basin Plan and the Porter-Cologne Act. They also argued that the Board's SEIR is inadequate and that the Board failed to comply with CEQA by relying on the 2004 Negative Declaration and failing to adequately analyze and mitigate the adverse environmental effects of the new, 2012 Waiver.

The agricultural interests also requested the State Board stay certain provisions of the 2012 Waiver pending resolution of the petitions. The State Board granted the request and issued a stay order on September 19, 2012, staying Provisions 44(g), 68, 74, and 67 of the 2012 Waiver (and Part 3 of the related Tier 2 and Tier 3 Monitoring and Reporting Programs).

On September 17, 2012, the State Board initiated its review of the petitions by transmitting a "30-day letter" inviting the Regional Board and all interested persons to respond to the petitions. In response to the 30-day letter, the State Board received responses from several parties, including Petitioners and Respondent-Intervenors.

On June 6, 2013, the State Board released a first revised draft Waiver and received public comments. On August 20, 2013, the State Board released a second revised draft Waiver, followed by another public comment period. On September 9, 2013, the Board released a third revised draft Waiver, followed by yet another public comment period. A final draft Waiver was released on September 20, 2013, prior to the September 24, 2013, Board hearing.

On September 24, 2013, after receiving testimony from the public and interested parties, as well as Regional and State Board staff, the State Board adopted its final Order WQ 2013-0101. (See SB 7162-234 [redline version].) The State Board's Order upheld most of the provisions of the Regional Board's 2012 Waiver, but also amended several requirements. The most significant revision was to replace the Waiver's nitrogen balance ratio requirement with an expanded nitrogen reporting protocol.

In its Order, the State Board indicated that it was in the process of convening a panel of experts to assess existing agricultural nitrate control practices and propose new practices to protect groundwater in the Central Coast region. The State Board indicated that many of the groundwater issues contested in the petitions should be addressed by the expert panel. Thus, the State Board emphasized that its Order constitutes only an interim determination as to how to move forward on the "difficult and complex questions presented in the petitions," pending the expert panel's "more thorough examination of the underlying issues." (SB 7165.)

The Regional Board staff modified Order No. R3-2012-0011 as directed by the State Board's Order WQ 2013-0101. (For ease of reference, the court shall refer to the Regional Board's modified Order, and the related Monitoring and Reporting Programs, as the "Modified Waiver").

This lawsuit followed. The Amended Petition alleges that the State Board abused its discretion in adopting Order No. WQ 2013-0101, modifying the 2012 Waiver, because the Order violates the California Water Code, the Basin Plan, and California's Antidegradation Policy, and because the Board improperly excluded highly-relevant scientific evidence that Petitioners submitted during the public review and comment period (namely, a report by Thomas Harder and Jay. R Lund entitled "Addressing Nitrate in California's Drinking Water," also known as the "U.C. Davis Report"). The Amended Petition also alleges that the State Board violated CEQA by failing to undertake additional environmental review before adopting its final Order.

The Amended Petition seeks a peremptory writ of mandate commanding Respondent State Board to set aside its Order No. WQ 2013-0101, remanding this matter for further proceedings consistent with this court's order, and reinstating the Regional Board's 2012 Waiver until the State Board complies with the writ. Petitioners also seek an award of reasonable attorney fees under California Civil Procedure Code section 1021.5.

Respondents oppose the petition. Respondent State Board also has filed a demurrer alleging that the Fifth Cause of Action (CEQA) fails to state facts sufficient to constitute a cause of action due to Petitioners' failure to exhaust administrative remedies. (Because the demurrer is duplicative of the State Board's arguments opposing the petition, the court need not, and does not, address it further in this ruling.)

IV.
Standard of Review

The challenges to the Board's actions are reviewed under Code of Civil Procedure section 1094.5. (Water Code § 13330(e).) The inquiry under section 1094.5 is whether the agency has (1) proceeded without, or in excess of, jurisdiction; (2) whether there was a fair trial; and (3) whether there was any prejudicial abuse of discretion. Abuse of discretion is established if the agency has not proceeded in the manner required by law, the order or decision is not supported by the findings, or the findings are not supported by the evidence. (Civ. Proc. Code § 1094.5(b).)

Under Water Code section 13330(e), the Court is authorized to exercise its independent judgment on the evidence. In applying the independent judgment test, the trial court reweighs the evidence from the hearing and makes its own determination as to whether the administrative findings are supported by the weight (i.e., preponderance) of the evidence. (*Vaill v. Edmonds* (1991) 4 Cal.App.4th 247, 257.)

Even where the independent judgment test applies, the factual findings of the agency come before the court with a presumption of correctness. (*Fukuda v. City of Angels* (1999) 20 Cal.4th 805, 811-12, 817.) It is presumed that the agency regularly performed its official duty. (*Id.*; *Elizabeth D. v. Zolin* (1993) 21 Cal.App.4th 347, 354.) The burden falls on the petitioner attacking the administrative decision to convince the court that the administrative proceedings were unfair, were in excess of jurisdiction, or that the agency's findings are contrary to the weight of the evidence. (*Fukuda, supra*, at pp. 811-12.)

The amount of deference to be afforded to an agency's interpretation of a statute or regulation is "contextual," and must be considered in light of the agency's expertise and technical knowledge, its thorough analysis of the issues, and its consistency over time. (*California Society of Anesthesiologists v. Brown* (2012) 204 Cal.App.4th 390, 405; *McCormick v. County of Alameda* (2011) 193 Cal.App.4th 201, 207-08; see also *Yamaha Corp. of America v. State Bd. of Equalization* (1998) 19 Cal.4th 1, 7-8.) In general, where an agency is charged with enforcing a statute or regulation, its interpretation is entitled to considerable weight. (*Family Planning Associates Med. Group, Inc. v. Belshe* (1998) 62 Cal.App.4th 999, 1004.) However, the court itself is the ultimate arbiter of the interpretation of the law. (*C.E. Buggy, Inc. v. Occupational Safety & Health Appeals Bd.* (1989) 213 Cal.App.3d 1150, 1156.)

The court reviews the State Board's compliance with CEQA by evaluating whether there was a prejudicial abuse of discretion. (Pub. Res. Code § 21168.5.)

In a mandate proceeding to review an agency's decision for compliance with CEQA, the court reviews the administrative record to determine whether the agency abused its discretion. Abuse of discretion is shown if the agency has not proceeded in the manner required by law, or the determination is not supported by substantial evidence. (*Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th 1099, 1106.) Judicial review differs significantly depending on whether the claim is predominantly one of improper procedure or a dispute over the facts. (*Clover Valley Foundation v. City of Rocklin* (2011) 197 Cal.App.4th 200, 211-12.)

Where the alleged defect is that the agency has failed to proceed in the manner required by law, the court's review is de novo. (*Ibid.*) Although CEQA does not mandate technical perfection, CEQA's information disclosure provisions are scrupulously enforced. (*Ibid.*) A failure to comply with the requirements of CEQA which results in an omission of information necessary to informed decision-making and informed public participation constitutes a prejudicial abuse of discretion, regardless whether a different outcome would have resulted if the agency had complied with the disclosure requirements. (*Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 1184, 1198.)

Where the alleged defect is that the agency's factual conclusions are not supported by substantial evidence, the reviewing court must accord deference to the agency's factual conclusions. The reviewing court may not weigh conflicting evidence to determine who has the better argument and must resolve all reasonable doubts in favor of the administrative decision. The court may not set aside an agency's approval of an EIR on the ground that an opposite conclusion would have been equally or more reasonable. (*Ebbetts Pass Forest Watch v. California Dept. of Forestry & Fire Protection* (2008) 43 Cal. 4th 936, 945.)

Regardless of what is alleged, an EIR approved by a governmental agency is presumed legally adequate, and the party challenging the EIR has the burden of showing otherwise. (*Santa Clarita Organization for Planning the Environment v. County of Los Angeles* (2007) 157 Cal.App.4th 149, 157-58.)

V.
Requests for Judicial Notice

The request for judicial notice filed by Respondent-Intervenors, although unopposed, is denied because Respondent-Intervenors have failed to furnish the court with sufficient information to enable it to take judicial notice of the matters listed.

VI.
Discussion

A. Did Petitioners exhaust their administrative remedies?

As a preliminary matter, Respondents contend that a number of the issues Petitioners raise in their Opening Brief were not presented to the State Board or were presented in contravention of a State Board rule restricting comments to revisions made since the prior draft.[6] The issues that Respondents contend were not properly presented to the State Board relate to provisions of the Modified Waiver addressing (i) pesticide controls [specifically, monitoring use of certain categories of pesticides], (ii) vegetation buffers, (iii) tile drains, (iv) tiering, (v) individual surface water discharge monitoring, (vi) compliance with the State's Antidegradation Policy, and (vii) compliance with CEQA. Because the State Board did not have the opportunity to fully consider those issues, Respondents contend that Petitioners failed to exhaust their administrative remedies.

Petitioners respond that all of the issues presented in this litigation were raised by Petitioners or other interested parties during the administrative process, and therefore are properly before this court.

In general, the court agrees with Petitioners that the purpose of exhaustion of administrative remedies is satisfied if the issue properly was raised during the administrative process, regardless of who raised it. (See *Evans v. City of San Jose* (2005) 128 Cal.App.4th 1123, 1137.)

On the other hand, as Petitioners concede, consideration of whether exhaustion has occurred depends upon the particular procedures applicable to the public agency in question. (See Reply Brief, p.4, lines 1-3 [citing *Citizens for Open Government v. City of Lodi* (2006) 144 Cal.App.4th 865, 876].) In this case, the applicable procedures include State Board regulations governing the administrative process.

Under State Board regulations, any petition for State Board review of an action by a regional board must be in writing and must include a full and complete statement of the reasons the regional board's action was inappropriate or improper. (See 23 C.C.R. § 2050.) Further, if the action that is the subject of the petition for review was taken by the regional board after notice and opportunity to comment, the petition to the State Board shall be limited to those substantive issues or objections that were raised before

---

[6] Under State Board regulations, where staff makes revisions to a proposed order, subsequent comments are limited to the revisions. (23 C.C.R. § 2067; see also SB 6673.)

the regional board. (*Ibid.*) In short, an "aggrieved person" cannot present issues for the first time to the State Board.

Upon receipt of a petition that complies with § 2050, the State Board may solicit responses to the petition. (23 C.C.R. § 2050.5.) After review of the regional board's records pertaining to the matter, the State Board may deny the petition, set aside or modify the regional board order, or direct the regional board to take appropriate action. (23 C.C.R. § 2052.)

Before taking final action, the state board may, in its discretion, hold a hearing for the purpose of oral argument, receipt of additional evidence, or both. (*Ibid.*) When a state board hearing is held, the decision of the State Board will be based on that evidence and testimony in the record of the hearing. When no hearing is held, the decision of the Board will be based on the record before the regional board, except that, in either case, the record may be supplemented by other evidence and testimony pursuant to section 2050.6. (23 C.C.R. § 2064.)

The State Board also has the authority to order review of a regional board's action on its own motion. (23 C.C.R. § 2050.5.) When review is undertaken on the Board's own motion, all affected persons known to the Board shall be notified and given an opportunity to submit information and comments, subject to such conditions as the Board may prescribe. (23 C.C.R. § 2055.)

Formal disposition of petitions occurs at board meetings. At such meetings, the Board may invite comments from interested persons. Comments must be based on evidence contained in the record or legal argument. No new evidence is submitted at the meeting. (23 C.C.R. § 2067.)

The regulations further provide that when the Board makes revisions to a proposed order, subsequent written comments are limited to those revisions. (23 C.C.R. § 2067.)

In this case, even though petitions challenging the Regional Board's Waiver were filed by Petitioners and by agricultural interests, the Board ultimately decided to review the Regional Board's actions on its own motion – apparently because the Board could not meet the time limits for deciding the petitions. (See 23 C.C.R. § 2050.5.)

The only issue raised in the petition filed by Petitioners was the Regional Board's decision to "eliminate" the nitrogen balance ratio targets – specifically, by replacing the requirement to "meet" nitrogen balance ratio targets with the requirement merely to "report progress" towards nitrogen balance ratio milestones. In contrast, the agricultural interests raised numerous objections to the Waiver, challenging nearly every aspect of the Waiver as well as the Regional Board's compliance with CEQA.

Petitioners submitted a written response to the petitions filed by the agricultural interests. Rather than challenging the Regional Board's Waiver, Petitioners defended it. Petitioners argued that the petitions are "wholly without merit" and should be denied. Among other things, Petitioners argued that the Regional Board "acted properly and appropriately in issuing the 2012 Waiver" after an extensive public process, and that the Waiver is "consistent with the Basin Plan and squarely within the public interest." (See SB 5434.) Petitioners argued that the 2012 Waiver is a "proper and appropriate" application of the Regional Board's mandate. (SB 5434.) Petitioners specifically defended the Waiver's tiering system, vegatation buffer/filter strip requirements, and time schedules to achieve compliance over the "longer term," among other provisions. (See SB 5434-42.)

In addition, Petitioners defended the Regional Board's CEQA determinations, arguing that the Regional Board "adhered to CEQA requirements" when it incorporated the analysis from the 2004 Negative Declaration into an SEIR, and when it issued an addendum to that SEIR. (SB 5454-58.)

Petitioners continued to defend the Waiver through the State Board's first draft order. In their comments to that draft, Petitioners stated that their petition "likely would have been withdrawn" were it not for the efforts by agricultural interests to "overturn" the 2012 Waiver and revert to the 2004 Waiver. (SB 5726.) However, in the course of defending the Regional Board's Waiver, Petitioners expressed some dissatisfaction with a perceived weakening of the Waiver to "appease" growers. (SB 5727.)

Petitioners' main objection to the Waiver continued to be the elimination of the requirement to "meet" nitrogen balance ratio targets. Rather than restore the requirement to "meet" nitrogen balance ratios, the State Board proposed to eliminate nitrogen balance ratio targets entirely (and eliminate the requirement to report crop nitrogen uptake values), and instead require high-risk dischargers to report total nitrogen applied. Petitioners objected to this because it would give staff no estimate of the amount of nitrogen removed at harvest, and therefore no means to assess the amount of nitrogen being discharged as waste.

Petitioners also objected to other changes made by the State Board in its draft order, including the Board's proposal to reduce the requirements applicable to containment structures (Provision 33). Petitioners also expressed concerns about the Board's proposal to convene an expert review panel, and the Regional Board's Cooperative Groundwater Monitoring Program. (See SB 5724 et seq.)

Agricultural interests, other environmental organizations, and the Regional Board also submitted comments. The comments submitted by the environmental groups and Regional Board discussed a range of issues, including that the Waiver fails to comply with the anti-degradation requirements; that the Board had inappropriately weakened Provision 11 (third party water quality projects), Provisions 44.d and 44g (Farm Plan effectiveness and compliance), Provisions 76 & 77 and Section B.1 of Part 6 of the Tier 3 MRP (nutrient reporting), Provision 78 (nitrogen balancing ratios), Provision 82 (control of pollutant discharges), Part 3A of the Tier 2 and 3 MRP (reporting of management practice effectiveness), and Part 5A of the Tier 3 MRP (individual surface water discharge monitoring), among other provisions.

In response to the State Board's second draft order, Petitioners objected that the changes had further weakened the Waiver, such that it bore little resemblance to the original February 2010 Draft Waiver. Petitioners argued that if the Waiver is going to provide meaningful water quality protection, the State Board must: (1) require growers to meet and report nutrient balancing ratios; (2) require Tier 3 growers participating in cooperative groundwater monitoring programs to monitor and report results annually; and (3) ensure that growers implement "effective" management practices, not just "modified" management practices.

In addition, Petitioners commented that the initial 2010 Draft Waiver included a "comprehensive list of pesticides," but the most recent draft only focuses on diazinon and chlorpyrifos. Petitioners argued this represented a "missed opportunity" for the Board to reduce discharges of toxic pesticides. (See SB 6301 *et seq.*)

Agricultural interests, other environmental organizations, and the Regional Board also submitted comments. The topics addressed in such comments included Provision 51 (groundwater monitoring), Provisions 76-77 (nutrient balance ratios), Provision 11 (third party water quality programs), Provision 33 (containment structures), Provisions 22-23, 84-87, and 87A (compliance), and Provision 72 (individual surface water discharge monitoring), among others.

By the time of the State Board's third draft order, Petitioners, exasperated with the perceived weakening of the Waiver, indicated that they no longer supported the Waiver and urged the Board to restore many of the provisions from the 2010 Draft Waiver, including (1) the pesticide/toxicity provisions; (2) the requirement for all Tier 2 and 3 growers to report crop nitrogen uptake values and nitrogen balance ratios; (3) the requirement for all Tier 3 growers to "meet" nitrogen balance ratios; (4) sediment control requirements; and (5) aquatic habitat control requirements. Petitioners also urged the Board to admit the U.C. Davis report into evidence; to delete cooperative groundwater monitoring provisions allowing "statistical characterization" of water quality based on existing and collected data; and to delete language providing that iterative implementation of "modified management practices" would be sufficient to comply with the Waiver. (See SB 6730 *et seq.*)

Again, Petitioners were not the only ones to comment. Agricultural interests, other environmental organizations, and the Regional Board also submitted comments in response to the State Board's draft order. Topics covered by such comments included Provision 11; Provision 33; Provision 51; Part 2, Section A.6-7 of the Tier 1-3 MRPs; and provisions addressing nutrient management, among others.

The court is sympathetic to the Board's position that Petitioners should be limited to the issues specifically raised by Petitioners in their petition for review and during the course of administrative proceedings before the State Board. However, as described above, the purpose of the exhaustion doctrine is satisfied as long as the issue was raised during the administrative process, regardless who raised it. In light of the long and complicated history behind the Board's adoption of the Modified Waiver, the court is persuaded that the issues raised by Petitioners have been fully exhausted. Thus, the court shall proceed to decide the issues on their merits.[7]

B. <u>Does the Modified Waiver violate Water Code section 13269?</u>

The Porter-Cologne Act authorizes a waiver of waste discharge requirements only if the waiver is both consistent with the applicable basin plan and in the public interest. (Water Code § 13269.) In addition, Water Code section 13269 requires a waiver to include monitoring requirements "designed to support the development and implementation of the waiver program, including, but not limited to, verifying the adequacy and effectiveness of the waiver's conditions." (*Ibid.*) Petitioners contend that the Modified Waiver violates Water Code section 13269 because it is not consistent with the Basin Plan, does not include adequate monitoring provisions, and is not in the public interest. The court agrees.

---

[7] In the course of reaching this decision, the court has not reviewed or considered Petitioners' Supplemental Brief on Administrative Exhaustion, which was filed without leave.

1. Is the Modified Waiver consistent with the Basin Plan?

Petitioners argue that the Modified Waiver is not consistent with the Basin Plan because it lacks specific, enforceable measures necessary to meet the Basin Plan's water quality objectives, and because it fails to comply with the NPS Policy and the Antidegradation Policy.

a. Compliance with Water Quality Objectives

The Central Coast Basin Plan establishes water quality objectives to protect beneficial uses of water, establishes a program of implementation to achieve water quality objectives, and incorporates state plans and policies, including the NPS Policy and the Antidegradation Policy. (RB 9165, 9193-94.)

As relevant here, the objectives for nitrates, toxicity, pesticides, and sediment provide, in relevant part:

> Nitrates: Water shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses. (RB 9195.) For municipal and domestic water supplies, the narrative standard has been converted into a numeric Maximum Contaminant Level (MCL) of 45 mg/L as Nitrate (NO_3) or 10 mg/L as Nitrogen (N), which is equivalent to the State's drinking water standard. (RB 9197, 9199, 9357; see also RB 5450.) In addition, although not part of the Basin Plan, Regional Board staff has estimated that a standard of 1 mg/L as Nitrogen is necessary to protect aquatic life from biostimulation. (RB 5450.)
>
> Toxicity: All waters shall be maintained free of toxic substances in concentrations which are toxic to, or which produce detrimental physiological responses in, human, plant, animal, or aquatic life. (RB 9196.)
>
> Pesticides: No individual pesticide or combination of pesticides shall reach concentrations that adversely affect beneficial uses. There shall be no increase in pesticide concentrations found in bottom sediments or aquatic life. (RB 9196.)

> Sediment: The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses. (RB 9195.)

To achieve these objectives, the Basin Plan provides, among other things, that:

- The discharge of pollutants into surface fresh waters shall be discontinued. (RB 9353.)
- Waste discharges shall not contain materials in concentrations which are hazardous to human, plant, animal, or aquatic life. (RB 9355.)
- Wastewaters percolated into the ground waters shall be of such quality at the point where they enter the ground so as to assure the continued usability of all ground waters of the basin. (RB 9353.)

The Basin Plan includes a program of implementation to meet the objectives, a time schedule for actions to be taken, and enforcement mechanisms to ensure compliance with the objectives. The Basin Plan provides that control measures implemented by the Regional Board must provide for the attainment of the Basin Plan's beneficial uses and water quality objectives. (RB 9211.)

The Modified Waiver ostensibly requires compliance with the Basin Plan and its water quality objectives. (See SB 7238, 7253, 7347; see also SB 7347.) It does so by means of a "long term" approach that seeks to achieve compliance with water quality objectives over time through "iterative" implementation of management practices.

This iterative approach is described in Provision 83.5 of the Modified Waiver [or Provision 87.5 of the Order], which provides:

> To comply with Provisions 22, 23, 33, and 80 - 83 of this Order, Dischargers must (1) implement management practices that prevent or reduce discharges of waste that are causing or contributing to exceedances of water quality standards; and (2) to the extent practice effectiveness evaluation or reporting, monitoring data, or inspections indicate that the implemented management practices have not been effective in preventing the discharges from causing or contributing to exceedances of water quality standards, the Discharger must implement improved management practices. (SB 7362.)

Petitioners argue that the State Board's iterative approach is not sufficient to achieve compliance with the Basin Plan's water quality objectives because it lacks specific, enforceable standards against which to measure existing management practices; lacks meaningful deadlines/timeframes; lacks adequate feedback mechanisms to determine if management practices are effective.

Petitioners further complain that the Modified Waiver is less protective of water quality than the 2012 Waiver and previous draft waivers circulated by the Regional Board and its staff. Petitioners note that the Regional Board's 2010 Draft Waiver would have required Tier 3 dischargers to meet nitrogen balance ratio targets. Petitioners argue that, at growers' insistence, the Regional Board weakened this requirement so that, instead of requiring Tier 3 dischargers to "meet" nitrogen balance ratio targets, they merely had to "report progress towards" achieving nitrogen balance ratio "milestones." (RB 8327.) Then, in the Modified Waiver, the State Board eliminated the nitrogen balance ratio requirement altogether. (SB 7210-16, 7359-60.) Under the Modified Waiver, Tier 2 and 3 dischargers determined to have high nitrate loading risk merely are required to report total nitrogen applied. Petitioners contend that requiring dischargers to calculate and meet nitrogen balance ratio targets is essential to prevent excessive use of fertilizer and make progress toward achieving the Basin Plan's water objectives.

Petitioners contend that the State Board's elimination of nitrogen balancing and reporting might be acceptable if the Board adopted other enforceable standards to control nitrate pollution. However, Petitioners contend, as a result of the Board's modifications, there is not a single enforceable standard in the Modified Waiver that will require agricultural dischargers to use less nitrogen. Thus, Petitioners argue, nitrate contamination will continue to worsen and the Waiver will not achieve the Basin Plan's objectives.

Apart from the lack of enforceable standards, Petitioners contend the State Board also weakened other provisions that were critical to achieve compliance with the Basin Plan's water quality objectives. Petitioners cite several examples.

First, Petitioners contend the State Board eliminated the requirement of Farm Plans to describe and report the results of methods used to verify the effectiveness of management practices, treatment/control measures, and farming practices. Petitioners contend that the Regional Board already had watered down an earlier proposal to require dischargers to show that their discharges do not impair water quality. (RB 3786; see also RB 1129.) Petitioners contend that the State Board then further weakened the Waiver to require only a "description of the method and schedule" for assessing the effectiveness of each management practice, treatment, and control measure. (SB

7190.) Thus, Petitioners argue, the requirement went from dischargers having to show discharges do not impair water quality; to dischargers only having to describe their verification methods and results; to dischargers only having to describe their methods for evaluating effectiveness, with no need to demonstrate compliance or provide results.

Second, Petitioners contend the State Board weakened the Waiver's pesticide controls. In the 2010 Draft Waiver, Regional Board staff proposed to require that within two years dischargers within 1000 feet of a surface waterbody implement management practices sufficient to "eliminate toxicity in irrigation runoff or eliminate the discharge of irrigation runoff" or demonstrate that any irrigation runoff has been sufficiently treated or controlled that it will not cause or contribute to exceedances of any toxicity water quality standards. (RB 1258.) The Modified Waiver requires monitoring for certain pesticides and provides that Tier 3 dischargers must "effectively control" individual waste discharges of pesticides, but relies on the iterative management practices approach to achieve compliance. (SB 7361.) For the reasons describe above, Petitioners contend the iterative approach is not sufficient to attain water quality standards.

Third, Petitioners contend the State (and Regional) Board weakened the requirement for vegetation buffers. Petitioners argue that in the 2010 Draft Waiver, the Regional Board initially proposed to require all growers either to maintain vegetation buffers or develop and implement a Riparian Function Protection and Restoration Plan, as part of the discharger's Farm Plan. (RB 165-67.) However, in the 2012 Waiver, the Regional Board required only a small number of growers – a subset of Tier 3 dischargers – to comply with this requirement, and the State Board upheld this change. Petitioners contend this change stripped the Waiver of necessary buffer requirements.

Fourth, Petitioners contend that the Modified Waiver fails to adequately regulate the discharge of pollutants from "tile drains," merely requiring dischargers to describe tile drain discharges and management measures that dischargers have implemented or will implement to "minimize" impacts to water quality. (See SB 7351.)

Fifth, Petitioners contend the State Board reduced the number of growers subject to the Modified Waiver's most stringent requirements. As described above, the Modified Waiver assigns each discharger to one of three tiers, which determine the requirements applicable to the discharger. (SB 5659.)

The tier designations are based on criteria intended to capture the risk to water quality, including whether the discharger uses the pesticides chlorpyrifos or diazinon, proximity of the discharger's farm to an impaired surface waterbody, farm size, and whether the discharger grows crop types with high potential to discharge nitrogen to groundwater. A discharger is classified as a Tier 3 discharger – the tier expected to pose the highest threat to water quality – if (a) the discharger grows crop types with high potential to discharge nitrogen to groundwater and the farm total irrigated acreage is 500 acres or more, or (b) the discharger applies chlorpyrifos or diazinon at the farm, and the farm discharges irrigation or stormwater runoff to a waterbody listed as impaired for toxicity or pesticides. (SB 7344-45.)

A discharger is classified as a Tier 1 discharger – the lowest threat tier – if the discharger is a certified sustainable agriculture program or if all of the following conditions are true: (a) the discharger does not use chlorpyrifos or diazinon; (b) the discharger is located more than 1,000 feet from a surface waterbody listed as impaired for toxicity, pesticides, nutrients, turbidity, or sediment; and (c) the discharger either does not grow crop types with high potential to discharge nitrogen to groundwater or, if the discharger does grow such crops, the farm has less than 50 acres of total irrigated area and is not within 1,000 feet of a well that is part of the public water system and that exceeds the maximum contaminant level (MCL) for nitrogen-related pollutants. (*Ibid.*)

Dischargers that do not meet the criteria for Tier 1 or Tier 3 are classified as Tier 2 dischargers. (*Ibid.*)

Tier 3 dischargers must comply with more stringent requirements than Tier 2 dischargers, and Tier 2 dischargers must meet more stringent requirements than Tier 1 dischargers. For example, dischargers in all three tiers must prepare Farm Plans, obtain water quality education, maintain riparian areas, and conduct groundwater and surface receiving water quality monitoring and reporting. However, only Tier 2 and Tier 3 dischargers are required to submit annual compliance forms and report nitrate loading risk levels. Only Tier 2 and Tier 3 dischargers with high nitrate loading risks are required to report total nitrogen applied in their annual compliance forms. Only Tier 2 and Tier 3 dischargers with farms adjacent to impaired waterbodies are required to conduct photo monitoring. Only Tier 3 dischargers are required to conduct and report individual surface water discharge monitoring. Only Tier 3 dischargers with high nitrate loading risks are required to develop and implement an Irrigation and Nutrient Management Plan (INMP). And only Tier 3 dischargers with farms adjacent to impaired waterbodies are required to develop and submit vegetation buffer plans.

Although the State Board concluded that the Modified Waiver is "more stringent" than the 2004 Waiver, (SB 7281), this conclusion was based primarily on the Tier 3 requirements. Regional Board staff found the 2012 Waiver imposed "fewer" requirements on Tier 1 dischargers, and "comparable" requirements on Tier 2 dischargers, as compared to the 2004 Waiver. (RB 7756; see also SB 487, 1978.)

The Regional Board's early proposals would have placed approximately 11% of farms and 54% of irrigated acreage in Tier 3. (RB 4863-64.) In contrast, the Modified Waiver placed only about 3% of farms and 14% of irrigated acreage into Tier 3. (RB 7779.) Under the Regional Board's early proposals, about 59% of farms and 79% of irrigated acreage would be in either Tier 2 or 3, whereas under the Modified Waiver, about 45% of farms and 61% of irrigated acreage would be in Tier 2 or 3.

Further, under the Modified Waiver, a discharger may request to be moved to a lower, less stringent tier. (See SB 7346.) Dischargers may qualify for a tier change by participating in an alternative third party water quality improvement project or program demonstrating a "reasonable chance of improving water quality and/or reducing pollutant loading." (SB 7343.)

Even if the Tier 3 requirements are more stringent than the 2004 Waiver, Petitioners argue that the number of growers subject to the "more stringent" Tier 3 requirements is too small to achieve the Basin Plan's water quality objectives. In sum, Petitioners argue the Modified Waiver is, at most, only marginally stronger than the 2004 Waiver, and it is not strong enough to comply with the Basin Plan. The Regional and State Boards have removed or weakened nearly every substantive standard, pollution control, and monitoring provision needed to protect water quality.

Respondents do not dispute that nitrate and pesticide pollution are problems in the Central Coast region. But Respondents contend it is irrelevant whether the final Waiver is more or less protective of water quality than previous drafts, especially drafts published by Regional Board staff. Respondents contend that only the portions of the 2012 Waiver actually issued by the Regional Board and timely challenged in the petitions to the State Board, and the limited amendments made by the State Board, are properly before this court.

Further, Respondents contend the Modified Waiver's approach to solving the water quality problems in the Central Coast region is consistent with the Basin Plan. While Petitioners may prefer a program that achieves immediate compliance with all water quality objectives, Respondents argue that the Basin Plan permits the State Board to adopt an iterative, long-term approach to address the long-term water quality issues. (See SB 7186.) Implementation of increasingly more effective management practices over time constitutes compliance with water quality requirements. In fact, Respondents contend, such an approach is the only realistic way to improve water quality in a watershed degraded by decades of past practices.

Respondents deny that the State Board's modifications gutted the Waiver's requirements, rendering it inadequate. Rather, they contend, the State Board made the Waiver clearer, more reliable, and easier to implement and enforce.

With regard to nitrogen balance ratios, Respondents argue that the State Board reasonably exercised its discretion in deciding to replace provisions that would have required dischargers to calculate data based on speculative and unreliable variables, with a more detailed nitrogen application reporting requirement.

In regard to farm plans, Respondents argue that the State Board reasonably responded to concerns expressed by agricultural interests and the Regional Board that the term "verify" implied the need for costly studies and statistical analyses, and modified the language to clarify that standard farming practices would be sufficient to evaluate practice effectiveness. (SB 5537, 7188-90, 7351.) Respondents contend this minor change does not change the nature of the Farm Plan requirement.

In regard to pesticide controls, vegetation buffers, tile drains, and the tiering criteria, Respondents argue that the State Board did not modify anything in the Waiver relating to these provisions. Thus, Respondents argue that Petitioners' arguments are not properly before the court. In any event, Respondents argue, they lack merit.

On balance, the court agrees with Petitioners that the Modified Waiver is not consistent with the Basin Plan because it lacks sufficiently specific, enforceable measures and feedback mechanisms needed to meet the Basin Plan's water quality objectives.

The court recognizes, as did the Regional Board, the State Board, and staff, that immediate compliance with water quality standards is not possible without complete cessation of agricultural activity – which is not a "viable or desirable" waste discharge control option. (SB 2362.) The NPS Policy recognizes that, where water already is degraded, it may take time to achieve water quality objectives. Even Petitioners do not contend that the Modified Waiver must achieve "instantaneous compliance" with the Basin Plan's water quality standards. Rather, Petitioners argue, the Modified Waiver must include requirements reasonably designed to show measurable progress toward improving water quality over the short-term and achieving water quality standards in a meaningful timeframe. The court agrees.

The problem with the Modified Waiver is that there is little to support a conclusion that the Waiver will lead to quantifiable improvements in water quality or even arrest the continued degradation of the region's waters.

For the most part, the Modified Waiver continues the approach adopted by the 2004 Waiver. This is problematic because the 2004 Waiver has failed to make meaningful progress in improving water quality or attaining water quality standards. The 2004 Waiver has been "successful" in getting growers to join cooperative monitoring groups, prepare Farm Plans, and provide reports. But it has failed to improve water quality or even halt the continued degradation of the region's water resources.

The focus of the 2004 Conditional Waiver was on enrollment, education, and assessing agricultural water quality. The 2004 Conditional Waiver did not emphasize compliance with water quality standards or follow the State Board's NPS Policy. (RB 2132, 2151.) The 2004 Waiver lacked clarity regarding water quality requirements, did not include time schedules or milestones to achieve compliance with water quality standards, and did not include compliance and verification monitoring to measure and assure progress towards restoration of water quality and protection of beneficial uses. (RB 1141, 2133, 2151.)

Since the adoption of the 2004 Waiver, the Regional Board has documented that agricultural discharges continue to load pollutants to already-severely-impaired water bodies, further degrading water quality and impairing beneficial uses. (RB 2133, 2145, 2149; see also RB 3767, 3897-98, 3974; SB 17, 61.)

The 2004 Waiver has not been successful because it lacks adequate standards and feedback mechanisms to assess the effectiveness of implemented management practices in reducing pollution and preventing further degradation of water quality. The Modified Waiver suffers from the same defect.

The Modified Waiver is based on an "iterative approach" to attain water quality standards, by which dischargers must implement "management practices" to prevent or reduce discharges of waste that are causing or contributing to exceedances of water quality standards. To the extent monitoring data shows implemented management practices have not been effective in preventing discharges from causing or contributing to exceedances, the Modified Waiver requires the discharger to implement "improved" management practices. (SB 7362.)

In theory, the Modified Waiver ensures that dischargers will, over time, implement "effective" management practices because it requires them to implement increasingly "improved" management practices until there are no more discharges causing or contributing to exceedances of water quality standards. Thus, if there is an exceedance at one of the 50 surface receiving water monitoring locations, all growers with discharges that "contribute" to that exceedance must implement increasingly "improved" management practices until the exceedance is eliminated.[8]

In practice, this approach is highly unlikely to work because the receiving water monitoring data, submitted in most cases by a cooperative monitoring group, does not identify the individual discharges that are "causing or contributing" to the exceedance. As a result, neither the Board, nor the cooperative monitoring group, nor (in many cases) the grower, can identify where the pollution is coming from or whether the grower's management practices are effectively reducing pollution and degradation.

It is possible for an iterative management practice approach to meet statutory requirements without requiring individual surface discharge monitoring for all discharges. But there must be some means to verify that implemented management practices are effectively controlling the relevant discharge. If they are not, the Waiver must ensure that dischargers will implement effective management practices that will make measurable progress towards attaining water quality standards. The Modified Waiver does not do that.[9]

While the court agrees that implementation of management practices may be an acceptable means to achieve water quality standards, as the NPS Policy makes clear, implementing management practices is not a substitute for actual compliance with water quality standards. Management practices are merely a means to achieve water quality standards. Adherence to management practices does not ensure that standards are being met. The Modified Waiver recognizes this, but fails to do anything about it. Under the Modified Waiver, if monitoring or inspections indicate that implemented management practices are not effective, the discharger simply must make a "conscientious effort" to identify and implement "improved management practices."

The Modified Waiver does not define what constitutes "improved" management practices, or include any additional monitoring or standards by which to verify the "improved" management practices are effectively reducing pollution. Under the Modified Waiver, compliance is achieved as long as the discharger implements a new

---

[8] If monthly monitoring is required, as is the case with nitrates, growers would have to implement "improved" management practices every month until the exceedance is eliminated.
[9] The court is aware that Tier 3 dischargers with a high nitrate loading risk, must submit an INMP Effectiveness Report to evaluate reductions in nitrate loading to surface water and groundwater based on the implementation of irrigation and nutrient management practices. (See SB 7214.) However, this appears to be a one-time requirement that applies to only a small subset of growers. The Effectiveness Report does not "save" the Waiver.

management practice which the discharger *believes* will be an improvement.[10] In this court's view, this is inadequate to ensure any meaningful progress toward achieving quantifiable reductions in pollutant discharges. (See RB 5149 [Regional Board staff rejecting a similar proposal by agricultural interests because the proposal did not contain adequate verification monitoring or feedback mechanisms to determine if management practices were working or whether additional management practices should be taken].)

For Tier 3 dischargers required to conduct individual surface discharge monitoring, there is a mechanism at least to determine whether the grower's implemented management practices are reducing pollution.[11] But the Waiver does not set any benchmarks for defining how much "improvement" a grower must show to demonstrate compliance. The Waiver seems to assume that any perceived improvement is enough, as long as the improved management practice was implemented in good faith. It is difficult for the court to see how this is an enforceable standard. In effect, the Modified Waiver guarantees that the Regional Board will not take enforcement action against a discharger as long as the discharger believes it is implementing "improved" management practices, even if the "improved" management practices remain completely ineffective at controlling discharges of waste.

In addition, there is another, more fundamental problem with the Waiver, which is the small number of growers subject to the "more stringent" requirements of Tier 3. Tier 3 includes only about 3% of growers and only about 14% of the irrigated acreage in the region. In addition, Tier 3 growers can move to a lower tier by participating in an approved alternative third-party project/program (determined to have a "reasonable chance of improving water quality and/or reducing pollutant loading") or, some cases, simply by switching to pesticides other than diazinon or chlorpyrifos. Thus, at most, about 3% of growers will be subject to the "more stringent" requirements of the Modified Waiver. The vast majority of growers, 97% or more, will be subject to requirements equal to, or less stringent than, the 2004 Waiver. And for the vast majority of growers, the Waiver does not require any individual surface discharge monitoring or other focused monitoring to identify the sources of exceedances or assess the effectiveness of individual farm management practices. It is unreasonable for the Board to keep doing the same things it has been doing and expect different results.

---

[10] This assumes, of course, that growers acknowledge their operations are "causing or contributing to" the exceedance. As a practical matter, growers may deny that their operations are responsible, and point the finger at other operations. It is not clear how the Regional Board would prove otherwise.

[11] The same is true of the groundwater monitoring program because even in the case of a cooperative groundwater monitoring program that relies on representative sampling, the Waiver requires direct sampling of the individual well level if there is a concern that nitrate concentration in the well may approach the Maximum Contaminant Level. (See SB 7193.)

The court is not persuaded that an adequate Waiver necessarily must include nitrogen balancing ratios,[12] broader farm plan reporting, more rigorous pesticide controls, mandatory vegetation/riparian buffers, and/or more comprehensive tile drain monitoring. The court simply concludes that the Modified Waiver, as currently structured, lacks sufficient measures to meet the Basin Plan's water quality objectives and, as a result, the Waiver is not consistent with the Basin Plan.

b. Compliance with the NPS and Antidegradation Policies

Petitioners also argue that the Modified Waiver does not comply with the Basin Plan because it does not comply with California's NPS and Antidegradation Policies.

i. The NPS Policy

The Basin Plan incorporates California's NPS Policy. (RB 9348.) As described above, the NPS Policy requires that nonpoint source pollution control programs include the following five "key elements:"

---

[12] Although the court does not find that nitrogen balance ratio targets are *required* to meet water quality standards, the court fails to understand why they were not included as reportable milestones. In eliminating the requirement, the Board bemoans the lack of reliable data on crop nitrogen uptake values. However, the Board retained the requirement for certain Tier 3 dischargers to identify crop nitrogen uptake values in their INMP for use in nutrient balance calculations. The Board stated that this information is "important" to both the discharger and the professional certifying the INMP in determining the appropriate amount of nitrogen to be applied at the farm. (SB 7209.) The Board also stated that the practice of recording and budgeting of nitrogen application is a relatively low-cost, standard industry practice that is widely recommended by agronomists and crop specialists and already utilized by many growers. (SB 7205.) Thus, the lack of reliable crop nitrogen uptake values does not appear to be an impediment to nitrogen balancing. Further, if the Board currently lacks reliable crop nitrogen uptake values, it presumably could obtain that information from growers under the Waiver. Yet the Board struck the requirement to have crop nitrogen uptake values reported to the Board. (SB 7210.)

Likewise, it is unclear why the Board deleted in Provision 44(g) the requirement for Farm Plans to describe the "results" of methods used to verify practice effectiveness. This is critical information that needs to be reported to the Board. Although it doesn't necessarily have to be reported as part of the Farm Plans, the NPS Policy requires sufficient feedback mechanisms to ensure that the Waiver is achieving its stated purpose, and/or determine whether additional or different actions are required. For Tier 2 and 3 dischargers, this change is arguably of little importance, because those dischargers are required to report the information in their Annual Compliance Form. (See SB 7219.) But the change could be important as to Tier 1 dischargers.

Nevertheless, the court realizes that these are issues that cannot be decided in a vacuum; they must be considered in the context of the Waiver as a whole. Here, for example, instead of requiring dischargers to report progress toward nitrogen balancing ratios, the Board imposed nitrogen application reporting requirements. The court refuses to tell the Board what elements must be included in the Waiver. Rather, the court shall review the Waiver as a whole and decide whether it meets legal requirements.

> KEY ELEMENT 1: An NPS control implementation program's ultimate purpose shall be explicitly stated. Implementation programs must, at a minimum, address NPS pollution in a manner that achieves and maintains water quality objectives and beneficial uses, including any applicable antidegradation requirements.
>
> KEY ELEMENT 2: An NPS control implementation program shall include a description of the MPs [Management Practices] and other program elements that are expected to be implemented to ensure attainment of the implementation program's stated purpose(s), the process to be used to select or develop MPs, and the process to be used to ensure and verify proper MP implementation.
>
> KEY ELEMENT 3: Where a RWQCB determines it is necessary to allow time to achieve water quality requirements, the NPS control implementation program shall include a specific time schedule, and corresponding quantifiable milestones designed to measure progress toward reaching the specified requirements.
>
> KEY ELEMENT 4: An NPS control implementation program shall include sufficient feedback mechanisms so that the RWQCB, dischargers, and the public can determine whether the program is achieving its stated purpose(s), or whether additional or different MPs or other actions are required.
>
> KEY ELEMENT 5: Each RWQCB shall make clear, in advance, the potential consequences for failure to achieve an NPS control implementation program's stated purposes. (RB 9417-20.)

Most nonpoint source management programs depend, at least in part, on implementation of management practices to control nonpoint sources of pollution. (RB 9413.) Successful implementation of management programs typically requires (i) adaptation to specific conditions, (ii) monitoring to assure practices are properly applied and are effective in attaining and maintaining water quality standards, (iii) immediate mitigation if practices are not effective, (iv) improvement of management practice implementation or additional management practices when needed to resolve a deficiency. (*Ibid.*)

Before approving a specific NPS pollution control program, the water board must determine there is a "high likelihood" that implementation of the program will be successful and attain the applicable water quality objectives. (RB 9417.) This includes consideration of the management practices to be used and the process for ensuring their proper implementation, as well as assessment of their effectiveness. (*Ibid.*)

The NPS Policy recognizes that there are instances where it will take time to achieve water quality requirements. (RB 9419.) Where a water board determines it is necessary to allow time to achieve water quality requirements, the NPS Policy requires the program to include specific time schedules and quantifiable milestones designed to measure progress toward reaching the specified goals. (*Ibid.*) A time schedule may not be longer than that which is necessary to achieve an NPS implementation program's water quality objectives. (*Ibid.*)

Adherence to best management practices does not excuse compliance with water quality requirements. (RB 9413.) A nonpoint source pollution control program must include verification measures adequate to determine whether the program is meeting its objectives, and a description of the course of action to be taken if the verification/feedback mechanisms indicate or demonstrate the program is failing to achieve its stated objectives. (RB 9419-20.)

The Modified Waiver does not meet the requirements of the NPS Policy because it lacks adequate monitoring and reporting to verify compliance with requirements and measure progress over time; specific time schedules designed to measure progress toward reaching quantifiable milestones; and a description of the action(s) to be taken if verification/feedback mechanisms indicate or demonstrate management practices are failing to achieve the stated objectives. The Board has failed to show a "high likelihood" that implementation of the Modified Waiver will be successful in attaining the applicable water quality standards.

For these reasons, the court agrees with Petitioners that the Modified Waiver does not comply with the NPS Policy.

i. <u>The Antidegradation Policy</u>

The Basin Plan also incorporates California's Antidegradation Policy. (RB 9194, 9418, 9348.) The Antidegradation Policy is designed to protect water quality that is higher than necessary to protect designated beneficial uses. (RB 9418.) The Policy prohibits the degradation of "high quality" waters absent specific findings, and requires restoration of high quality waters that have been degraded below water quality standards. (RB 9377.)

To permit a proposed discharge that will degrade "high quality" water, a water board must find that the discharge (1) will be consistent with maximum benefit to the people of the State; (2) will not unreasonably affect present and anticipated beneficial use of the water; and (3) will not result in water quality less than that prescribed in water quality plans and policies. In addition, the board must ensure the discharge is utilizing the "best practicable treatment or control (BPTC)" to ensure pollution or nuisance will not occur and that the highest quality consistent with the maximum benefit to the people of the State will be maintained. (RB 9349, 9377-78; see also RB 8548.)

As described above, the first step in an antidegradation analysis is to determine whether there are "high quality" waters that may be affected by discharges. If the receiving water is high quality and an activity will discharge waste into the water, the Policy presumes that the quality of the water will be degraded by the discharge. (*AGUA, supra*, 210 Cal.App.4th at p.1272.)

To determine if water is "high quality," the Policy requires the water board to compare the "baseline water quality" to the water quality objectives established to protect designated beneficial uses. The baseline water quality is the "best quality of the receiving water that has existed since 1968 . . . unless subsequent lowering was due to regulatory action consistent with State and federal antidegradation policies." (*Id.* at p.1270.)

If the baseline water quality is equal to or less than the established water quality objectives, the water is not "high quality" and the objectives set forth the water quality that must be maintained or achieved. The Antidegradation Policy is not triggered. (*AGUA, supra,* at p.1270.) If the baseline water quality is better than the water quality objectives, the Policy is triggered and the baseline water quality must be "maintained" in the absence of the findings required by the Policy. (*Ibid.*)

The Regional Board found the Waiver to be consistent with the Antidegradation Policy because it will "improve" water quality. (RB 8509; see also SB 7229.) Petitioners contend that the Waiver violates the Antidegradation Policy because it allows continued degradation of high quality waters and the Board has not made the findings required to allow such degradation.

The court is unable to decide whether the Waiver violates the Antidegradation Policy because the Board has failed to apply the Policy in the manner directed by the Court in *AGUA*, including any consideration of whether the waters are "high quality" waters. On remand, the Board is directed to consider whether the Waiver is consistent with the Antidegradation Policy, as interpreted by the Court in *AGUA*.

2. <u>Does the Modified Waiver have adequate monitoring provisions?</u>

As described above, Water Code section 13269 requires a conditional waiver of waste discharge requirements to include monitoring requirements "designed to support the development and implementation of the waiver program, including, but not limited to, verifying the adequacy and effectiveness of the waiver's conditions. (Cal. Water Code § 13269(a)(2).) Additionally, monitoring results must be made available to the public. (*Ibid.*) A water board may waive monitoring requirements only for discharges that "do not pose a significant threat to water quality." (Water Code § 13269(a)(3).) Petitioners argue that the Modified Waiver violates section 13269 because its monitoring program is inadequate to verify its effectiveness, and the Waiver fails to disclose adequate monitoring data to the public.

Petitioners contend that the Modified Waiver's surface water monitoring program suffers from two fatal flaws. First, it does not require surface discharge water quality monitoring and reporting from all dischargers. (It only requires surface discharge monitoring from Tier 3 dischargers, and then only for some discharges -- "outfalls," but not sheet flows.) In all other cases, the Waiver measures receiving water pollution concentrations, rather than actual discharges. Second, the Waiver allows dischargers to join cooperative monitoring groups in lieu of individual monitoring.

Petitioners contend the Modified Waiver's groundwater monitoring program is equally flawed. First, the Waiver only requires dischargers to monitor the primary irrigation well and wells used for drinking water purposes. Growers can simply avoid identifying their wells as "drinking water wells" to avoid having to do any monitoring. Second, the Waiver does not require growers to sample their primary irrigation well. Instead, Tier 1 and 2 growers and growers who join cooperative groups can use existing data or studies to estimate pollution levels. Third, the frequency of monitoring – twice the first year and once every five years for Tier 1 and 2, once every year for Tier 3 – is inadequate.

Respondents contend the State Board did not materially change the monitoring standards for surface water and groundwater quality, except to make some clarifying revisions to the cooperative groundwater monitoring provisions. Thus, Respondents argue that Petitioners' arguments are not properly before the court. Regardless, Respondents contend the Waiver's monitoring provisions comply with the requirements of the Water Code.

Petitioners have failed to persuade the court that surface discharge monitoring of all discharges is required – or even possible given that there are approximately 435,000 acres of irrigated land and approximately 3000 agricultural operations generating discharges of waste. The Board struck an appropriate balance in requiring individual surface discharge water monitoring for "high risk" dischargers, while retaining surface receiving water monitoring for other dischargers.

Likewise, both the Water Code and the NPS Policy expressly allow the use of cooperative or watershed-based monitoring. (RB 9414-16; Wat. Code § 13269.) While individual monitoring might provide more information, it would be complicated, costly, and would threaten to overwhelm Regional Board staff. The Board acted within its discretion in generally supporting the use of cooperative or watershed-based monitoring, and limiting individual surface discharge reporting to "high-risk" dischargers.

Petitioners have failed to show that the frequency of groundwater sampling is insufficient, that the proposed statistical monitoring is impermissible,[13] or that the Waiver fails to disclose adequate monitoring data to the public.[14]

The court agrees with Petitioners, however, that the Waiver's compliance/verification monitoring is inadequate. Because the Waiver relies on implementation of management practices to achieve water quality standards, monitoring must be sufficient to verify the effectiveness of the management practices that are implemented. Problems arise when the implemented management practices are not effectively controlling discharges of pollution. The limitations of the cooperative surface receiving water monitoring in identifying the source of exceedances was the impetus behind the inclusion of the individual surface water discharge monitoring for Tier 3 dischargers in this Waiver.

The Board acknowledged the limitations of the representative monitoring approach, and even suggested possible solutions, but failed to include the necessary changes in its Waiver. (See SB 7198-99.) As a result, the Waiver continues to be inadequate to identify and resolve exceedances for all but the small class of dischargers subject to individual surface discharge monitoring.[15] The Waiver does not contain adequate

[13] The Board's Waiver required direct sampling where the statistical method projected nitrate at half the safe level, and repeat sampling if the statistical method projected nitrate at 80% of the safe level. The court agrees with Petitioners, however, that the Waiver should define what it means to be "statistically valid."

[14] As discussed above, the court is troubled by the amendments to Provision 44(g) alleviating Tier 1 dischargers of the requirement to report results of methods used to verify practice effectiveness in their Farm Plans.

[15] It is noteworthy that the Board admitted that compliance monitoring was not a "primary" focus of the Waiver's groundwater monitoring provisions. (See SB 7191.) Rather, the monitoring was focused on

monitoring provisions to verify that management practices are effectively controlling pollution.

3. Is the Modified Waiver in the public interest?

As described above, the Porter-Cologne Act prohibits waivers unless they are "in the public interest." (Cal. Water Code § 13269(a)(1).) Petitioners argue that the Modified Waiver is not in the public interest because there is no evidence it will lead to quantifiable improvements in water quality or arrest the continued degradation of the Central Coast Region's waters. The court agrees, for the reasons stated above.

C. Did the Board abuse its discretion by excluding the U.C. Davis report?

Recognizing a need to protect the public health by preventing or reducing the contamination of groundwater, the California Legislature appropriated about fifty million dollars for grants for projects to protect public health by preventing or reducing the contamination of groundwater that serves as a major source of drinking water for a community. (Water Code § 83002(b)(2)(D).)

Of this amount, two million dollars was appropriated for pilot projects in the Tulare Lake Basin and the Salinas Valley focusing on nitrate contamination. The stated purpose of the pilot projects was to identify sources of groundwater nitrate contamination; estimate the proportionate contributions to such contamination by source and category of discharger; identify and analyze options to reduce nitrate levels and prevent continuing nitrate contamination and the estimated costs associated with such options; identify methods and costs to treat nitrate contaminated groundwater for use as drinking water; identify methods and costs to provide an alternative water supply to affected communities; and identify potential funding sources to pay for treatment or alternative drinking water supplies. (Water Code § 83002.5.)

In June 2010, the State Board selected experts at the University of California, Davis, to study the causes of, and solutions for, nitrate contamination in the Salinas Valley. The final U.C. Davis Report was published on March 13, 2012.

On March 15, 2012, Petitioner Monterey Coastkeeper attempted to introduce the Report during the public hearing on the 2012 Waiver. The Regional Board declined, stating

---

monitoring drinking water quality. This is telling. The monitoring required by the Waiver may be adequate for the purpose of monitoring drinking water quality, but it is not sufficient for the purpose of verifying the effectiveness of implemented management practices.

that the Report was submitted too late to be included in the administrative record. (RB 8130-32.)

After Petitioners and the agricultural interests filed their petitions for administrative review with the State Board, however, the Regional Board requested the State Board to take official notice of the U.C. Davis Report. (SB 7163.) The State Board recognized the "significance of the information and analysis contained in the Report," but declined to take official notice of it, stating:

> [F]or the short-term purposes of resolving the Petitions, we find that the administrative record already before us contains sufficient evidence of the impact of agricultural practices on drinking water in the Central Coast region as well as practices that may ameliorate the problem. (*Ibid.*)

The State Board committed to convene an expert panel to consider the findings of the Report and assess agricultural nitrate control practices. (*Ibid.*)

While Petitioners recognize the Board has discretion to decide whether to accept additional evidence, Petitioners contend that the Board abused its discretion in refusing to consider the U.C. Davis Report because it is unique, highly relevant, and the most current scientific information available addressing groundwater contamination in the Salinas Valley.

Respondents contend the Board appropriately declined to consider the U.C. Davis Report because it was not published until the day before the Regional Board adopted the 2012 Waiver, was not part of the administrative record, and was cumulative of other evidence already in the record (including a PowerPoint presentation of the draft U.C. Davis Report itself). Instead, the State Board appropriately committed to convene an expert panel to consider fully the findings of the U.C. Davis Report.

The court is not persuaded that the Board abused its discretion in refusing to admit the U.C. Davis Report. However, on remand the Board is directed to reconsider whether the Report should be admitted into the record.

D. <u>Did the Board violate CEQA by failing to undertake additional environmental review before adopting its final Order?</u>

Petitioners' final contention is that the State Board violated CEQA by making substantial changes to the 2012 Waiver without conducting supplemental environmental review.

Respondents contend the Modified Waiver did not constitute a substantial change to the 2012 Waiver such that it required additional environmental review.

While the court is not persuaded that the Board's incremental changes to the Waiver necessarily required a Subsequent EIR, it is possible that some additional environmental review was required to address the changes to the Waiver since preparation of the Regional Board's SEIR, which was based on the 2010 Draft Waiver. On remand, the Board is directed to consider what, if any, supplemental review may be required to comply with CEQA in connection with the Waiver.

VII.
Disposition

For the reasons described above, the court shall grant the petition and issue a peremptory writ of mandate compelling Respondent State Board to set aside its Order No. WQ 2013-0101 and reconsider the Conditional Waiver of Waste Discharge Requirements (Order No. R3-2012-0011) and related Monitoring and Reporting Program (Order Nos. R3-2012-0011-01, R3-2012-0011-02, and R3-2012-0011-03). The State Board may choose to allow the Modified Waiver to remain in effect on an interim basis while the State Board takes action to formulate a new waiver consistent with this ruling.

Counsel for Petitioners is directed to prepare a formal judgment and writ (consistent with this ruling); submit them to opposing counsel for approval as to form; and thereafter submit them to the court for signature and entry of judgment in accordance with Rule of Court 3.1312.

Dated: August 10, 2015

Hon. Timothy M. Frawley
California Superior Court Judge
County of Sacramento

CERTIFICATE OF SERVICE BY MAILING
(C.C.P. Sec. 1013a(4))

I, the undersigned deputy clerk of the Superior Court of California, County of Sacramento, do declare under penalty of perjury that I did this date place a copy of the above entitled RULING in envelopes addressed to each of the parties, or their counsel of record as stated below, with sufficient postage affixed thereto and deposited the same in the United States Post Office at Sacramento, California.

MATTHEW J. SAUNDERS
MICHAEL H. TODISCO
DEBORAH A. SIVAS
MALIA J. MCPHERSON
ANDREW J. GRAF
Environmental Law Clinic
Crown Quadrangle
559 Nathan Abbott Way
Stanford, CA 94305-8610

EMEL G. WADHWANI
PHILIP G. WYELS
Environmental Protection Agency
State Water Resources Control Board
Office of Chief Counsel
1001 I Street, 22nd Floor
Sacramento, CA 95814

MATTHEW J. GOLDMAN
TRACY L. WINSOR
Deputy Attorney General
Natural Resources Law Section
1300 I Street, Ste. 125

KARI E. FISHER
California Farm Bureau Federation
Legal Services Division
2300 River Plaza Drive
Sacramento, CA 95833

THERESA A. DUNHAM
Somach Simmons & Dunn law corp.
500 Capitol Mall, Ste. 1000
Sacramento, CA 95814

WILLIAM J. THOMAS, JR.
Best Best & Krieger
500 Capitol Mall, Ste. 1700
Sacramento, CA 95814

Dated: August 10, 2015

By: F. Temmerman
Deputy Clerk, Department 29
Superior Court of California,
County of Sacramento

Attachment 3

Shimek Declaration 2015

Deborah A. Sivas, CA Bar No. 135446
Alicia E. Thesing, CA Bar No. 211751
Matthew J. Sanders, CA Bar No. 222757
ENVIRONMENTAL LAW CLINIC
Mills Legal Clinic at Stanford Law School
559 Nathan Abbott Way
Stanford, CA 94305-8610
Telephone: (650) 723-0325
Facsimile: (650) 723-4426
E-mail: dsivas@stanford.edu

Attorneys for All Petitioners

Michael L. Meuter, CA Bar No. 161554
CALIFORNIA RURAL LEGAL ASSISTANCE
3 Williams Road
Salinas, CA 93905-2835
Telephone: (831) 757-5221
Facsimile: (831) 757-6212
E-mail: mmeuter@crla.org

Attorneys for Petitioner Antonia Manzo

Helen H. Kang, CA Bar No. 124730
Andrew J. Graf, CA Bar No. 300169
ENVIRONMENTAL LAW AND JUSTICE CLINIC
Golden Gate University School of Law
536 Mission Street
San Francisco, CA 94105-2968
Telephone: (415) 442-6647
Facsimile: (415) 442-2450
E-mail: hkang@ggu.edu

Attorneys for All Petitioners

SUPERIOR COURT OF CALIFORNIA
COUNTY OF SACRAMENTO

MONTEREY COASTKEEPER, a program of THE OTTER PROJECT, a non-profit organization; ANTONIA MANZO, an individual; ENVIRONMENTAL JUSTICE COALITION FOR WATER, a non-profit organization; CALIFORNIA SPORTFISHING PROTECTION ALLIANCE, a non-profit organization; PACIFIC COAST FEDERATION OF FISHERMEN'S ASSOCIATIONS, a non-profit trade association; and SANTA BARBARA CHANNELKEEPER, a non-profit organization,

Petitioners,

v.

CALIFORNIA STATE WATER RESOURCES CONTROL BOARD, a public agency,

Respondent,

OCEAN MIST FARMS, et al.,

Respondent-Intervenors.

Case No. 34-2012-80001324

DECLARATION OF STEVEN SHIMEK IN SUPPORT OF [PROPOSED] JUDGMENT GRANTING WRIT OF MANDATE PURSUANT TO CODE OF CIVIL PROCEDURE § 1094.5

I, Steven Shimek, declare:

1. I am the Program Director for Petitioner Monterey Coastkeeper, a program of The Otter Project, and I am also Executive Director of The Otter Project. The matters set forth herein are based on my personal knowledge, and, if called upon to testify, I could and would testify competently to them.

2. I have come to be aware that the State Water Resources Control Board ("State Board") is insisting on a proposed judgment and writ that would, as a means of complying with the Court's August 10, 2015, Ruling on Submitted Matter ("Ruling"), allow the State Board to simply deny the administrative petitions for review of the Central Coast Regional Water Quality Control Board's ("Regional Board") Order No. R3-2012-0011 ("2012 Waiver") and associated monitoring and reporting program. I also understand that this action, if permitted, would, in the State Board's view, have the effect of reinstating the 2012 Waiver.

3. The State Board's Order WQ 2013-0101 ("Modified Waiver") has been in effect since October 24, 2013, before which the 2012 Waiver was in effect since March 2012. Apart from this litigation, including the Court's judgment and whatever action(s) the State Board takes to satisfy the judgment, the Modified Waiver would expire on its own terms on March 15, 2017.

4. The 2012 Waiver shares many of the features of the Modified Waiver, which the Court, in its Ruling, found violated applicable laws and was inconsistent with applicable case law. Those features are failing to measurably improve and protect water quality in the Central Coast Region, for at least the four reasons discussed below.

5. The Modified Waiver and the 2012 Waiver have the same inadequate tiering structure, in that they unwisely subject dischargers to the most stringent requirements based primarily on which pesticides they use.

a. The Modified Waiver and 2012 Waiver employ tiers with different requirements for dischargers. Tier 3, the most restrictive tier, is defined to include any discharger that "grows crop types with high potential to discharge nitrogen to groundwater at the farm/ranch . . ., and farm/ranch total irrigated acreage is greater than or equal to 500 acres," or that "applies chlorpyrifos or diazinon at the farm/ranch, and the farm/ranch discharges irrigation or stormwater runoff to a waterbody listed for toxicity or pesticides on the 2010 List of Impaired Waterbodies." RB 8481; SB 7346. Because there are few irrigated agricultural operations in the Central Coast larger than 500 acres, Tier 3 generally applies to dischargers based on the second condition, the use of diazinon and chlorpyrifos, two organophosphate pesticides.

b. The use of diazinon and chlorpyrifos has been declining for many years, and dischargers are rapidly replacing them with more toxic (pyrethroids) and more persistent (neonicotinoids) alternatives. The following table, which I have created using data from the source identified below the table, shows this marked shift over the most recent six-year period for which data are publicly available:

		Agricultural pounds applied					
Chemical	**Class**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Chlorpyrifos	organophosphate	69,616	50,009	49,870	38,314	24,084	13,894
Diazinon	organophosphate	117,923	51,256	38,367	19,791	11,874	2,815
Imidicloprid	neonicitinoid	15,358	15,639	18,568	20,174	22,052	20,071
Permethrin	pyrethroid	18,009	20,133	22,290	31,666	33,470	37,652

Figure 1.
Agricultural use of select pesticides in Monterey County by year. Source: California Department of Pesticide Regulation, Pesticide Use Annual Summaries, available at http://www.cdpr.ca.gov/docs/pur/purmain.htm.

c. Pyrethroid pesticides, such as permethrin, are far less soluble in water than organophosphates, such as diazinon and chlorpyrifos. This characteristic makes them especially toxic to bees, fish and aquatic insects. See, e.g., http://npic.orst.edu/factsheets/Permtech.html. Neonicotinoids, meanwhile, are believed to contribute to honey bee colony collapse disorder. See Renee Johnson, "Honey Bee Colony Collapse Disorder," Congressional Research Service Review (July 7, 2010), available at http://www.fas.org/sgp/crs/misc/RL33938.pdf. Indeed, a recent study published by the National Institutes of Health explains that neonicotinoids are becoming ever more popular "largely due to their high toxicity to invertebrates, the ease and flexibility with which they can be applied, their long persistence, and their systemic nature, which ensures that they spread to all parts of the target crop." J.M. Bonmatin, et al., "Environmental fate and exposure; neonicotinoids and fipronil," Environ. Sci. Pollut. Res. Int. 2015; 22: 35–67 (Aug. 7, 2014), available at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4284396/. "However," the study explains, "these properties also increase the probability of environmental contamination and exposure of nontarget organisms . . . . Persistence in soils, waterways, and nontarget plants is variable but can be prolonged; for example, the half-lives of neonicotinoids in soils can exceed 1,000 days, so they can accumulate when used repeatedly . . . . Breakdown results in toxic metabolites, though concentrations of these in the environment are rarely measured." Id.; see also National Pesticide Information Center, "Imidacloprid (Neonicotinoid) Technical Fact Sheet, available at http://npic.orst.edu/factsheets/imidacloprid.pdf.

6. The Modified Waiver and 2012 Waiver employ a tiering structure that requires too little of too few to be effective.

a. Like the Modified Waiver, the 2012 Waiver uses a tiering structure in an attempt to focus regulatory effort on those farming operations that pose the most risk to human health and the environment. Tier 3 is the more restrictive tier and requires more care and monitoring than the previous 2004 Waiver, which failed to meaningfully improve water quality. Tier 1 is less restrictive than the 2004 Waiver and Tier 2 is about the same.

b. When it was developing the 2012 Waiver, Regional Board staff estimated that early proposed waivers would have placed 11% of dischargers and 54% of irrigated acreage in Tier 3. RB 4863-64. Staff significantly reduced those numbers for the 2012 Waiver, estimating that approximately 100 farm operations and 14% of irrigated acreage would be in Tier 3. RB 7760, 7779.

c. Things are even worse in practice; perhaps as the result of switching pesticides discussed above, far fewer farms and far less acreage are in Tier 3. As of May 2015, roughly 49 farm operations totaling approximately 21,000 acres, only 4.6% of the total irrigated acreage in the Region, are in Tier 3. Of those 49 operations, 35 (71%) self-report that they have no discharge, which means they have no discharge monitoring requirements. See http://www.waterboards.ca.gov/centralcoast/board_info/agendas/2015/may/item15/item15_presentation%20Compliance_ACF.pdf. Requiring undefined improved management practices for less than 5% of irrigated acreage, as the 2012 Waiver would do, will not result in improved water quality in the Central Coast.

7. Water quality conditions have deteriorated, not improved, under the Modified Waiver and the 2012 Waiver.

a. The 2012 Waiver's emphasis on pesticides no longer in widespread use, combined with the low number of growers enrolled in Tier 3, have resulted in surface water conditions deteriorating since the 2012 Waiver was adopted. According to a presentation given by the dischargers' water quality testing program, conditions at monitoring sites in some of the most cultivated areas are deteriorating, as seen in the two figures below. For pesticides, the trends are exactly what would be expected if dischargers were switching away from diazinon and chorpyrifos (which cause toxicity in water) to pyrethroid pesticides (which cause toxicity in sediment) (Figure 2). For nitrates, in the contiguous lower Salinas and Pajaro systems, two sites show improving trends while six sites show worsening trends (Figure 3).

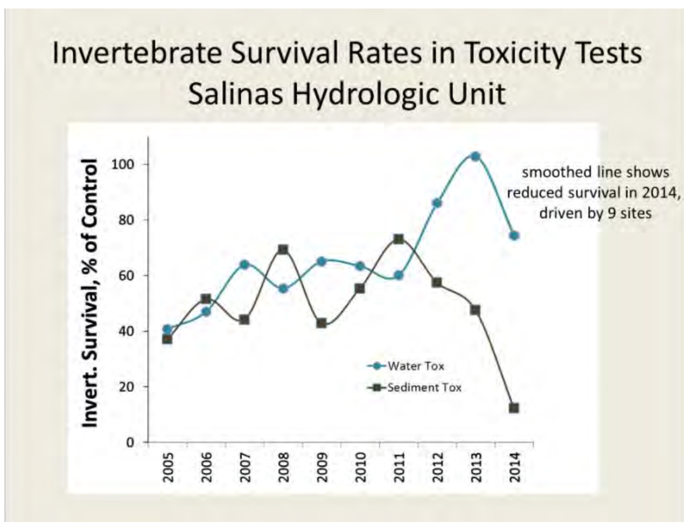


Figure 2.
Slide from presentation by dischargers' water quality monitoring program to the Regional Board (July 30, 2015), available at www.waterboards.ca.gov/centralcoast/board_info/agendas/2015/july/item15/item15_presentation.pdf.
Survival less than 80% is considered toxic.

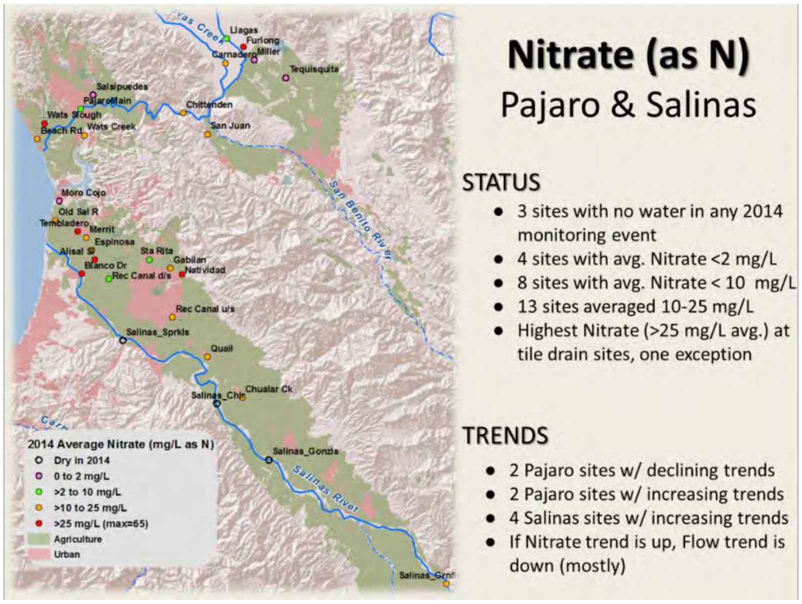


Figure 3.
Slide from presentation by dischargers' water quality monitoring program to the Regional Board (July 30, 2015), available at
www.waterboards.ca.gov/centralcoast/board_info/agendas/2015/july/item15/item15_presentation.pdf.
The drinking water standard is 10 mg/L; the aquatic life standard is 1 mg/L.

8. The Modified Waiver and 2012 Waiver employ inadequate and outdated monitoring.

a. Whether by coincidence or design, the dischargers' monitoring program, which the Regional Board relies on for water quality data and to determine regulatory compliance, uses a tiny crustacean for toxicity testing: *Ceriodaphnia dubia*, commonly known as a water flea. *Ceriodaphnia*, which is not native to the Central Coast Region, is most sensitive to organophosphate pesticides such as chlorpyrifos and diazinon.

b. Another EPA-approved test crustacean, *Hyalella azteca*, is native to the Region and is an important food for native fishes, including the federally endangered South Central Coast steelhead trout. *Hyalella* are sensitive to pyrethroid pesticides, and are often used in combination with *Chironomus* (a midge, or small fly), which are sensitive to neonicotinoid pesticides.

c. When non-native *Ceriodaphnia* and native *Hyalella* were tested side-by-side in Quail Creek in the Salinas Valley, the results were noticeably different: samples using *Ceriodaphnia* more often met toxicity standards, while samples using *Hyalella* more often failed them. See Figure 4 (next page).

Sample	Ceriodaphnia Survival Percentage	Hyalella Survival Percentage
untreated	80	86
untreated	100	54
untreated	96	98
untreated	96	0
untreated	0	0
untreated	96	50
Samples meeting toxicity standards	**5 of 6**	**2 of 6**

Figure 4.
Table comparing toxicity rates based on the 2012 Waiver's testing method and more comprehensive methods. Extracted from B.M. Phillips, et al., "The Effects of the Landguard A900 Enzyme on the Macroinvertebrate Community in the Salinas River, California," 69 Arch. Environ. Contam. and Toxicol. 1, 5 (June 29, 2015), available at http://www.ncbi.nlm.nih.gov/pubmed/26118992.

d. A follow-up test was conducted to determine the accuracy of the toxicity test the growers were using. The results of that test are reported in the May 2015 Executive Officer's Report to the Regional Board, *available at* www.waterboards.ca.gov/centralcoast/board_info/agendas/2015/may/item23/item23_stfrpt.pdf, and are represented in a table copied from the report (Figure 5, on the next page). Like Figure 4, Figure 5 shows that dischargers' testing under the 2012 Waiver, using *Ceriodaphnia*, found no toxicity at any of the listed sites, while independent testing, using *Hyalella* and *Chironomus*, found 89% of the same sites to be toxic.

FALL 2014: DPR/SWAMP/CMP Region 3

Salinas and Santa Maria Valley Sites	*Hyalella* 10d water	*Chironomus* 10d water	EPA 3 species chronic
Water Sample	SWAMP		CMP
Alisal Slough @ Hartnell Rd	T	T	-
Chualar Creek @ Chualar River Road*	T	NT	NT
Main St. Ditch @ Main St.	NT	NT	NT
Orcutt Creek @ West Main	T	T	NT
Oso Flaco Creek @ OF Lake Rd	T	T	NT
Quail Creek @ SR-101	T	T	NT
Rec Ditch III (Near Airport Blvd)	T	T	NT
Solomon Creek @ SR-1	NT	T	NT
Tembladero Slough @ Haro	T	NT	NT
Percent Toxic	78%	67%	0%
Combined Percent Toxic	89%		

Figure 5.
Another table comparing toxicity rates based on the 2012 Waiver's testing method and more comprehensive methods. In this table, "T" means "toxic" and "NT" means "not toxic." The fourth column (EPA /CMP) lists the results of the dischargers' toxicity test, while the second and third columns represent the results of other EPA-approved tests methods.

e. These data suggest two things. First, as growers substitute some organophosphate pesticides in favor of more toxic and persistent pyrethroids and neonicotinoids, toxicity is increasing, or at least not improving, in the Central Coast Region. Second, the 2012 Waiver's monitoring program, which tests for toxicity caused by organophosphate pesticides but not pyrethroid and neonicotinoid pesticides, may be vastly underestimating the toxicity of the Central Coast Region's waters.

9. To summarize, as a consequence of focusing on only two pesticides that are no longer in widespread use, the 2012 Waiver, like the Modified Waiver, fails to cover enough growers or acreage to make meaningful improvements in water quality. The 2012 Waiver incentivizes growers to switch to new classes of pesticides that are more toxic and more persistent than existing pesticides, and growers are in fact switching to these new pesticides. New testing protocols have not kept pace with this switch; as a consequence, the toxicity of Central Coast waters may be seriously underestimated. And data collected by growers themselves in fact demonstrates worsening conditions, both in terms of nitrate pollution and toxicity.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this Declaration was executed on September 9, 2015, in Monterey, California.

STEVEN SHIMEK

Attachment 4

2012 Original Petition of RWQCB

Ag Order (Nitrate Balancing)

Deborah A. Sivas, State Bar No. 135446
Leah Russin, State Bar No. 225336
Alicia Thesing, State Bar No. 238896
Brigid DeCoursey, Certified Law Student No. 27248
ENVIRONMENTAL LAW CLINIC
Mills Legal Clinic at Stanford Law School
Crown Quadrangle
559 Nathan Abbott Way
Stanford, California 94305-8610
Telephone: (650) 723-0325
Facsimile: (650) 723-4426
E-mail: dsivas@law.stanford.edu

Attorneys for Petitioners
MONTEREY COASTKEEPER,
SANTA BARBARA CHANNELKEEPER,
SAN LUIS OBISPO COASTKEEPER

STATE OF CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD

In the Matter of Adoption of Order No. R3-2012-0011, by the Central Coast Regional Water Quality Control Board for the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands	**PETITION REQUESTING REVIEW OF CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD ORDER NO. R3-2012-0011**

Pursuant to Section 13320 of the California Water Code and Section 2050 of Title 23 of the California Code of Regulations ("CCR"), Monterey Coastkeeper, Santa Barbara Channelkeeper, and San Luis Obispo Coastkeeper (collectively "Petitioners") hereby petition the State Water Resources Control Board ("State Board") to review the March 15, 2012 adoption by the California Regional Water Quality Control Board for the Central Coast Region ("Regional Board") of Order No. R3-2012-0011 (hereinafter "Order"), which sets out the conditions for a waiver of the Waste Discharge Requirements ("WDRs") for discharges from irrigated lands (hereinafter "agricultural discharges") under the Porter-Cologne Water Quality Control Act ("Porter-Cologne Act"), Cal. Water Code, div. 7, ch. 5.5.

This appeal concerns the Regional Board's improper application of California Water Code section 13269 to agricultural discharges in light of ongoing water quality degradation in the Central Coast. Although many different agricultural pollutants contribute to the impairment of beneficial uses within the Central Coast Region, nitrate contamination is perhaps the single greatest threat to drinking water supplies and public health. In adopting the Final Order on March 15, 2012, the Regional Board substantially weakened staff's proposed controls on nitrate discharges. As a result, the Final Order is inconsistent with the Water Quality Control Plan for the Central Coast Region ("Basin Plan"), is not in the public interest, and is not supported by evidence in the record.

1. NAME, ADDRESS, TELEPHONE AND EMAIL ADDRESS OF THE PETITIONERS:

The Otter Project
475 Washington St., Ste. A
Monterey, CA 93940
Telephone: (831) 646-8837 x 114
E-mail: exec@otterproject.org
Attention: Steve Shimek, Monterey Coastkeeper

Environment in the Public Interest
EPI-Center, 1013 Monterey St., Ste. 202
San Luis Obispo, CA 93401
Telephone: (805) 781-9932
E-mail: coastkeeper@epicenteronline.org
Attention: Gordon R. Hensley, San Luis Obispo Coastkeeper

Santa Barbara Channelkeeper
714 Bond Ave
Santa Barbara, CA 93103
Telephone: (805) 563-3377
E-mail: ben@sbck.org and kira@sbck.org
Attention: Kira Redmond and Ben Pitterle

2. THE SPECIFIC ACTION OF THE REGIONAL BOARD WHICH THE STATE BOARD IS REQUESTED TO REVIEW AND A COPY OF ANY ORDER OR RESOLUTION OF THE REGIONAL BOARD WHICH IS REFERRED TO IN THE PETITION:

Petitioners seek review of the Regional Board's adoption of the Conditional Waiver of Waste Discharge Requirements for Discharges of Irrigated Lands, Order No. R3-2012-0011. A copy of the Order is attached hereto as Exhibit A.

3. THE DATE ON WHICH THE REGIONAL BOARD ACTED OR REFUSED TO ACT OR ON WHICH THE REGIONAL BOARD WAS REQUESTED TO ACT:

The Regional Board adopted Order No. R3-2012-0011 on March 15, 2012.

4. A FULL AND COMPLETE STATEMENT OF REASONS THE ACTION OR FAILURE TO ACT WAS INAPPROPRIATE OR IMPROPER:

The groundwater and surface waters of the Central Coast have been heavily polluted by agricultural discharge and runoff. As a result, the Regional and State Boards and the U.S. EPA have determined that designated beneficial uses of many of these waters are impaired by sediment, nutrients, pesticides, turbidity, toxicity, pathogens, temperature, and other pollutants. Perhaps the most troubling agricultural contaminant is nitrate, discharged into surface and groundwater as a result of extensive fertilizer use. As the Regional Board's own staff reports and analyses demonstrate, nitrate contamination is a widespread and serious problem, rendering many drinking water supplies unsafe and endangering both public health, adversely affecting ecological resources, and exacting a significant financial toll on municipal drinking water suppliers.

To address agricultural pollution in general and nitrate loading in particular, staff of the Central Coast Regional Board has worked for several years to develop a conditional waiver of waste discharge requirements for irrigated land. In crafting this waiver, staff attempted to balance the added burden of new requirements for agricultural polluters against the urgent need to address the widespread and increasing problem of nitrate and other agriculture-related contamination. Staff ultimately struck that balance by proposing that a small group of dischargers who pose the highest risk to water quality – the so-called "Tier 3" farms – be required to meet somewhat more stringent standards.

Among the Tier 3 standards proposed by staff, one of the most important was the requirement that Dischargers with High Nitrate Loading Risk farms/ranches "meet the nitrate balance ratio targets." This proposed requirement was developed over the course of several years as staff collected and analyzed data and public input. At the March 15, 2012 meeting where the new waiver was finally adopted, however, the Regional Board arbitrarily revised this requirement; the Final Order now requires only that Tier 3 dischargers "report progress towards . . . nitrate balance ratio milestones." Order No. R3-2012-0011, Part F, Section 78. By replacing the word "meet" with "make progress," the Regional Board effectively eliminated any requirement to satisfy nutrient ratio balancing targets. Moreover, the hard "targets" previously established by the Draft Order became soft "milestones" by which the Board will measure success in future years. Removing the only firm and measurable requirements for nitrate discharges renders the Final Order inconsistent with California Water Code Section 13269 because the conditional waiver is not consistent with the Basin Plan and not in the public interest. Accordingly, the Regional Board abused its discretion by adopting this revision in light of the evidence in the record and its own factual findings in the Final Order.

5. THE MANNER IN WHICH THE PETITIONER IS AGGRIEVED:

Petitioner Monterey Coastkeeper ("MCK") works to tackle water pollution problems through policy advocacy and legal tools to ensure that the interests of development, industry and urban activity are kept in line with the environmental needs and wishes of the Monterey Bay and Salinas Valley community it serves. MCK has thousands of members nationally, hundreds of whom live in the Monterey Bay watershed and depend upon clean local streams and shorelines in order to further their recreational, scientific, economic and social interests. Since its inception, MCK has been active in championing for effective government regulations, good public policy and an active community role in protecting freshwater and marine waters alike. MCK's members are particularly concerned with pollution related to agricultural operations in the Monterey Bay watershed, and MCK participated actively as a stakeholder in the AAP that informed the process to update the conditional waiver as well as subsequent workshops and hearings held by the Regional Board.

MCK and its members are aggrieved by the Regional Board's March 15 revisions that removed any firm targets for nitrate discharges. MCK is concerned that this aspect of the Final Order is inadequate to address the severe nitrate contamination in the Central Coast Region. MCK advocates for more effective control requirements to ensure that polluters are held accountable for their activities throughout the agricultural communities. MCK's members live and work in the region and have a beneficial interest in assuring that agriculture is regulated by meaningful and effective requirements to prevent and minimize pollution discharges to the Salinas River and downstream waters. The Salinas River is already impaired by high levels of nitrates and other agriculture-related pollutants. Failure to significantly stem releases to that River is detrimental to MCK and its members.

Petitioner Santa Barbara Channelkeeper ("SBCK") is a grassroots non-profit organization that works to protect and enhance the water quality of the waters of southern Santa Barbara County for the benefit of its 900 members, as well as natural ecosystems and human communities. SBCK is dedicated to the preservation, protection and defense of the environment, wildlife, and the natural resources of the waters of southern Santa Barbara County and other area receiving waters. To further these goals, SBCK works to ensure the implementation and enforcement of the Porter- Cologne Water Quality Control Act, the Central Coast Basin Plan and other relevant laws through a combination of policy advocacy, water quality monitoring, and community education and engagement.

SBCK participated actively as a stakeholder in the AAPs that informed the 2004 Order, the process to update the conditional waiver, and the adoption of the Final Order. Since 2002, SBCK has been monitoring water quality throughout the Goleta Slough watershed and in other nearby streams in the Central Coast Region. Immediately downstream of undeveloped National Forest lands, agricultural facilities dominate the landscape surrounding streams in the Goleta area. Many of SBCK's monitoring sites are directly downstream of these agricultural influences, and at these sites, it has been determined that stream water quality is regularly polluted with concentrations of nutrients, bacteria and suspended sediments that exceed Basin Plan Water Quality Objectives. These results are verified by the Regional Board's CCAMP data.

Members of SBCK use, recreate on, and enjoy the aesthetic values of the beaches, rivers and creeks ("Receiving Waters") of southern Santa Barbara County, to which numerous irrigated agricultural operations discharge pollution. Members of SBCK use and enjoy the Receiving Waters for recreational, scientific, aesthetic, educational, conservation and commercial purposes, including but not limited to, fishing, boating, kayaking, surfing, swimming, windsurfing, fish and wildlife observation, photography, hiking and aesthetic enjoyment. The discharge of pollutants, including nitrates, from irrigated agricultural operations to Receiving Waters impairs those uses.

Thus, the interests of SBCK's members have been, are being, and will continue to be adversely affected by discharges from irrigated agricultural operations. The continued and additional impairments to water quality and beneficial uses that will be allowed under the woefully inadequate approach to controlling nitrate from major dischargers in the Final Order directly harm SBCK members' use and enjoyment of the water.

Petitioner San Luis Obispo Coastkeeper ("SLOCK"), a program of Environment in the Public Interest, has consistently participated in water pollution, environmental impact and endangered species permit process via comments on particular permits, or when necessary bringing enforcement actions in northern Santa Barbara County and throughout San Luis Obispo County. As such SLOCK has a direct interest in the Regional Board's Conditional Waiver of Waste Discharge Requirements for Discharges for Irrigated Lands, because the 800 members of the organization use local streams for recreational, scientific, economic and aesthetic purposes.

Contrary to the requirements set forth in Porter-Cologne and the Basin Plan, the Final Order's weakened nitrate control provision will allow agricultural discharges that result in nitrate concentrations that exceed the drinking water standard, especially at a number of sites in the Santa Maria River watershed. The continuing impairments allowed by the Final Order's weak approach to addressing nitrate directly harm SLOCK members' use and enjoyment of the water.

6. THE SPECIFIC ACTION BY THE STATE OR REGIONAL BOARD WHICH PETITIONER REQUESTS:

Petitioners urge the State Board to reject the Regional Board's March 15, 2012 revision eliminating nitrate ratio balance targets, pursuant to its authority under California Water Code section 13320.

7. A STATEMENT OF POINTS AND AUTHORITIES IN SUPPORT OF LEGAL ISSUES RAISED IN THE PETITION:

Background

Waste Discharge Requirements

Hundreds of water segments and many groundwater drinking water sources within the jurisdiction of the Central Coast Regional Board have been contaminated with nitrates and other pollutants as a result of agricultural activities. Under the Porter-Cologne Act, agricultural discharges of pollutants are subject to regulation through WDRs:

> Waste discharge requirements shall implement any relevant water quality control plans that have been adopted, and shall take into consideration the beneficial uses to be protected, the water quality objectives reasonably required for that purpose, other waste discharges, [and] the need to prevent nuisance . . . .

Cal. Water Code § 13263(a).

In the absence of a WDR, the discharge of pollutants is generally prohibited. Cal. Water Code § 13264(a). State or Regional Boards may conditionally waive WDRs, however, where "the waiver is consistent with any applicable state or regional water quality control plan and is in the public interest." Cal. Water Code § 13269(a)(1).

The 2004 Conditional Waiver

The Regional Board first adopted a Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands, Order No. R3-2004-0117 ("2004 Order"), for the Central Coast Region on July 9, 2004. The 2004 Order was informed by an Agricultural Advisory Panel ("AAP") comprised of stakeholder representatives from agricultural interests and environmental organizations, including Petitioner SBCK.

The Regional Board found the 2004 Order to be in the public interest, per Water Code Section 13269(a)(1), because:

(1) [I]t include[d] conditions that are intended to reduce and prevent pollution and nuisance and protect the beneficial uses of the waters of the state, [and]
(2) it contain[ed] more specific and more stringent conditions for protection of water quality compared to existing regulatory programs . . . .

2004 Order at 3. When the 2004 Order was adopted, Regional Board staff forecast that "at the end of the first [five-year] waiver cycle, the program [would] be evaluated and revised as necessary as part of the waiver review process." Regional Board Staff Report, Item 3, at 17 (July 8, 2004). For example, the 2004 Order states that in time "increased reporting and monitoring may be required in order to ensure that water quality is improving." 2004 Order at 3.

Expiration of the 2004 Conditional Waiver

The 2004 Order expired in July 2009. Regional Board staff convened a second AAP, which included Petitioners MCK and SBCK, in December 2008. This AAP was tasked with discussing proposed updates to the 2004 Order, to be included in a revised conditional waiver that would meet the requirements of Water Code section 13269(a)(1). In particular, staff indicated that "new requirements" are "necessary to directly address and resolve the major water quality issues associated with irrigated agriculture." Letter from Regional Board Staff to AAP, at 1 (Dec. 12, 2008). Specifically, Regional Board staff indicated that the 2004 Order would be "revised to require growers and property owners to demonstrate compliance with the following conditions per defined schedules":

1. Eliminate toxic discharges of agricultural pesticides to surface waters and groundwater
2. Reduce nutrient discharges to surface waters to meet nutrient standards
3. Reduce nutrient discharges to groundwater to meet groundwater standards
4. Minimize sediment discharges from agricultural lands
5. Protect aquatic habitat (riparian areas and wetlands) and their buffer zones

Id. Staff indicated that while some regulated entities have improved agricultural operations to benefit water quality, "other growers are not making progress, and severe water quality problems continue." *Id.* at 2. For example, "the food safety issue has resulted in some growers removing riparian habitat and buffer zones on and around irrigated agricultural fields, which is a direct violation of the Basin Plan." *Id.* at 3.

Initially, the AAP was convened for approximately five meetings between December 2008 and April 2009. *Id.* at 4. However, when the 2004 Order expired in July 2009, the AAP was still engaged in substantive internal discussion, and Regional Board staff opted to extend the stakeholder input process past July. On July 10, 2009, as recommended by staff, the Regional Board adopted Order No. R3-2009-0050, which renewed the 2004 Order for one additional year.

The AAP continued to meet following the 2009 renewal of the 2004 Order, including in meetings with Regional Board staff, in facilitated meetings, and in stakeholder only meetings. Even after at least a dozen such additional meetings, however, AAP members were unable to reach consensus with Regional Board staff about the direction of a revised Order, and the AAP dissolved at the conclusion of its September 22, 2009, meeting.

Revising the 2004 Waiver

Regional Board staff then solicited public comment on the 2004 Order and proposed revisions. Petitioners and others submitted a letter on December 2, 2009, which explained that the 2004 Order is no longer adequate to protect water quality and does not meet the requirements of Water Code Section 13269(a)(1). Letter from Petitioners to Regional Board (Dec. 2, 2009).

After receiving input on the 2004 Order and proposed revisions, Regional Board staff released a new Draft Order for public comment on February 1, 2010. The Draft Order contained provisions that would be necessary for the waiver to be consistent with Water Code Section 13269, including enumerated water quality standards, explicit and liberal timelines for compliance, riparian setbacks and vegetated buffers, individual discharge monitoring, and protections for drinking water. These provisions are also consistent with the proposed updates to the 2004 Order that staff described to the second AAP.

Regional Board staff set forth overwhelming evidence that the 2004 Order is inconsistent with water quality plans and standards, and is not in the public interest, in a staff report accompanying the Draft Order. Regional Board Staff Preliminary Draft Report (Feb. 1, 2010). The 2004 Order was intended to "regulate discharges from irrigated lands to ensure that such dischargers are not causing or contributing to exceedances of any Regional, State, or Federal numeric or narrative water quality standard." *Id.* at 8. Six years after it was adopted, however, there is "no direct evidence that water quality is improving due to the 2004 Conditional Waiver." *Id.* at 7. In fact, many water segments throughout the region continue to be listed as impaired under Clean Water Act section 303(d), nearly all beneficial uses are impacted by agricultural pollution, and these impairments remain "well documented, severe, and widespread" despite the fact that a number of dischargers have enrolled under the 2004 Order. *Id.* at 4. For this reason, Regional Board staff concluded that "[i]mmediate and effective action is necessary to improve water quality protection and resolve the widespread and serious impacts on people and aquatic life." *Id.*

A Second Renewal of the 2004 Order Despite Its Obvious Shortcomings

In spite of the evidence submitted in public comments and staff's recommendations regarding water quality degradation, the Regional Board declined to adopt the February 2010 Draft Order and instead renewed the 2004 Order for a second time on July 8, 2010. On August 6, 2010, Petitioners and EDC petitioned the State Water Quality Board to set aside the renewal as unlawful and adopt the February 2010 Draft Order as modified by recommendations contained in Petitioners' April 1, 2010, letter to the Regional Board. Letter from Petitioners and EDC to Regional Board (Apr. 1, 2010).

Public Workshops and Hearings on Subsequent Drafts

On May 12, 2010 and July 8, 2010, the Regional Board held public workshops to provide an opportunity for public comments and recommendations for updating the 2004 Order. The staff reports from both of these workshops reveal grave concerns about the prospect of continued nitrate loading in the region. After the May and July workshops and a review of many public comments, the Regional Board released a Draft Agricultural Order, Draft Monitoring and Reporting Program, and staff report. Draft Order (Nov. 19, 2010). This document expresses staff's continued concern about nitrate pollution in the region:

> Nitrate pollution of drinking water supplies is a critical problem throughout the Central Coast Region. Studies indicate that fertilizer from irrigated agriculture is the largest primary source of nitrate pollution in drinking water wells and that significant loading of nitrate continues as a result of agricultural fertilizer practices. Researchers estimate that tens of millions of pounds of nitrate leach into groundwater in the Salinas Valley alone each year. Studies indicate that irrigated agriculture contributes approximately 78 percent of the nitrate loading to groundwater in agricultural areas. Hundreds of drinking water wells serving thousands of people throughout the region have nitrate levels exceeding the drinking water standard. This presents a significant threat to human health as pollution gets substantially worse each year . . . .

Id. at 2.

On March 1, 2011, the Regional Board released a further revised Draft Agricultural Order, (Draft Order (Mar. 1, 2011), and on March 17, 2011, initiated a Panel Hearing. The Panel Hearing was continued to May 4, 2011 to allow further opportunity for public input. Both hearing sessions included extensive evidence of nitrate contamination of surface and groundwater in the Central Coast, and written comments on the draft expressed dismay at the lack of consideration given to already present levels of nitrate when tiering groups for differentiated regulation. At the May 4, 2011 Panel Hearing, the Regional Board allowed agricultural stakeholders to submit additional information regarding their alternative proposal, including redline versions of sections of the March 1, 2011 Draft Order.

In July 2011, Regional Board staff released an addendum to the March 2011 staff report, including additional revisions to the Draft Order in response to public comments (the fourth version). The Regional Board then accepted written comments on this version in preparation for the September 1, 2011 Board Meeting at which the Draft Order would be considered for adoption. On August 16, 2011, staff released another addendum to the March 2011 staff report (the fifth version) that responded to written comments submitted on the July 2011 version.

A Fourth Extension of the 2004 Waiver & Continued Public Input

The September 2011 hearing was postponed due to a lack of Board quorum and extended the 2004 Agricultural Order for an additional year. This was the fourth time the Regional Board extended the 2004 order beyond its original 2009 expiration date. In November 2011, additional members were appointed to the Regional Board, creating a quorum that could consider and act on the Draft Order. On February 1, 2012, the Regional Board hosted a final opportunity for public comment (oral only) on Order No. R3-2012-0011 in the form of a workshop, allotting three minutes for each speaker to summarize previous submittals. The written record closed before this meeting, and the Regional Board did not accept any additional written comments into the record.

Meeting of the Regional Board

On March 15, 2012 the Regional Board met and made revisions to the Draft Order, including elimination of nitrate ratio balance targets, and then adopted the Order as final. It made this critical change despite the fact that just two days earlier, on March 13, 2012, the University of California at Davis formally released a report commissioned by the State Water Quality Control Board addressing nitrate contamination in the Tulare Lake Basin, which includes Fresno and Bakersfield, and the Salinas Valley, which includes Salinas and areas near Monterey. Thomas Harter and Jay R. Lund, *Addressing Nitrate in California's Drinking Water, With a Focus on Tulare Lake Basin and Salinas Valley Groundwater*, Report for the State Water Resources Control Board Report to the Legislature (2012), *available at* http://groundwaternitrate.ucdavis.edu. The study found that 10 percent of the 2.6 million people in the Tulare Lake Basin and Salinas Valley rely on groundwater that may exceed the nitrate standard of 45 milligrams per liter set by the California Department of Public Health for public water systems. The study also noted that the nitrate contamination problem is likely to worsen for decades, as nitrogen applied to today's crops slowly makes its way into groundwater as nitrate. Excess nitrate in groundwater from surface nitrogen use has been linked to thyroid illnesses, some cancers and reproductive problems.

Reasons the Board's Revisions Were Improper

A. ELIMINATING THE ONLY FIRM AND MEASURABLE REQUIREMENTS THAT WOULD HAVE APPLIED TO NITRATE DISCHARGES TO GROUNDWATER IS NOT CONSISTENT WITH THE BASIN PLAN.

In order to utilize a conditional waiver of WDRs under Water Code section 13269, the

Regional Board must ensure that the exempted discharges are consistent with state and regional water quality plans, including the Central Coast Basin Plan. The Regional Board has failed to bring agricultural discharges into compliance with the Basin Plan's goals for nitrate through the lax standards of the 2004 Order. Similarly, the Final Order's approach to controlling nitrate contamination from agricultural discharges is too weak to achieve compliance with the Basin Plan any time soon. Therefore, the Regional Board's March 15 revision to the Draft Order is inconsistent with state law.

For example, general water quality objectives in the Basin Plan provide that:

> All waters shall be maintained free of toxic substances in concentrations which are toxic to, or which produce detrimental physiological responses in, human, plant, animal, or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analyses of species diversity, population density, growth anomalies, toxicity bioassays of appropriate duration, or other appropriate methods as specified by the Regional Board. . . .

Basin Plan at III-3. With respect to nutrient loading more specifically, the Basin Plan provides that "[w]aters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses." *Id.* In addition, nitrate concentrations in domestic water supplies shall not exceed 45 mg/l. *Id.* at III-5, III-7.

Data gathered by staff make it clear that agriculture causes "widespread and serious impacts on people and aquatic life" on a regular and ongoing basis. Regional Board Staff Preliminary Draft Report at 4 (Feb. 1, 2010). Domestic and public water supplies have been significantly contaminated with nitrates and other agricultural pollutants, in many cases at levels that far exceed applicable drinking water standards. Also, surface water discharges from irrigation ditches continue to regularly violate water quality standards, despite claims of significant enrollment under the 2004 waiver. And trends in the use of riparian vegetation buffers to protect against sedimentation, nutrient loading, and temperature increases are going in exactly the wrong direction. *Id.* at 16.

The severity of the problem is demonstrated by the existing Clean Water Act section 303(d) impaired waters list for the Central Coast region. Water segments where agricultural pollutants as a source of impairment include:

> Alamo Creek, Alisal Creek (Salinas), Blanco Drain, Bradley Canyon Creek, Carpinteria Creek, Carpinteria Marsh (El Estero Marsh), Cholame Creek, Chorro Creek, Elkhorn Slough, Espinoza Slough, Los Osos Creek, Love Creek, Main Street Canal, Moro Cojo Slough, Moss Landing Harbor, Newell-Creek (Upper), Nipomo Creek, Old Salinas River Estuary, Orcutt Creek, Oso Flaco Lake, Pacific Ocean at East Beach (mouth of Mission Creek, Santa Barbara County), Pacific Ocean at Jalama Beach (Santa Barbara County), Salinas Reclamation Canal, Salinas River (lower, estuary to near Gonzales Rd crossing, watersheds 30910 and 30920), Salinas River (middle, near Gonzales Rd crossing to confluence with Nacimiento River), Salinas River (upper, confluence of Nacimiento

River to Santa Margarita Reservoir), Salinas River Lagoon (North), San Lorenzo Creek, Santa Maria River, Santa Ynez River (below city of Lompoc to Ocean), Santa Ynez River (Cachuma Lake to below city of Lompoc), Tembladero Slough, Tequisquita Slough, Valencia Creek, Watsonville Slough, and Zayante Creek.

California Section 303(d) List, *available at* http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml.

In its most recent biennial review, staff assessed data from 347 of the region's 818 waterbodies and recommended 515 new listings, bringing total recommended listings to 707. Regional Board Staff Report for July 10, 2009, Item 12, at 1, *available at* www.swrcb.ca.gov/rwqcb3/water_issues/programs/tmdl/303d_list.shtml. A quick review of the recommended additions to the list readily reveals that nitrate loading continues to be a significant problem in areas dominated by agricultural uses, and agriculture-related discharges are the source of many new listings. *Id.*, Appendix A. In contrast, staff proposed a mere 49 waterbodies for delisting, of which only 6 are meeting water quality standards (the remainder of the proposed delistings appear to be driven by lack of data). In short, water quality in the Central Coast region is continuing to degrade, especially in those waterbodies affected primarily by agricultural discharges.

The Final Order itself acknowledges the dire situation. The following are direct quotations from the Regional Board's findings in its Existing Conditions Report:

- "Regional evaluations of available data indicate the largest and most severe impacts to groundwater, particularly drinking water beneficial use impacts, in the Region are from widespread nonpoint source nitrogen (primarily in the form of nitrate) discharges." Order No. R3-2012-0011, Appendix G, at 21.
- "A Department of Water Resources (DWR) survey of groundwater quality data collected between 1994 and 2000 from 711 public supply wells in the Central Coast hydrologic unit found that 55% of the drinking water standard violations were attributable to nitrate, with inorganic constituents a distant second at 17 %. . . . An evaluation of public water supply well data on a sub-regional basis up to 2009 . . . indicates even higher incidences of nitrate impacted groundwater supplies around and within areas subject to intensive agricultural land use." *Id.* at 21-22.
- "[M]ore than 37.5% of applied fertilizer-nitrogen (more than 80 pounds of nitrogen per acre per year) is leached to groundwater in the form of nitrate . . . in Central Coast counties over the last ten years, this would equate to over 17,000 tons of nitrogen (75,225 tons of nitrate) being discharged to groundwater on average every year for the last ten years. . . . For perspective, this [nitrate leaching] would be equivalent to dumping about 2,000 dump truck loads of pure ammonium-nitrate fertilizer directly into our drinking water supplies every year." *Id.* (citing Thomas Harter, Agricultural Impacts on Groundwater Nitrate, 8 Southwest Hydrology No.4 (July/Aug. 2003)).

Given the severity of nitrate contamination in the region, the Regional Board's last-minute revision of the Draft Order to require that the highest risk Tier 3 dischargers do nothing more than "mak[e] progress towards nitrate ratio balance milestones" is inconsistent with the

Basin Plan's biostimulatory substance objectives and domestic drinking water standards. Therefore, this aspect of the Final Order is inconsistent with the Basin Plan and violates Water Code Section 13269(a)(1).

B. THE ORDER IS NOT IN THE PUBLIC INTEREST BECAUSE IT ALLOWS FOR THE CONTINUED DETERIORATION OF WATER QUALITY AND NEGATIVE IMPACTS ON HUMAN HEALTH.

Water Code Section 13269(a)(1) requires that discharge waivers be in the public interest. The March 15, 2012 revision to the Final Order that removed firm targets for nitrate discharges to groundwater is not in the public interest because it allows agricultural discharges to continue degrading both surface water and groundwater quality to the detriment of public health and the ecosystem. The Regional Board's own staff stated in its prior report that "continuing to operate in a mode that causes constant or increasingly severe receiving water problems is not a sustainable model" and will result in "increasingly impaired habitat[] and reactive fixes." Regional Board Staff Preliminary Draft Report at 8 (Feb. 1, 2010).

The major water quality issues on the Central Coast are "toxicity, nitrates, pesticides and sediment in agricultural runoff and/or leaching to groundwater." *Id.* at 4. "Agricultural discharges (primarily due to contaminated irrigation runoff and percolation to groundwater) are a major cause of water quality impairment" for drinking water as well as aquatic organisms. *Id.* In some cases, agricultural discharges are the sole or primary source of pollution in impaired water bodies. Even in areas where agriculture is not the only source of pollution, it is a primary contributor. *Id.* at 17.

The 2004 Order was largely ineffective, and most of the same areas that showed serious contamination from agricultural pollutants five years ago are still seriously contaminated. For instance, the 2008 Clean Water Act Section 303(d) List of Impaired Waterbodies for the Central Coast Region ("Impaired Waters List") identifies surface water impairments for approximately 167 water quality limited segments related to a variety of pollutants (for example, salts, nutrients, pesticides/toxicity, and sediment/turbidity). Sixty percent of the surface water listings identified agriculture as one of the potential sources of water quality impairment.

Agricultural discharges most severely impact surface waterbodies in the lower Salinas and Santa Maria watersheds, both areas of intensive agricultural activity. Evaluated through a multi-metric of water quality, 82 percent of the most degraded sites in the Central Coast Region are in these agricultural areas. Nitrate concentrations in areas that are most heavily impacted are not improving significantly or in any widespread manner. In fact, a number of sites in the lower Salinas and Santa Maria watersheds appear to be getting worse (from Central Coast Ambient Monitoring Program (CCAMP) and Cooperative Monitoring Program (CMP) data).

Nitrate pollution from agricultural discharges is particularly problematic. In the Central Coast Region "thousands of people are drinking water contaminated with unsafe levels of nitrate or are drinking replacement water to avoid drinking contaminated water." Regional Board Staff Preliminary Draft Report at 4 (Feb. 1, 2010). Beyond health considerations, "[t]he cost to society for treating [this] polluted drinking water is estimated to be in the hundreds of millions of dollars." *Id.* The facts related to drinking water contamination in the Central Coast Region are startling:

- Thirty percent of all sites from CCAMP and CMP have average nitrate concentrations that exceed the drinking water standard, and approximately 57 percent exceed the level necessary to protect aquatic life.
- Several Central Coast waters have average nitrate concentrations that exceed the drinking water standard by five-fold or more.
- Some of the most seriously polluted waterbodies include the Tembladero Slough system, the Pajaro River, the lower Salinas River, the lower Santa Maria River, and the Oso Flaco watershed.
- Groundwater contamination from nitrate severely impacts public drinking water supplies in the Central Coast Region. Around 20 percent of public supply wells are affected, and over half of drinking water supply wells are vulnerable.
- Due to these elevated concentrations of nitrate in groundwater, many public water supply systems must provide wellhead treatment, at a significant cost.

Groundwater contamination from nitrate severely impacts shallow domestic drinking water supplies in the Central Coast Region. Domestic wells (wells supplying one to several households) are typically screened in shallower zones than public supply wells, and typically have higher nitrate concentrations as a result. Water quality monitoring of domestic wells is not generally required and water quality information is not readily available, however based on the limited data available, the number of domestic wells that exceed the nitrate drinking water standard is likely in the range of hundreds to thousands in the Central Coast Region.

In Monterey County, 25 percent of 352 wells sampled (88 wells) had concentrations above the nitrate drinking water standard in the northern Salinas Valley. In portions of the Salinas Valley, up to approximately 50 percent of the wells surveyed had concentrations above the nitrate drinking water standard, with average concentrations nearly double the drinking water standard and the highest concentration of nitrate approximately nine times the drinking water standard. Nitrate exceedences in the Gilroy-Hollister and Pajaro groundwater basins are similar, as reported by local agencies/districts for those basins.

In many cases, whole communities relying on groundwater for drinking water purposes are affected. Local agencies have reported the shutdown of domestic drinking water wells due to high nitrate concentrations. In addition, local agencies and consumers have reported impacts to human health resulting from nitrate contaminated groundwater, likely due to agricultural land uses, and have expended significant financial resources to ensure proper drinking water treatment and reliable sources of quality drinking water for the long-term. In the Central Coast Region, the Monterey County community of San Jerardo, the San Martin area of Santa Clara County, and the City of Morro Bay are among the local communities affected by nitrate. *Id.* at 15.

Given the human health and economic toll that agricultural discharges are exacting along the Central Coast, there is no reasonable argument that eliminating the nitrate ratio balance targets for major dischargers is consistent with Basin Plan objectives or policies, or is in anyway "in the public interest," as required by Water Code Section 13269(a)(1).

8. A STATEMENT THAT THE PETITION HAS BEEN SENT TO THE APPROPRIATE REGIONAL BOARD:

A true and correct copy of this petition was mailed on April 16, 2012 to the Central Coast Regional Board at the following addresses:

Roger Briggs, Executive Officer
California Regional Water Quality Control Board, Central Coast Region
895 Aerovista Place, Suite 101
San Luis Obispo, California 93401
E-mail: rbriggs@waterboards.ca.gov

State Water Resources Control Board
Office of Chief Counsel
Jeannette L. Bashaw, Legal Analyst
P.O. Box 100
Sacramento, CA 95812-0100
E-mail: jbashaw@waterboards.ca.gov

9. A STATEMENT THAT THE SUBSTANTIVE ISSUES OR OBJECTIONS RAISED IN THE PETITION WERE RAISED BEFORE THE REGIONAL BOARD:

Petitioners raised the issues discussed in this petition before the Regional Board in written and verbal comments during the various public comment periods, workshops, and hearings on this matter.

* * *

If you have any questions regarding this petition, please feel free to contact us directly.

Dated: April 16, 2012

Respectfully submitted,

By: Brigid DeCoursey
Brigid DeCoursey

Attachments:
Exhibit A, Order No. R3-2012-0011

Attachment 5

Review of Nitrate Toxicity in Aquatic Animals

ELSEVIER

Chemosphere 58 (2005) 1255–1267

CHEMOSPHERE

www.elsevier.com/locate/chemosphere

Nitrate toxicity to aquatic animals: a review with new data for freshwater invertebrates

Julio A. Camargo *, Alvaro Alonso, Annabella Salamanca

Departamento Interuniversitario de Ecología, Edificio de Ciencias, Universidad de Alcalá, E-28871 Alcalá de Henares, Madrid, Spain

Received 9 December 2003; received in revised form 19 October 2004; accepted 25 October 2004

Abstract

Published data on nitrate (NO_3^-) toxicity to freshwater and marine animals are reviewed. New data on nitrate toxicity to the freshwater invertebrates *Eulimnogammarus toletanus*, *Echinogammarus echinosetosus* and *Hydropsyche exocellata* are also presented. The main toxic action of nitrate is due to the conversion of oxygen-carrying pigments to forms that are incapable of carrying oxygen. Nitrate toxicity to aquatic animals increases with increasing nitrate concentrations and exposure times. In contrast, nitrate toxicity may decrease with increasing body size, water salinity, and environmental adaptation. Freshwater animals appear to be more sensitive to nitrate than marine animals. A nitrate concentration of 10 mg NO_3-N/l (USA federal maximum level for drinking water) can adversely affect, at least during long-term exposures, freshwater invertebrates (*E. toletanus*, *E. echinosetosus*, *Cheumatopsyche pettiti*, *Hydropsyche occidentalis*), fishes (*Oncorhynchus mykiss*, *Oncorhynchus tshawytscha*, *Salmo clarki*), and amphibians (*Pseudacris triseriata*, *Rana pipiens*, *Rana temporaria*, *Bufo bufo*). Safe levels below this nitrate concentration are recommended to protect sensitive freshwater animals from nitrate pollution. Furthermore, a maximum level of 2 mg NO_3-N/l would be appropriate for protecting the most sensitive freshwater species. In the case of marine animals, a maximum level of 20 mg NO_3-N/l may in general be acceptable. However, early developmental stages of some marine invertebrates, that are well adapted to low nitrate concentrations, may be so susceptible to nitrate as sensitive freshwater invertebrates.

Keywords: Nitrate toxicity; Aquatic invertebrates; Fishes; Amphibians; Review

1. Introduction

In the aquatic environment, the most common ionic (reactive) forms of inorganic nitrogen are ammonium (NH_4^+), nitrite (NO_2^-) and nitrate (NO_3^-). These ions may be present naturally in aquatic ecosystems as a result of atmospheric deposition, surface and groundwater runoff, dissolution of nitrogen-rich geological deposits, N_2 fixation by certain prokaryotes (cyanobacteria, particularly), and biological degradation of organic matter (Spencer, 1975; Kinne, 1984; Gleick, 1993; Wetzel, 2001; Rabalais, 2002). Ammonium tends to be oxidized to nitrate in a two-step process ($NH_4^+ \rightarrow NO_2^- \rightarrow NO_3^-$) by aerobic chemoautotrophic bacteria (*Nitrosomonas* and *Nitrobacter*, primarily), even if levels of dissolved oxygen decline to a value as low as 1.0 mg O_2/l (Sharma and Ahlert, 1977; Stumm and Morgan, 1996; Wetzel, 2001). In consequence, concentrations of nitrate in

* Corresponding author. Tel.: +34 91 885 49 27; fax: +34 91 885 49 29.
E-mail address: julio.camargo@uah.es (J.A. Camargo).

0045-6535/$ - see front matter
doi:10.1016/j.chemosphere.2004.10.044

freshwater and marine ecosystems usually are higher than those of ammonium and nitrite (Spencer, 1975; Kinne, 1984; Gleick, 1993; Wetzel, 2001; Rabalais, 2002). Nitrate (but also ammonium and nitrite) may however be removed from water by aquatic plants, algae and bacteria which assimilate it as a source of nitrogen (Nixon, 1995; Smith et al., 1999; Wetzel, 2001). Furthermore, when concentrations of dissolved oxygen decrease to minimum values, facultative anaerobic bacteria (e.g., *Pseudomonas*, *Micrococcus*, *Bacillus*, *Achromobacter*) can utilize nitrate as a terminal acceptor of electrons, resulting in the ultimate formation of N_2 (Austin, 1988; Wetzel, 2001).

During the past two centuries, the human species has substantially altered the global nitrogen cycle, increasing both the availability and the mobility of nitrogen over large regions of Earth (Vitousek et al., 1997; Carpenter et al., 1998; Galloway and Cowling, 2002). Consequently, in addition to natural sources, inorganic nitrogen (NH_4^+, NO_2^-, NO_3^-) can nowadays enter aquatic ecosystems via anthropogenic sources such as animal farming, urban and agricultural runoff, industrial wastes, and sewage effluents (including effluents from sewage treatment plants that are not performing tertiary treatments) (Meybeck et al., 1989; Conrad, 1990; Bouchard et al., 1992; Welch and Lindell, 1992; Gleick, 1993; Vitousek et al., 1997; Carpenter et al., 1998; Smith et al., 1999; Wetzel, 2001; Rabalais, 2002). Moreover, the atmospheric deposition of inorganic nitrogen (mainly in the form of NO_3^-) has dramatically increased because of the extensive use of nitrogen fertilisers and the huge combustion of fossil fuels (Vitousek et al., 1997; Carpenter et al., 1998; Moomaw, 2002; Boumans et al., 2004). As a result, concentrations of nitrate in ground and surface waters are increasing around the world, causing one of the most prevalent environmental problems responsible for water quality degradation on a worldwide scale (Meybeck et al., 1989; Conrad, 1990; Bouchard et al., 1992; Welch and Lindell, 1992; Gleick, 1993; Nixon, 1995; Smith et al., 1999; Wetzel, 2001; Rabalais, 2002; Smith, 2003). Nitrate concentrations may actually exceed values as high as 25 mg NO_3-N/l in surface waters and 100 mg NO_3-N/l in ground waters (Bogardi et al., 1991; Goodrich et al., 1991; Gleick, 1993; Ministry of Agriculture, Fisheries and Food, 1993; Steinheimer et al., 1998). On the other hand, in marine aquaria and aquaculture systems, where water is recirculating with good oxygenation, nitrate concentrations can approach values of 500 mg NO_3-N/l (De Graaf, 1964; Pierce et al., 1993).

In spite of the current worldwide environmental concern about increasing nitrate concentrations in ground and surface waters, comparatively few studies have been conducted to assess nitrate toxicity to aquatic animals, probably because it has been traditionally assumed that other occurring inorganic nitrogen compounds, such as ammonia (the unionized form of NH_4^+) and nitrite, are more toxic (Russo, 1985; Meade and Watts, 1995; Wetzel, 2001; Alonso and Camargo, 2003). In fact, although safe levels of ammonia have been well established for fishes and aquatic invertebrates (Alabaster and Lloyd, 1982; US Environmental Protection Agency, 1986), no safe level of nitrate has been established for aquatic animals (US Environmental Protection Agency, 1986; Scott and Crunkilton, 2000). It however is worth mentioning that an acceptable level of nitrate for seawater culture was considered to be less than 20 mg NO_3-N/l (Spotte, 1979).

The main toxic action of nitrate on aquatic animals is due to the conversion of oxygen-carrying pigments (e.g., hemoglobin, hemocyanin) to forms that are incapable of carrying oxygen (e.g., methemoglobin) (Grabda et al., 1974; Conrad, 1990; Jensen, 1996; Scott and Crunkilton, 2000; Cheng and Chen, 2002). Nevertheless, owing to the low branchial permeability to nitrate, the NO_3^- uptake in aquatic animals seems to be more limited than the uptake of NH_4^+ and NO_2^-, contributing to the relatively low toxicity of nitrate (Russo, 1985; Meade and Watts, 1995; Jensen, 1996; Stormer et al., 1996; Cheng and Chen, 2002; Alonso and Camargo, 2003).

Elevated nitrate concentrations in drinking waters have serious risks for humans. Ingested nitrates may cause methemoglobinemia in infants through their conversion to nitrites (under anaerobic conditions in the gut) and the subsequent blockade of the oxygen-carrying capacity of hemoglobin (Sandstedt, 1990; Amdur et al., 1991; Wolfe and Patz, 2002). In addition, ingested nitrates have a potential role in developing cancers of the digestive tract through their contribution to the formation of nitrosamines, which are among the most potent of the known carcinogens in mammals (Harte et al., 1991; Nash, 1993). To prevent these deleterious effects of nitrate on human health, drinking water quality criteria have been established: the USA federal maximum contaminant level is 10 mg NO_3-N/l (US Environmental Protection Agency, 1986; Nash, 1993; Scott and Crunkilton, 2000).

The chief purpose of this paper is to review published scientific literature on the toxic effects of nitrate (NO_3^-) on freshwater and marine animals (invertebrates, fishes and amphibians) to establish preliminary safe levels of nitrate for aquatic life. To better compare toxicity data from different authors, all concentrations and levels of nitrate were expressed as mg NO_3-N/l. Additionally, we present new data on the short-term toxicity of nitrate to three species of freshwater invertebrates that are relatively common in rivers and streams of Central Spain: *Eulimnogammarus toletanus* Pinkster & Stock (Gammaridae, Amphipoda, Crustacea), *Echinogammarus echinosetosus* Pinkster (Gammaridae, Amphipoda, Crustacea), and *Hydropsyche exocellata* Dufőur (Hydropsychidae, Trichoptera, Insecta). Individuals of *E. toletanus* and

E. echinosetosus are shredder and detritivorous animals that feed on coarse particulate organic matter. Caddisfly larvae of *H. exocellata* are filter-feeders that construct fixed silk retreat-nets to strain food particles from the current. These species were chosen because the information on nitrate toxicity to freshwater invertebrates, particularly to freshwater amphipods, was very limited.

2. Materials and methods

Adults of *Eulimnogammarus toletanus* (average size of 8.5 mm in length) and *Echinogammarus echinosetosus* (average size of 11.2 mm in length), and last instar larvae of *Hydropsyche exocellata* (>1 mm head capsule width), were obtained from relatively unpolluted reaches of the Henares River (Central Spain). Invertebrates were transported to the laboratory using plastic containers with river water. No animal died during transportation. In the laboratory, invertebrates were deposited into three glass aquaria (one for each species) and acclimated to water quality conditions for seven days prior to the beginning of toxicity bioassays. During acclimation, amphipods were fed with macerated poplar leaves from the Henares river, and caddisfly larvae were fed with fine particulate dried fish food.

Invertebrate species were tested separately. Three static (with water renovation) short-term toxicity bioassays were conducted in triplicate for five days using small glass aquaria, each containing one litre of bottled drinking water (with no chlorine). A control and 5-6 different nominal nitrate concentrations were used per bioassay, with 10 animals per concentration/aquarium (including control). Test nitrate concentrations ranged from 5 to 160 mg NO_3-N/l for *E. echinosetosus*, from 15 to 480 mg NO_3-N/l for *E. toletanus*, and from 20 to 640 mg NO_3-N/l for *H. exocellata*. In all cases, nitrate solutions were made from sodium nitrate ($NaNO_3$, Merck, Germany). These nitrate solutions, together with water in control aquaria, were daily renewed. Invertebrates were not fed during bioassays to prevent changes in nitrate concentrations. Water oxygenation and turbulence were produced with air pumps and airstones. Average water quality conditions during bioassays were: 7.7 mg O_2/l for dissolved oxygen, 17.9 °C for temperature, 7.8 for pH, and 293 mg $CaCO_3$/l for total hardness. In the case of *H*. exocellata, and following previous recommendations by Camargo and Ward (1992), PVC pieces were added to quaria to facilitate net-building by net-spinning caddisfly larvae. Mortality was recorded every day, dead animals being removed.

Statistical analyses were performed using the multifactor probit analysis (MPA) software (US Environmental Protection Agency, 1991; Lee et al., 1995). The MPA methodology solves the concentration-time-response equation simultaneously via the iterative reweighed least squares technique (multiple linear regression). The dependent variable is the probit of the proportion responding to each concentration, and the independent variables are exposure time and toxicant concentration. After evaluating several MPA models regarding the heterogeneity factor (chi-squared variable divided by degrees of freedom), a parallel-regression-line model was selected as the best one. 48, 72, 96 and 120 h LC_{10} and LC_{50} values were calculated for each test species. In addition, 120 h $LC_{0.01}$ values (lethal concentrations for 0.01% response after 120 h of exposure) were estimated for each test species as short-term safe levels of nitrate.

3. Toxicity to aquatic invertebrates

Nitrate toxicity to aquatic invertebrates increases with increasing nitrate concentrations and exposure times (Camargo and Ward, 1992, 1995; Scott and Crunkilton, 2000; Tsai and Chen, 2002; Alonso and Camargo, 2003). Conversely, nitrate toxicity decreases with increasing body size and water salinity (Camargo and Ward, 1992, 1995; Tsai and Chen, 2002). In general, freshwater invertebrates appear to be more sensitive to nitrate toxicity than marine invertebrates as a probable consequence of the ameliorating effect of water salinity on the tolerance of aquatic invertebrates to nitrate ions. However, early life stages of some marine invertebrates may be very sensitive to nitrate toxicity (Muir et al., 1991).

Camargo and Ward (1992), studying the short-term toxicity of $NaNO_3$ to the Nearctic net-spinning caddisflies *Cheumatopsyche pettiti* and *Hydropsyche occidentalis*, calculated 72, 96 and 120 h LC_{50} values of nitrate-nitrogen for early and last instar larvae of these two hydropsychid species (Table 1). In both cases, early instar larvae appeared to be more sensitive to nitrate toxicity than last instar larvae. Additionally, Camargo and Ward (1995) estimated short-term safe levels (120 h $LC_{0.01}$ values) of 6.7 and 9.6 mg NO_3-N/l for early and last instar larvae of *C. pettiti*, and 4.5 and 6.5 mg NO_3-N/l for early and last instar larvae of *H. occidentalis* (Table 1).

Meade and Watts (1995) examined the toxic effects of $NaNO_3$ on the survival and metabolic rate (oxygen consumption) in juvenile individuals (9–13 mm total length) of the Australian freshwater crayfish *Cherax quadricarinatus*. After 5 days, no mortality was observed in crayfish exposed to a nominal nitrate concentration of 1000 mg NO_3-N/l. Furthermore, no significant difference was observed in oxygen consumption between control (0 mg NO_3-N/l) and experimental (1000 mg NO_3-N/l) individuals (Table 1).

Jensen (1996) studied the uptake and physiological effects of nitrate ions (from $NaNO_3$) in the freshwater crayfish *Astacus astacus*. The nitrate uptake was minor

Table 1
Comparative toxicity of nitrate-nitrogen (NO_3-N) to aquatic invertebrates

Species	Developmental stage	Aquatic medium	Toxicological parameter (mg NO_3-N/l)	References
Cheumatopsyche pettiti	Early instar larvae	Freshwater	191 (72 h LC_{50})	Camargo and Ward (1992)
	Early instar larvae	Freshwater	113.5 (96 h LC_{50})	Camargo and Ward (1992)
	Early instar larvae	Freshwater	106.5 (120 h LC_{50})	Camargo and Ward (1992)
	Early instar larvae	Freshwater	6.7 (120 h $LC_{0.01}$)	Camargo and Ward (1995)
	Last instar larvae	Freshwater	210 (72 h LC_{50})	Camargo and Ward (1992)
	Last instar larvae	Freshwater	165.5 (96 h LC_{50})	Camargo and Ward (1992)
	Last instar larvae	Freshwater	119 (120 h LC_{50})	Camargo and Ward (1992)
	Last instar larvae	Freshwater	9.6 (120 h $LC_{0.01}$)	Camargo and Ward (1995)
Hydropsyche occidentalis	Early instar larvae	Freshwater	148.5 (72 h LC_{50})	Camargo and Ward (1992)
	Early instar larvae	Freshwater	97.3 (96 h LC_{50})	Camargo and Ward (1992)
	Early instar larvae	Freshwater	65.5 (120 h LC_{50})	Camargo and Ward (1992)
	Early instar larvae	Freshwater	4.5 (120 h $LC_{0.01}$)	Camargo and Ward (1995)
	Last instar larvae	Freshwater	183.5 (72 h LC_{50})	Camargo and Ward (1992)
	Last instar larvae	Freshwater	109 (96 h LC_{50})	Camargo and Ward (1992)
	Last instar larvae	Freshwater	77.2 (120 h LC_{50})	Camargo and Ward (1992)
	Last instar larvae	Freshwater	6.5 (120 h $LC_{0.01}$)	Camargo and Ward (1995)
Cherax quadricarinatus	Juveniles (9–13 mm)	Freshwater	1000 (5 d NOAEL)	Meade and Watts (1995)
Astacus astacus	Juveniles	Freshwater	14 (7 d NOAEL)	Jensen (1996)
Ceriodaphnia dubia	Neonates (<24 h)	Freshwater	374 (48 h LC_{50})	Scott and Crunkilton (2000)
	Neonates (<24 h)	Freshwater	7.1–56.5 (7 d NOEC)	Scott and Crunkilton (2000)
	Neonates (<24 h)	Freshwater	14.1–113 (7d LOEC)	Scott and Crunkilton (2000)
Daphnia magna	Neonates (<48 h)	Freshwater	462 (48 h LC_{50})	Scott and Crunkilton (2000)
Potamopyrgus antipodarum	Adults (2.6–3.8 mm)	Freshwater	2009 (24 h LC_{50})	Alonso and Camargo (2003)
	Adults (2.6–3.8 mm)	Freshwater	1128 (24 h LC_{10})	Alonso and Camargo (2003)
	Adults (2.6–3.8 mm)	Freshwater	1297 (48 h LC_{50})	Alonso and Camargo (2003)
	Adults (2.6–3.8 mm)	Freshwater	728 (48 h LC_{10})	Alonso and Camargo (2003)
	Adults (2.6–3.8 mm)	Freshwater	1121 (72 h LC_{50})	Alonso and Camargo (2003)
	Adults (2.6–3.8 mm)	Freshwater	629 (72 h LC_{10})	Alonso and Camargo (2003)
	Adults (2.6–3.8 mm)	Freshwater	1042 (96 h LC_{50})	Alonso and Camargo (2003)
	Adults (2.6–3.8 mm)	Freshwater	585 (96 h LC_{10})	Alonso and Camargo (2003)
	Adults (2.6–3.8 mm)	Freshwater	195 (96 h $LC_{0.01}$)	Alonso and Camargo (2003)
Crassostrea virginica	Juveniles	Seawater	3794 (96 h LC_{50})	Epifano and Srna (1975)
Penaeus spp.	Juveniles	Seawater (28‰)	3400 (48 h LC_{50})	Wickins (1976)
Haliotis tuberculata	Juveniles (12–14.4 g)	Seawater (34‰)	250 (15 d safe level)	Basuyaux and Mathieu (1999)
Paracentrotus lividus	Juveniles (2.7–5.9 g)	Seawater (34‰)	100 (15 d safe level)	Basuyaux and Mathieu (1999)
Penaeus monodon	Protozoea (I stage)	Seawater (32‰)	0.226 (31–37% mortality 40 h)	Muir et al. (1991)
	Protozoea (I stage)	Seawater (32‰)	2.26 (35–43% mortality 40 h)	Muir et al. (1991)
	Protozoea (I stage)	Seawater (32‰)	22.6 (37–58% mortality 40 h)	Muir et al. (1991)
	Juveniles (22–35 mm)	Seawater (15‰)	2876 (48 h LC_{50})	Tsai and Chen (2002)
	Juveniles (22–35 mm)	Seawater (15‰)	1723 (72 h LC_{50})	Tsai and Chen (2002)
	Juveniles (22–35 mm)	Seawater (15‰)	1449 (96 h LC_{50})	Tsai and Chen (2002)
	Juveniles (22–35 mm)	Seawater (25‰)	3894 (48 h LC_{50})	Tsai and Chen (2002)
	Juveniles (22–35 mm)	Seawater (25‰)	2506 (72 h LC_{50})	Tsai and Chen (2002)
	Juveniles (22–35 mm)	Seawater (25‰)	1575 (96 h LC_{50})	Tsai and Chen (2002)
	Juveniles (22–35 mm)	Seawater (35‰)	4970 (48 h LC_{50})	Tsai and Chen (2002)
	Juveniles (22–35 mm)	Seawater (35‰)	3525 (72 h LC_{50})	Tsai and Chen (2002)
	Juveniles (22–35 mm)	Seawater (35‰)	2316 (96 h LC_{50})	Tsai and Chen (2002)
	Juveniles (22–35 mm)	Seawater (15‰)	145 (safe level)	Tsai and Chen (2002)

Table 1 (*continued*)

Species	Developmental stage	Aquatic medium	Toxicological parameter (mg NO_3-N/l)	References
	Juveniles (22–35 mm)	Seawater (25‰)	158 (safe level)	Tsai and Chen (2002)
	Juveniles (22–35 mm)	Seawater (35‰)	232 (safe level)	Tsai and Chen (2002)
Marsupenaeus japonicus	Juveniles (8.3–14.9 g)	Seawater (30‰)	105 (24 h LOEC)	Cheng and Chen (2002)

Values of toxicological parameters (LC_{50}, LC_{10}, $LC_{0.01}$, NOAEL, NOEC, LOEC) at different exposure times for several species of freshwater and marine invertebrates. In all cases, animals were exposed to sodium nitrate ($NaNO_3$).

in crayfish exposed to a nitrate concentration of 14 mg NO_3-N/l for seven days, indicating a low branchial permeability to nitrate (Table 1). This minor uptake of nitrate appeared to be passive, the haemolymph nitrate concentration staying far below the ambient nitrate concentration. In addition, nitrate exposure did not induce significant changes in haemolymph chloride, sodium or potassium concentrations, nor in divalent cations and anions, extracellular osmolality and amino acid concentrations (Table 1).

Scott and Crunkilton (2000), examining the acute toxicity of $NaNO_3$ to neonates of the cladocerans *Ceriodaphnia dubia* (<24 h old) and *Daphnia magna* (<48 h old), estimated 48 h LC_{50} values of 374 and 462 mg NO_3-N/l (Table 1). Moreover, Scott and Crunkilton (2000) reported that the no-observed-effect concentration (NOEC) and the lowest-observed-effect concentration (LOEC), for neonate production in *C. dubia* females after 7 days of exposure to nominal nitrate concentrations ranging from 2.2 to 113 mg NO_3-N/l, ranged from 7.1 to 56.5 mg NO_3-N/l (average NOEC value of 21.3 mg NO_3-N/l) and from 14.1 to 113 mg NO_3-N/l (average LOEC value of 42.6 mg NO_3-N/l) (Table 1).

Alonso and Camargo (2003), conducting laboratory experiments to examine the acute toxicity of $NaNO_3$ to the snail *Potamopyrgus antipodarum*, calculated 24, 48, 72 and 96 h LC_{10} and LC_{50} values (Table 1). This aquatic snail appeared to be relatively tolerant to nitrate toxicity, since an exposure of 4 days to a nitrate concentration as high as 585 mg NO_3-N/l (96 h LC_{10} value) could potentially cause 10% mortality in *P. antipodarum*. Alonso and Camargo (2003) also estimated a short-term safe level (96 h $LC_{0.01}$ value) of 195 mg NO_3-N/l (Table 1).

In toxicity tests with *Eulimnogammarus toletanus*, *Echinogammarus echinosetosus* and *Hydropsyche exocellata*, mortality percentages increased with increasing nitrate concentrations and exposure times. Before death, gammarids showed alterations in normal movement, and net-spinning caddisfly larvae tended to migrate from their retreat and capture nets. This sublethal effect of migration in larvae of *H. exocellata* has been previously reported in larvae of other hydropsychid species exposed to high levels of sodium nitrate (Camargo and Ward, 1992, 1995). The 48, 72, 96 and 120 h LC_{10} and LC_{50} values, and their 95% confidence limits, are presented in Table 2. From a simple comparison of LC_{50} values (Tables 1 and 2), we can see that test gammarid species (in particular *E. echinosetosus*) seem to be more sensitive to nitrate toxicity than other freshwater invertebrates, at least during short-term exposures. Furthermore, a nitrate concentration as low as 8.5 mg NO_3-N/l (120 h LC_{10} value) could potentially cause 10% mortality in *E. echinosetosus*. Short-term safe levels (120 h $LC_{0.01}$ values) of nitrate for *E. toletanus*, *E. echinosetosus* and *H. exocellata* are also presented in Table 2. 120 h $LC_{0.01}$ values for gammarid species were lower than those for hydropsychid species (Tables 1 and 2). The lowest

Table 2
LC_{50}, LC_{10} and $LC_{0.01}$ values for *Eulimnogammarus toletanus*, *Echinogammarus echinosetosus* and *Hydropsyche exocellata*

Toxicological parameter (mg NO_3-N/l)	*E. toletanus*	*E. echinosetosus*	*H. exocellata*
48 h LC_{50}	180.3 (135.6–266.4)	106.9 (86.6–140.5)	592.3 (447.5–813.1)
48 h LC_{10}	47.2 (26.5–66.4)	16.2 (11.5–20.9)	62.7 (35.0–92.8)
72 h LC_{50}	109.2 (84.9–148.1)	74.8 (61.4–96.6)	350.4 (289.6–436.6)
72 h LC_{10}	28.5 (14.9–40.9)	11.4 (7.9–14.7)	40.0 (20.9–60.5)
96 h LC_{50}	85.0 (63.6–116.8)	62.5 (50.6–81.9)	269.5 (227.4–327.8)
96 h LC_{10}	22.2 (10.9–33.0)	9.5 (6.5–12.6)	31.8 (15.7–50.2)
120 h LC_{50}	73.1 (52.6–102.8)	56.2 (44.7–74.5)	230.2 (194.3–279.4)
120 h LC_{10}	19.1 (9.0–29.3)	8.5 (5.7–11.4)	27.8 (13.2–45.2)
120 h $LC_{0.01}$	4.4 (1.6–7.9)	2.8 (1.0–5.2)	11.9 (4.6–20.8)

95% confidence limits are presented in parenthesis.

120 h $LC_{0.01}$ value was for *E. echinosetosus* (2.8 mg NO_3-N/l).

Regarding marine invertebrates, Epifano and Srna (1975), studying the acute toxicity of $NaNO_3$ to juveniles of the American oyster *Crassostrea virginica*, estimated a 96 h LC_{50} value of 3794 mg NO_3-N/l (Table 1). Wickins (1976), examining the acute toxicity of $NaNO_3$ to combined species of penaeid shrimps (*Penaeus aztecus*, *P. japonicus*, *P. occidentalis*, *P. orientalis*, *P. schmitti* and *P. setiferus*), estimated a 48 h LC_{50} value as high as 3400 mg NO_3-N/l in 28‰ seawater (Table 1). Basuyaux and Mathieu (1999), studying the effect of elevated nitrate concentrations on growth of the abalone *Haliotis tuberculata* and the sea urchin *Paracentrotus lividus* during 15 days of exposure, reported maximum safe levels of 100 mg NO_3-N/l for *P. lividus* and 250 mg NO_3-N/l for *H. tuberculata* (Table 1).

Cheng and Chen (2002) found that a nitrate concentration of 105 mg NO_3-N/l caused reduction of oxyhemocyanin and protein in individuals (wet weight of 8.28–14.85 g) of the Kuruma shrimp *Marsupenaeus japonicus* (Table 1). Similarly, Cheng et al. (2002) studied nitrate accumulation (from $NaNO_3$) in tissues of the penaeid shrimp *Penaeus monodon*, and found that nitrate accumulated in muscle, hepatopancreas, foregut, heart, gill, hemolymph, midgut and eyestalk by factors of 0.16, 0.20, 0.26, 0.45, 0.60, 0.61, 0.83 and 1.32 over the ambient nitrate concentration. In addition, Tsai and Chen (2002), examining the acute toxicity of $NaNO_3$ on juveniles (average length 28.4 mm) of *P. monodon* at different salinity levels, reported that 48, 72 and 96 h LC_{50} values were: 2876, 1723 and 1449 mg NO_3-N/l in 15‰ seawater (Table 1); 3894, 2506 and 1575 mg NO_3-N/l in 25‰ seawater (Table 1); and 4970, 3525 and 2316 mg NO_3-N/l in 35‰ seawater (Table 1). Safe levels for rearing *P. monodon* juveniles were estimated to be 145, 158 and 232 mg NO_3-N/l at salinity levels of 15‰, 25‰ and 35‰ (Table 1).

In contrast, Muir et al. (1991) reported much lower levels of nitrate toxicity in *P. monodon*. They studied the tolerance of larvae at the Protozoea I stage (55–60 h after hatching) to $NaNO_3$, and found that significant mortality (31–37%) occurred within 40 h at a nitrate concentration as low as 0.226 mg NO_3-N/l (Table 1). Examination of surviving larvae from nitrate treatments indicated sublethal histopatological changes including vacuolation and shrinkage of the ganglionic neuropiles, and minor muscle fragmentation and shrinkage. At higher nitrate concentrations (2.26 and 22.6 mg NO_3-N/l), larval mortality increased (35–43% and 37–58%; Table 1) and additional tissues were affected: vacuolation and splitting of the hypodermis from the cuticle, and cytoplasmatic vacuolation of cells in the midgut and proventriculus. Because *P. monodon* larvae moulted from Protozoea I to Protozoea II stage during the experimental study, and because *P. monodon* larvae occur naturally in offshore, tropical regions which typically contain extremely low levels of dissolved nitrate (<0.05 mg NO_3-N/l; see Spencer, 1975; Kinne, 1984; Motoh, 1985), Muir et al. (1991) concluded that the relatively great sensitivity of *P. monodon* larvae to nitrate toxicity might be related to ontogeny and natural habitat: on the one hand, it is likely that larvae are more susceptible to nitrate during ecdysis; on the other hand, it is possible that larvae are well adapted to natural conditions (very low nitrate concentrations) and, consequently, are intolerant of elevated nitrate concentrations.

4. Toxicity to fishes

Nitrate toxicity to freshwater and marine fishes increases with increasing nitrate concentrations and exposure times (Trama, 1954; Westin, 1974; Colt and Tchobanoglous, 1976; Rubin and Elmaraghy, 1977; Kincheloe et al., 1979; Brownell, 1980; Tomasso and Carmichael, 1986; Pierce et al., 1993; Scott and Crunkilton, 2000). Furthermore, nitrate toxicity can depend greatly upon the cationic composition of the solution (Dowden and Bennett, 1965). As in the case of aquatic invertebrates, freshwater fishes appear to be more sensitive to nitrate toxicity than marine fishes.

Trama (1954) found that the common bluegill *Lepomis macrochirus* was able to tolerate elevated nitrate levels during short-term exposures: a 96 h LC_{50} value of 1975 mg NO_3-N/l was estimated for this fish species (Table 3). Dowden and Bennett (1965) reported that the 24 h LC_{50} values of $NaNO_3$ and KNO_3 for *L. macrochirus* were 2110 and 761 mg NO_3-N/l (Table 3).

Knepp and Arkin (1973) reported that the channel catfish *Ictalurus punctatus* was able to tolerate a nitrate concentration of 90 mg NO_3-N/l without affecting their growth and feeding activity after an exposure of 164 days (Table 3). Colt and Tchobanoglous (1976), evaluating the short-term toxicity of $NaNO_3$ to fingerlings (50–76 mm total length) of *I. punctatus* at 22, 26 and 30 °C, calculated 96 h LC_{50} values of 1355, 1423 and 1400 mg NO_3-N/l (Table 3). They concluded that the acute toxicity of nitrate to *I. punctatus* was independent of water temperature.

Westin (1974) reported that the 96 h LC_{50} values of nitrate for the rainbow trout *Oncorhynchus mykiss* (*Salmo gairdneri*, previously) and the chinook salmon *Oncorhynchus tshawytscha* were 1355 and 1310 mg NO_3-N/l (Table 3). Stormer et al. (1996) exposed fingerlings of *O. mykiss* to a nitrate concentration of 14 mg NO_3-N/l for 8 days. They found that NO_3^- ions were taken up passively, with plasma concentrations remaining below the ambient nitrate concentration. This limited uptake appeared central to the low toxicity of nitrate, and did not measurably influence electrolyte balance or haematology (Table 3).

Table 3
Comparative toxicity of nitrate-nitrogen (NO_3-N) to fishes

Species	Developmental stage	Aquatic medium	Toxicological parameter (mg NO_3-N/l)	References
Lepomis macrochirus	Fingerlings	Freshwater	1975 (96 h LC_{50})[a]	Trama (1954)
	Fingerlings	Freshwater	2110 (24 h LC_{50})[a]	Dowden and Bennett (1965)
	Fingerlings	Freshwater	761 (24 h LC_{50})[b]	Dowden and Bennett (1965)
Ictalurus punctatus	Fingerlings	Freshwater	90 (164 d NOAEL)[a]	Knepp and Arkin (1973)
	Fingerlings (50–76 mm)	Freshwater (22 °C)	1355 (96 h LC_{50})[a]	Colt and Tchobanoglous (1976)
	Fingerlings (50–76 mm)	Freshwater (26 °C)	1423 (96 h LC_{50})[a]	Colt and Tchobanoglous (1976)
	Fingerlings (50–76 mm)	Freshwater (30 °C)	1400 (96 h LC_{50})[a]	Colt and Tchobanoglous (1976)
Oncorhynchus mykiss	Fingerlings	Freshwater	1355 (96 h LC_{50})[a]	Westin (1974)
	Eggs (anadromous)	Freshwater	1.1 (30 d LOEC)[a]	Kincheloe et al. (1979)
	Fry (anadromous)	Freshwater	4.5 (30 d NOEC)[a]	Kincheloe et al. (1979)
	Eggs (nonanadromous)	Freshwater	1.1 (30 d NOEC)[a]	Kincheloe et al. (1979)
	Eggs (nonanadromous)	Freshwater	2.3 (30 d LOEC)[a]	Kincheloe et al. (1979)
	Fry (nonanadromous)	Freshwater	1.1 (30 d NOEC)[a]	Kincheloe et al. (1979)
	Fry (nonanadromous)	Freshwater	2.3 (30 d LOEC)[a]	Kincheloe et al. (1979)
	Fingerlings	Freshwater	14.0 (8 d NOAEL)[a]	Stormer et al. (1996)
Oncorhynchus tshawytscha	Fingerlings	Freshwater	1310 (96 h LC_{50})[a]	Westin (1974)
	Eggs	Freshwater	4.5 (30 d NOEC)[a]	Kincheloe et al. (1979)
	Fry	Freshwater	2.3 (30 d NOEC)[a]	Kincheloe et al. (1979)
	Fry	Freshwater	4.5 (30 d LOEC)[a]	Kincheloe et al. (1979)
Salmo clarki	Eggs	Freshwater	2.3 (30 d NOEC)[a]	Kincheloe et al. (1979)
	Eggs	Freshwater	4.5 (30 d LOEC)[a]	Kincheloe et al. (1979)
	Fry	Freshwater	4.5 (30 d NOEC)[a]	Kincheloe et al. (1979)
	Fry	Freshwater	7.6 (30 d LOEC)[a]	Kincheloe et al. (1979)
Oncorhynchus kisutch	Eggs	Freshwater	4.5 (30 d NOEC)[a]	Kincheloe et al. (1979)
	Fry	Freshwater	4.5 (30 d NOEC)[a]	Kincheloe et al. (1979)
Poecilia reticulatus	Fry	Freshwater	267 (24 h LC_{50})[b]	Rubin and Elmaraghy (1977)
	Fry	Freshwater	219 (48 h LC_{50})[b]	Rubin and Elmaraghy (1977)
	Fry	Freshwater	199 (72 h LC_{50})[b]	Rubin and Elmaraghy (1977)
	Fry	Freshwater	191 (96 h LC_{50})[b]	Rubin and Elmaraghy (1977)
Micropterus treculi	Fingerlings	Freshwater	1261 (96 h LC_{50})[a]	Tomasso and Carmichael (1986)
Pimephales promelas	Larvae (<8 d)	Freshwater	1010–1607 (96 h LC_{50})[a]	Scott and Crunkilton (2000)
	Larvae (<24 h)	Freshwater	358 (7 d NOEC)[a]	Scott and Crunkilton (2000)
	Larvae (<24 h)	Freshwater	717 (7d LOEC)[a]	Scott and Crunkilton (2000)
Catla catla	Fry (static system)	Freshwater	1565 (24 h LC_{50})[a]	Tilak et al. (2002)
	Fry (flow through system)	Freshwater	1484 (24 h LC_{50})[a]	Tilak et al. (2002)
Lithognathus mormyrus	Fingerlings	Seawater (34‰)	3450 (24 h LC_{50})[a]	Brownell (1980)
Diplodus saegus	Fingerlings	Seawater (34‰)	3560 (24 h LC_{50})[a]	Brownell (1980)
Heteromycteris capensis	Fingerlings	Seawater (34‰)	5050 (24 h LC_{50})[a]	Brownell (1980)
Pomacentrus leucostritus	Fingerlings (59–85 mm)	Seawater (32‰)	>3000 (96 h LC_{50})[a]	Pierce et al. (1993)
Centropristis striata	Fingerlings (106–168 mm)	Seawater (32‰)	2400 (96 h LC_{50})[a]	Pierce et al. (1993)
Trachinotus carolinus	Fingerlings (69–115 mm)	Seawater (32‰)	1000 (96 h LC_{50})[a]	Pierce et al. (1993)
Raja eglanteria	Fingerlings (75–125 mm)	Seawater (32‰)	>960 (96 h LC_{50})[a]	Pierce et al. (1993)
Monocanthus hispidus	Fingerlings (39–55 mm)	Seawater (32‰)	573 (96 h LC_{50})[a]	Pierce et al. (1993)

Values of toxicological parameters (LC_{50}, NOAEL, NOEC, LOEC) at different exposure times for several species of freshwater and marine fishes.

[a] Animals were exposed to sodium nitrate ($NaNO_3$).

[b] Animals were exposed to potassium nitrate (KNO_3).

The first indication that relatively low concentrations of nitrate might be harmful to fish came from Grabda et al. (1974). They reported that fry of rainbow trout, exposed to 5–6 mg NO_3-N/l for several days, displayed increased blood levels of ferrihemoglobin, alterations in the peripheral blood and hematopoietic centres, and liver damage. In addition, Kincheloe et al. (1979), examining the tolerance of several salmonid species to nitrate toxicity after an exposure of 30 days, reported that developing eggs and early fry stages of *O. mykiss*, *O. tshawytscha* and the (Lahontan) cutthroat trout *Salmo clarki* exhibited significant increases in mortality at nitrate concentrations from 1.1 to 4.5 mg NO_3-N/l (Table 3). In the case of the coho salmon *Oncorhynchus kisutch*, eggs and fry were not affected at the highest nitrate concentration of 4.5 mg NO_3-N/l (Table 3). Kincheloe et al. (1979) concluded that a nitrate level as low as 2.0 mg NO_3-N/l in surface waters of low total hardness (<40 mg $CaCO_3$/l) would be expected to limit survival of some salmonid fish populations because of impaired reproductive success.

Rubin and Elmaraghy (1977), after examining the acute toxicity of KNO_3 to guppy (*Poecilia reticulatus*) fry, calculated 24, 48, 72 and 96 h LC_{50} values of 267, 219, 199 and 191 mg NO_3-N/l (Table 3). Tomasso and Carmichael (1986) reported that the 96 h LC_{50} value of nitrate for the Guadalupe bass *Micropterus treculi* was 1261 mg NO_3-N/l (Table 3). Tilak et al. (2002), using static and continuous flow through systems, determined 24 h LC_{50} values of 1565 and 1484 mg NO_3-N/l for the Indian major carp *Catla catla* (Table 3).

Scott and Crunkilton (2000), after conducting laboratory experiments to examine the acute toxicity of $NaNO_3$ to larvae (<8 day old) of the fathead minnow *Pimephales promelas*, found that the 96 h LC_{50} value fell within the range of 1010–1607 mg NO_3-N/l (average LC_{50} value of 1341 mg NO_3-N/l; Table 3). Scott and Crunkilton (2000) also reported that the no-observed-effect concentration (NOEC) and the lowest-observed-effect concentration (LOEC), for the growth of newly hatched larvae (<24 h old) of *P. promelas* after an exposure of 7 days, were 358 and 717 mg NO_3-N/l (Table 3). These larvae were lethargic and exhibited bent spines before death at a nitrate concentration of 717 mg NO_3-N/l.

With regard to marine fishes, Brownell (1980) reported 24 h LC_{50} values (mg NO_3-N/l) in 34‰ seawater of 3450 for *Lithognathus mormyrus*, 3560 for *Diplodus saegus*, and 5050 for *Heteromycteris capensis* (Table 3). Pierce et al. (1993) estimated 96 h LC_{50} values (mg NO_3-N/l) in 32‰ seawater of 573 for the planehead filefish *Monocanthus hispidus*, >960 for the clearnose skate *Raja eglanteria*, 1000 for the Florida pompano *Trachinotus carolinus*, 2400 for the black sea bass *Centropristis striata*, and >3000 for the beaugregory *Pomacentrus leucostritus* (Table 3).

5. Toxicity to amphibians

Current field data suggest that nitrogen fertilizers, such as ammonium nitrate (NH_4NO_3), potassium nitrate (KNO_3) and sodium nitrate ($NaNO_3$), may be contributing (with pesticides) to the decline of amphibian populations in agricultural areas (Wederkinch, 1988; Berger, 1989; Hecnar, 1995; Oldham et al., 1997; Birge et al., 2000). Laboratory studies have shown that the toxicity of nitrate compounds to amphibians increases with increasing nitrate concentrations and exposure times (Baker and Waights, 1993, 1994; Hecnar, 1995; Xu and Oldham, 1997; Marco et al., 1999; Schuytema and Nebeker, 1999a,b,c). The tolerance of amphibians to nitrogen fertilizers may however increase with increasing body size (Schuytema and Nebeker, 1999a,b) and environmental adaptation (Johansson et al., 2001).

Baker and Waights (1993), studying the toxicity of $NaNO_3$ to tadpoles of the common toad *Bufo bufo*, found that these animals exhibited reduced feeding activity, weight loss and decreased survival (84.6% mortality) when exposed for 13 days to a nitrate concentration of 9.1 mg NO_3-N/l (Table 4). Similarly, Baker and Waights (1994), examining the toxicity of $NaNO_3$ to tadpoles of the treefrog *Litoria caerulea*, found that these animals exhibited reduced feeding activity, weight loss and decreased survival (58.0% mortality) when exposed for 16 days to a nitrate concentration of 22.7 mg NO_3-N/l (Table 4).

Hecnar (1995), examining the acute toxicity of NH_4NO_3 to tadpoles of the American toad *Bufo americanus*, the chorus frog *Pseudacris triseriata*, the leopard frog *Rana pipiens* and the green frog *Rana clamitans*, reported 96 h LC_{50} values within the range 13.6–39.3 mg NO_3-N/l (Table 4). Hecnar (1995) also examined the chronic (100 days) toxicity of NH_4NO_3 to these amphibian species, and found that tadpoles of chorus frog and leopard frog exhibited lower survivorship at a nitrate concentration of 10.0 mg NO_3-N/l (Table 4). Signs of anormal behavior and development were similar in acute and chronic experiments: tadpoles swam and fed less vigorously, exhibited swelled and transparent bodies, developed head and digestive-system deformities, and suffered edemas and paralysis before death. Although Hecnar (1995) only considered nitrate toxicity when using ammonium nitrate, the toxicity of H_4NO_3 could be due not only to nitrate but also to ammonia (the unionized form of NH_4^+). Because laboratory conditions during toxicity tests were 7.6 for pH and 20 °C for temperature (Hecnar, 1995), it may be estimated that maximum ammonia levels in acute and chronic exposures were 1.0 and 0.20 mg NH_3/l, respectively. These NH_3 levels are higher than the established safe levels of ammonia for aquatic animals (Alabaster and Lloyd, 1982; US Environmental Protection Agency, 1986)

Table 4
Comparative toxicity of nitrate-nitrogen (NO_3-N) to amphibians

Species	Developmental stage	Toxicological parameter (mg NO_3-N/l)	References
Bufo bufo	Tadpoles	9.1 (84.6% mortality 13 d)[a]	Baker and Waights (1993)
	Tadpoles	384.8 (96 h LC_{50})[c]	Xu and Oldham (1997)
	Tadpoles	369.6 (168 h LC_{50})[c]	Xu and Oldham (1997)
	Tadpoles	22.6 (30 d LOEC)[c]	Xu and Oldham (1997)
Litoria caerulea	Tadpoles	22.7 (58% mortality 16 d)[a]	Baker and Waights (1994)
Bufo americanus	Tadpoles (from Ojibway)	13.6 (96 h LC_{50})[c]	Hecnar (1995)
	Tadpoles (from Harrow)	39.3 (96 h LC_{50})[c]	Hecnar (1995)
	Fertilized eggs	9.0 (NOAEL)[a]	Laposata and Dunson (1998)
Pseudacris triseriata	Tadpoles	17 (96 h LC_{50})[c]	Hecnar (1995)
	Tadpoles	10.0 (100 d LOEC)[c]	Hecnar (1995)
Rana pipiens	Tadpoles	22.6 (96 h LC_{50})[c]	Hecnar (1995)
	Tadpoles	10.0 (100 d LOEC)[c]	Hecnar (1995)
	Larvae	30.0 (NOAEL)[a]	Allran and Karasov (2000)
Rana clamitans	Tadpoles	32.4 (96 h LC_{50})[c]	Hecnar (1995)
Rana sylvatica	Fertilized eggs	9.0 (NOAEL)[a]	Laposata and Dunson (1998)
Rana pretiosa	Newly hatched larvae	16.45 (15 d LC_{50})[b]	Marco et al. (1999)
Ambystoma jeffersonianum	Fertilized eggs	9.0 (NOAEL)[a]	Laposata and Dunson (1998)
Ambystoma maculatum	Fertilized eggs	9.0 (NOAEL)[a]	Laposata and Dunson (1998)
Ambystoma gracile	Newly hatched larvae	23.39 (15 d LC_{50})[b]	Marco et al. (1999)
Pseudacris regilla	Embryos	643 (96 h LC_{50})[a]	Schuytema and Nebeker (1999a)
	Embryos	578 (240 h LC_{50})[a]	Schuytema and Nebeker (1999a)
	Embryos	56.7 (10 d NOAEL)[a]	Schuytema and Nebeker (1999a)
	Tadpoles	1749.8 (96 h LC_{50})[a]	Schuytema and Nebeker (1999b)
	Tadpoles	266.2 (240 h LC_{50})[a]	Schuytema and Nebeker (1999b)
	Tadpoles	30.1 (10 d NOAEL)[a]	Schuytema and Nebeker (1999b)
Xenopus laevis	Embryos	438.4 (120 h LC_{50})[a]	Schuytema and Nebeker (1999a)
	Embryos	24.8 (5 d NOAEL)[a]	Schuytema and Nebeker (1999a)
	Tadpoles	1655.8 (96 h LC_{50})[a]	Schuytema and Nebeker (1999b)
	Tadpoles	1236.2 (240 h LC_{50})[a]	Schuytema and Nebeker (1999b)
	Tadpoles	65.6 (10 d NOAEL)[a]	Schuytema and Nebeker (1999b)
	Tadpoles	66.0 (40 d NOAEL)[a]	Sullivan and Spence (2003)
Rana aurora	Embryos	636.3 (16 d LC_{50})[a]	Schuytema and Nebeker (1999c)
	Embryos	29.0 (16 d NOAEL)[a]	Schuytema and Nebeker (1999c)
Rana temporaria	Larvae (northern Scandinavia)	5.0 (8 w LOEC)[a]	Johansson et al. (2001)
	Larvae (southern Scandinavia)	5.0 (10 w NOEC)[a]	Johansson et al. (2001)

Values of toxicological parameters (LC_{50}, NOAEL, NOEC, LOEC) at different exposure times for several species of amphibians.
[a] Animals were exposed to sodium nitrate ($NaNO_3$).
[b] Animals were exposed to potassium nitrate (KNO_3).
[c] Animals were exposed to ammonium nitrate (NH_4NO_3).

and, consequently, we can assume that, in addition to nitrate toxicity, some toxicity might have been caused by NH_3.

Xu and Oldham (1997) examined lethal and sublethal effects of NH_4NO_3 on tadpoles of the common toad *Bufo bufo*. They reported 96 and 168 h LC_{50} values of 384.8 and 369.6 mg NO_3-N/l (Table 4). Tadpoles exhibited certain unusual behavior (either undirected swimming movements or twisting laterally), remaining static unless disturbed. In a subchronic exposure (30 days) at a nitrate concentration of 22.6 mg NO_3-N/l, there was 21% mortality and a further 17% failed to resorb their tails at metamorphosis (Table 4). As in the case of Hecnar (1995), Xu and Oldham (1997) only considered nitrate toxicity when using ammonium nitrate. Because laboratory conditions during toxicity tests were 7.4 for pH and 27.5 °C for temperature (Xu and Oldham, 1997), it may be estimated that maximum ammonia levels in acute and subchronic exposures were 9.2 and 0.51 mg NH_3/l, respectively. In consequence, we can assume that, in addition to nitrate toxicity, some toxicity might have been caused by NH_3.

Laposata and Dunson (1998) exposed fertilized eggs of the wood frog *Rana sylvatica*, the American toad *Bufo americanus*, the Jefferson salamander *Ambystoma jeffersonianum* and the spotted salamander *A. maculatum* to a nitrate concentration of 9.0 mg NO_3-N/l (from $NaNO_3$). They found that there was no significant difference in the hatching success with regard to control eggs in any of the four amphibian species (Table 4).

Marco et al. (1999), studying the effects of KNO_3 on several amphibian species indigenous of the Pacific Northwest (USA), found that newly hatched larvae of *Rana pretiosa* and *Ambystoma gracile*, exposed for 15 days to nitrate concentrations within the range 0.78–25.0 mg NO_3-N/l, reduced feeding activity, swam less vigorously, suffered edemas and paralysis, and eventually died. They calculated 15 d LC_{50} values of 16.45 mg NO_3-N/l for *R. pretiosa* and 23.39 mg NO_3-N/l for *A. gracile* (Table 4).

Schuytema and Nebeker (1999a,b,c) examined the toxic effects of $NaNO_3$ on embryos and tadpoles of the Pacific treefrog *Pseudacris regilla*, the African clawed frog *Xenopus laevis* and the red-legged frog *Rana aurora*. Schuytema and Nebeker (1999a) calculated 96 and 240 h LC_{50} values (mg NO_3-N/l) of 643 and 578 for embryos of *P. regilla*, and a 120 h LC_{50} value of 438.4 mg NO_3-N/l for embryos of *X. laevis* (Table 4). NOAEL (no observed adverse effect level) values, based on reduced growth (wet weight) of embryos, were 56.7 mg NO_3-N/l for *P. regilla* and 24.8 mg NO_3-N/l for *X. laevis* (Table 4). Schuytema and Nebeker (1999b) calculated 96 and 240 h LC_{50} values (mg NO_3-N/l) of 1749.8 and 266.2 for tadpoles of *P. regilla*, and 1655.8 and 1236.2 for tadpoles of *X. laevis* (Table 4). NOAEL values, based on reduced growth (wet weight) of tadpoles, were 30.1 mg NO_3-N/l for *P. regilla* and 65.6 mg NO_3-N/l for *X. laevis* (Table 4). Lastly, Schuytema and Nebeker (1999c) reported, for embryos of *R. aurora*, a 16 d LC_{50} value of 636.3 mg NO_3-N/l and a NOAEL value (based on length) of 29 mg NO_3-N/l (Table 4).

Allran and Karasov (2000), studying $NaNO_3$ toxicity to larvae of the leopard frog *Rana pipiens* exposed from first-feeding stage through metamorphosis, found that a nominal nitrate concentration of 30 mg NO_3-N/l had no significant effect on development rate, percent metamorphosis, time to metamorphosis, percent survival, mass at metamorphosis, or hematocrit. Although the growth of larvae was slowed, this growth inhibition was not biologically important when compared with natural variation in the environment.

Johansson et al. (2001), after conducting a comparison of nitrate tolerance between different populations of the common frog *Rana temporaria*, reported that a nitrate concentration of 5.0 mg NO_3-N/l might reduce the growth rate and metamorphic size in larvae (stage 25) from the northern parts of Scandinavia (less well adapted to cope with high environmental nitrate levels), but not in larvae from the southern parts of Scandinavia (better adapted to cope with high environmental nitrate levels) (Table 4). They concluded that increased anthropogenic nitrate pollution could impact more the northern than the southern Swedish common frog populations.

Sullivan and Spence (2003), examining $NaNO_3$ toxicity to tadpoles of the African clawed frog *Xenopus laevis*, found that a nominal nitrate concentration of 66 mg NO_3-N/l had no significant effect on the survival and metamorphosis of these animals during a exposure of 40 days (Table 4).

6. Concluding remarks

It should be evident, from data presented in this review, that nitrate discharges from anthropogenic sources may result in a serious ecological risk for certain aquatic animals. Indeed, as a consequence of nitrogen pollution, nitrate concentrations in surface waters can actually exceed values of 25 mg NO_3-N/l (Bogardi et al., 1991; Gleick, 1993; Ministry of Agriculture, Fisheries and Food, 1993). Because a nitrate concentration of 10 mg NO_3-N/l (USA federal maximum level for drinking water) can adversely affect, at least during long-term exposures, freshwater invertebrates (*Eulimnogammarus toletanus*, *Echinogammarus echinosetosus*, *Cheumatopsyche pettiti*, *Hydropsyche occidentalis*), fishes (*Oncorhynchus mykiss*, *Oncorhynchus tshawytscha*, *Salmo clarki*), and amphibians (*Pseudacris triseriata*, *Rana pipiens*, *Rana temporaria*, *Bufo bufo*) (Tables 1–4), safe levels below this nitrate concentration are therefore recommended to protect these sensitive freshwater animals from nitrate pollution. Furthermore, following Kincheloe et al.'s (1979) recommendation, we consider that a maximum level of 2.0 mg NO_3-N/l would be appropriate for protecting the most sensitive freshwater species. In the case of marine invertebrates and fishes, we consider that the proposed maximum level of 20 mg NO_3-N/l for culturing seawater animals (Spotte, 1979) may in general be acceptable. However, early developmental stages of some marine invertebrates (Muir et al., 1991), that are well adapted to low nitrate concentrations, may be so susceptible to nitrate as sensitive freshwater invertebrates (Tables 1 and 2).

In spite of this proposal of preliminary safe levels of nitrate for aquatic animals, further studies, especially long-term studies, are required to check and improve the recommended safe levels. Additional studies must also examine the influence of water hardness, salinity, pH, temperature, dissolved oxygen and other chemical compounds on nitrate toxicity to aquatic animals. Lastly, because aquatic organisms are subjected to biotic interactions (e.g., competition, predation, parasitism) and diseases, field and laboratory studies should be carried out to assess the effects of elevated nitrate concentrations on these ecological and evolutionary agents of natural selection.

Acknowledgement

Funds for this research came from Madrid Community (research project 07M/0065/2001) and Ministry of Science and Technology (research project REN2001-1008/HID) in Spain. The University of Alcala provided logistical support. Comments by two anonymous reviewers are gratefully acknowledged. A. Alonso was supported by a pre-doctoral grant from the Council of Castilla-La Mancha. Part of this work was presented at the 5th Iberian and 2nd Iberoamerican Congress on Environmental Contamination and Toxicology, held in Porto (Portugal) from 22 to 24 September of 2003.

References

Alabaster, J.S., Lloyd, R., 1982. Water Quality Criteria for Freshwater Fish, 2nd ed. Butterworths, London.

Allran, J.W., Karasov, W.H., 2000. Effects of atrazine and nitrate on northern leopard frog (*Rana pipiens*) larvae exposed in the laboratory from posthatch through metamorphosis. Environ. Toxicol. Chem. 19, 2850–2855.

Alonso, A., Camargo, J.A., 2003. Short-term toxicity of ammonia, nitrite, and nitrate to the aquatic snail *Potamopyrgus antipodarum* (Hydrobiidae, Mollusca). Bull. Environ. Contam. Toxicol. 70, 1006–1012.

Amdur, M.O., Dull, J., Klassen, E.D. (Eds.), 1991. Casarett and Doull's Toxicology, 4th ed. Pergamon Press, New York.

Austin, B., 1988. Marine Microbiology. Cambridge University Press, Cambridge.

Baker, J., Waights, V., 1993. The effect of sodium nitrate on the growth and survival of toad tadpoles (*Bufo bufo*) in the laboratory. Herpetol. J. 3, 147–148.

Baker, J., Waights, V., 1994. The effects of nitrate on tadpoles of the tree frog (*Litoria caerulea*). Herpetol. J. 4, 106–107.

Basuyaux, O., Mathieu, M., 1999. Inorganic nitrogen and its effect on growth of the abalone *Haliotis tuberculata* Linnaeus and the sea urchin *Paracentrotus lividus* Lamarck. Aquaculture 174, 95–107.

Berger, L., 1989. Disappearance of amphibian larvae in the agricultural landscape. Ecol. Int. Bull. 17, 65–73.

Birge, W.J., Westerman, A.G., Spromberg, J.A., 2000. Comparative toxicology and risk assessment of amphibians. In: Sparling, D.W., Linder, G., Bishop, C.A. (Eds.), Ecotoxicology of Amphibians and Reptiles. SETAC, Pensacola (USA), pp. 727–792.

Bogardi, I., Kuzelka, R.D., Ennega, W.G., 1991. Nitrate Contamination: Exposure, Consequence, and Control. NATO ASI Series G: Ecological Sciences, vol. 30. Springer-Verlag, New York.

Bouchard, D.C., Williams, M.K., Surampall, R.Y., 1992. Nitrate contamination of groundwater: sources and potential health effects. J. Am. Water Works Assoc. 84, 85–90.

Boumans, L., Fraters, D., van Drecht, G., 2004. Nitrate leaching by atmospheric deposition to upper groundwater in the sandy regions of the Netherlands in 1990. Environ. Monit. Assess. 93, 1–15.

Brownell, C.L., 1980. Water quality requirements for first-feeding in marine fish larvae. I. Ammonia, nitrite and nitrate. J. Exp. Mar. Biol. Ecol. 44, 269–283.

Camargo, J.A., Ward, J.V., 1992. Short-term toxicity of sodium nitrate ($NaNO_3$) to non-target freshwater invertebrates. Chemosphere 24, 23–28.

Camargo, J.A., Ward, J.V., 1995. Nitrate (NO_3-N) toxicity to aquatic life: a proposal of safe concentrations for two species of Nearctic freshwater invertebrates. Chemosphere 31, 3211–3216.

Carpenter, S.R., Caraco, N.F., Correll, D.L., Howarth, R.W., Sharpley, A.N., Smith, V.H., 1998. Nonpoint pollution of surface waters with phosphorus and nitrogen. Ecol. Appl. 8, 559–568.

Cheng, S.-Y., Chen, J.-C., 2002. Study on the oxyhemocyanin, deoxyhemocyanin, oxygen affinity and acid–base balance of *Marsupenaeus japonicus* following exposure to combined elevated nitrite and nitrate. Aquatic Toxicol. 61, 181–193.

Cheng, S.-Y., Tsai, S.-J., Chen, J.-C., 2002. Accumulation of nitrate in the tissues of *Penaeus monodon* following elevated ambient nitrate exposure after different time periods. Aquatic Toxicol. 56, 133–146.

Colt, J., Tchobanoglous, G., 1976. Evaluation of the short-term toxicity of nitrogenous compounds to channel catfish, *Ictalurus punctatus*. Aquaculture 8, 209–221.

Conrad, J.J., 1990. Nitrate Pollution and Politics. Aldershot, Avebury.

De Graaf, F., 1964. Maintenance problems in large public aquaria. Arch. Neerland. Zool. 16, 142–143.

Dowden, B.F., Bennett, H.J., 1965. Toxicity of selected chemicals to certain animals. J. Wat. Pollut. Control Fed. 37, 1308–1317.

Epifano, C.E., Srna, R.F., 1975. Toxicity of ammonia, nitrite ion, nitrate ion, and orthophosphate to *Mercenaria mercenaria* and *Crassostrea virginica*. Mar. Biol. 33, 241–246.

Galloway, J.N., Cowling, E.B., 2002. Reactive nitrogen and the world: 200 years of change. Ambio 31, 64–71.

Gleick, P.H. (Ed.), 1993. Water in Crisis: A Guide to the World's Fresh Water Resources. Oxford University Press, New York.

Goodrich, J.A., Lykins Jr., B.W., Clark, R.M., 1991. Drinking water from agriculturally contaminated groundwater. J. Environ. Qual. 20, 707–717.

Grabda, E., Einszporn-Orecka, T., Felinska, C., Zbanysek, R., 1974. Experimental methemoglobinemia in trout. Acta Ichthyol. Piscat. 4, 43–71.

Harte, J., Holdren, C., Schneider, R., Shirley, C., 1991. Toxics A to Z: A Guide to Everyday Pollution Hazards. University of California Press, Berkeley.

Hecnar, S.J., 1995. Acute and chronic toxicity of ammonium nitrate fertilizer to amphibians from southern Ontario. Environ. Toxicol. Chem. 14, 2131–2137.

Jensen, F.B., 1996. Uptake, elimination and effects of nitrite and nitrate in freshwater crayfish (*Astacus astacus*). Aquatic Toxicol. 34, 95–104.

Johansson, M., Räsänen, K., Merilä, J., 2001. Comparison of nitrate tolerance between different populations of the common frog, *Rana temporaria*. Aquatic Toxicol. 54, 1–14.

Kincheloe, J.W., Wedemeyer, G.A., Koch, D.L., 1979. Tolerance of developing salmonid eggs and fry to nitrate exposure. Bull. Environ. Contam. Toxicol. 23, 575–578.

Kinne, O. (Ed.), 1984. Marine Ecology. John Wiley and Sons, London.

Knepp, G.L., Arkin, G.F., 1973. Ammonia toxicity levels and nitrate tolerance of channel catfish (*Ictalurus punctatus*). Prog. Fish-Cult. 35, 221–224.

Laposata, M.M., Dunson, W.A., 1998. Effects of boron and nitrate on hatching success of amphibian eggs. Arch. Environ. Contam. Toxicol. 35, 615–619.

Lee, G., Ellersieck, M.R., Mayer, F.L., Krause, G.F., 1995. Predicting chronic lethality of chemicals to fishes from acute toxicity test data: multifactor probit analysis. Environ. Toxicol. Chem. 14, 345–349.

Marco, A., Quilchano, C., Blaustein, A.R., 1999. Sensitivity to nitrate and nitrite in pond-breeding amphibians from the Pacific Northwest, USA. Environ. Toxicol. Chem. 18, 2836–2839.

Meade, M.E., Watts, S.A., 1995. Toxicity of ammonia, nitrite, and nitrate to juvenile Australian crayfish, *Cherax quadricarinatus*. J. Shellfish Res. 14, 341–346.

Meybeck, M., Chapman, D.V., Helmer, R., 1989. Global Freshwater Quality: A First Assessment, World Health Organization and United Nations Environmental Program. Blackwell, Oxford.

Ministry of Agriculture, Fisheries and Food, 1993. Solving the Nitrate Problem. Ref. PB 1092. MAFF Publications, London.

Moomaw, W.R., 2002. Energy, industry and nitrogen: strategies for decreasing reactive nitrogen emissions. Ambio 31, 184–189.

Motoh, H., 1985. Biology and ecology of *Penaeus monodon*. In: Taki, Y., Primavera, J.H., Jose A.L. (Eds.). Proceedings of the First International Conference on the Culture of Penaeid Prawns/Shrimps. Aquaculture Department, Southeast Asian Fisheries Development Center, Iloilo (Philippines), pp. 27–36.

Muir, P.R., Sutton, D.C., Owens, L., 1991. Nitrate toxicity to *Penaeus monodon* protozoea. Mar. Biol. 108, 67–71.

Nash, L., 1993. Water quality and health. In: Gleik, P.H. (Ed.), Water in Crisis: A Guide to the World's Fresh Water Resources. Oxford University Press, New York, pp. 25–39.

Nixon, S.W., 1995. Coastal marine eutrophication: a definition, social causes, and future concerns. Ophelia 41, 199–219.

Oldham, R.S., Lathan, D.M., Hilton-Brown, D., Towns, M., Cooke, A.S., Burn, A., 1997. The effect of ammonium nitrate fertilizer on frog (*Rana temporaria*) survival. Agric. Ecosys. Environ. 61, 69–74.

Pierce, R.H., Weeks, J.M., Prappas, J.M., 1993. Nitrate toxicity to five species of marine fish. J. World Aquacult. Soc. 24, 105–107.

Rabalais, N.N., 2002. Nitrogen in aquatic ecosystems. Ambio 31, 102–112.

Rubin, A.J., Elmaraghy, G.A., 1977. Studies on the toxicity of ammonia, nitrate and their mixture to guppy fry. Water Res. 11, 927–935.

Russo, R.C., 1985. Ammonia, nitrite and nitrate. In: Rand, G.M., Petrocelli, S.R. (Eds.), Fundamentals of Aquatic Toxicology. Hemisphere Publishing Corporation, Washington DC, pp. 455–471.

Sandstedt, C.A., 1990. Nitrates: Sources and their Effects upon Humans and Livestock. American University, Washington, DC.

Schuytema, G.S., Nebeker, A.V., 1999a. Comparative effects of ammonium and nitrate compounds on Pacific treefrog and African clawed frog embryos. Arch. Environ. Contam. Toxicol. 36, 200–206.

Schuytema, G.S., Nebeker, A.V., 1999b. Comparative toxicity of ammonium and nitrate compounds to Pacific treefrog and African clawed frog tadpoles. Environ. Toxicol. Chem. 18, 2251–2257.

Schuytema, G.S., Nebeker, A.V., 1999c. Effects of ammonium nitrate, sodium nitrate, and urea on red-legged frogs, Pacific treefrogs, and African clawed frogs. Bull. Environ. Contam. Toxicol. 63, 357–364.

Scott, G., Crunkilton, R.L., 2000. Acute and chronic toxicity of nitrate to fathead minnows (*Pimephales promelas*), *Ceriodaphnia dubia* and *Daphnia magna*. Environ. Toxicol. Chem. 19, 2918–2922.

Sharma, B., Ahlert, R.C., 1977. Nitrification and nitrogen removal. Water Res. 11, 897–925.

Smith, V.H., 2003. Eutrophication of freshwater and coastal marine ecosystems: a global problem. Environ. Sci. Pollut. R. 10, 126–139.

Smith, V.H., Tilman, G.D., Nekola, J.C., 1999. Eutrophication: impacts of excess nutrient inputs on freshwater, marine, and terrestrial ecosystems. Environ. Pollut. 100, 179–196.

Spencer, C., 1975. The micronutrient elements. In: Riley, J.P., Skirrow, G. (Eds.), Chemical Oceanography, vol. II, second ed. Academic Press, London.

Spotte, S., 1979. Fish and Invertebrate Culture: Water Management in Closed System. John Wiley and Sons, New York.

Steinheimer, T.R., Scoggin, K.D., Kramer, L.A., 1998. Agricultural chemical movement through a field-sized watershed in Iowa: subsurface hydrology and distribution of nitrate in groundwater. Environ. Sci. Tech. 32, 1039–1047.

Stormer, J., Jensen, F.B., Rankin, J.C., 1996. Uptake of nitrite, nitrate, and bromide in rainbow trout, *Oncorhynchus mykiss*: effects on ionic balance. Can. J. Fish. Aquat. Sci. 53, 1943–1950.

Stumm, W., Morgan, J.J., 1996. Aquatic Chemistry, third ed. John Wiley and Sons, New York.

Sullivan, K.B., Spence, K.M., 2003. Effects of sublethal concentrations of atrazine and nitrate on metamorphosis of the african clawed frog. Environ. Toxicol. Chem. 22, 627–635.

Tilak, K.S., Lakshmi, S.J., Susan, T.A., 2002. The toxicity of ammonia, nitrite and nitrate to the fish, *Catla catla* (Hamilton). J. Environ. Biol. 23, 147–149.

Tomasso, J.R., Carmichael, G.J., 1986. Acute toxicity of ammonia, nitrite and nitrate to the Guadalupe bass, *Micropterus treculi*. Bull. Environ. Contam. Toxicol. 36, 866–870.

Trama, F.B., 1954. The acute toxicity of some common salts of sodium, potassium and calcium to the common bluegill (*Lepomis macrochirus* Rafinesque). Proc. Acad. Nat. Sci., Philadelphia 106, 185–205.

Tsai, S.-J., Chen, J.-C., 2002. Acute toxicity of nitrate on *Penaeus monodon* juveniles at different salinity levels. Aquaculture 213, 163–170.

US Environmental Protection Agency, 1986. Quality Criteria for Water. EPA 440/5-86-001, Washington, DC.

US Environmental Protection Agency, 1991. Multifactor Probit Analysis. EPA 600/X-91-101, Washington, DC.

Vitousek, P.M., Aber, J.D., Howarth, R.W., Likens, G.E., Matson, P.A., Schindler, D.W., Schlesinger, W.H., Tilman, D.G., 1997. Human alteration of the global nitrogen cycle: sources and consequences. Ecol. Appl. 7, 737–750.

Wederkinch, E., 1988. Population size, migration barriers, and other features of *Rana dalmatina* populations near Køge, Zealand, Denmark. Memo. Soc. Fauna Flora Fenn. 64, 101–103.

Welch, E.B., Lindell, T., 1992. Ecological Effects of Wastewater, 2nd ed. Chapman and Hall, London.

Westin, D.T., 1974. Nitrate and nitrite toxicity to salmonid fishes. Prog. Fish-Cult. 36, 86–89.

Wetzel, R.G., 2001. Limnology, 3rd ed. Academic Press, New York.

Wickins, J.F., 1976. The tolerance of warm-water shrimps to recirculated water. Aquaculture 9, 19–37.

Wolfe, A.H., Patz, J.A., 2002. Reactive nitrogen and human health: acute and long-term implications. Ambio 31, 120–125.

Xu, Q., Oldham, R.S., 1997. Lethal and sublethal effects of nitrogen fertilizer ammonium nitrate in common toad (*Bufo bufo*) tadpoles. Arch. Environ. Contam. Toxicol. 32, 298–303.

Dr. Julio A. Camargo teaches ecotoxicology, limnology, and evolutionary ecology at the University of Alcala. His research interest concerns aquatic ecology and ecotoxicology, with the primary goal of understanding and conserving aquatic ecosystems.

Alvaro Alonso is a PhD student at the University of Alcala. His research interest concerns aquatic ecology and ecotoxicology, particularly the effects of nitrogen compounds on riverine communities.

Annabella Salamanca is a PhD student at the University of Alcala. Her research interest concerns aquatic ecology and ecotoxicology, particularly the effects of inorganic nutrients on lacustrine communities.

Attachment 6

Value of Salmon Fishery

SOUTHWICK ASSOCIATES
FISH AND WILDLIFE ECONOMICS AND STATISTICS

August 9, 2012

Mr. Richard Pool
Golden Gate Salmon Association
1370 Auto Center Drive
Petaluma, CA 94952

Dear Mr. Pool:

We looked into updating our previous economic impact estimates associated with recreational salmon fishing in California. Please accept this letter as a presentation of the best estimates available along with a description of the methodology and data sources used.

As described below, our data sources were the U.S. Department of Commerce's National Marine Fisheries Service and the California Department of Fish and Game. We sought to update our 2006 estimates to 2010/2011, but the data necessary to estimate the economic impacts of salmon harvests were not available for these years. Therefore, we will stick with the 2006 estimates which are summarized as:

	Sales Impact[1]	Jobs Impact
Total 2004-2006 Commercial and Recreational Activity	$1.4 billion	23,000
Estimate of the Future Returns if Salmon were Restored to their Full Potential	$5.7 billion	94,000

Commercial Fisheries:

To estimate the potential impacts from a restored commercial salmon fishery, average landings for 2004 and 2005 were used as they represent rather steady harvests. Harvests began to decrease rapidly in 2006 down to practically nothing in 2008 and 2009. In 2004 and 2005, salmon on average represented 12% of the total value of California's commercial fisheries landings. Assuming the mark-ups and value added from salmon processing, distribution and retail were the same as for all other commercial fisheries in California as reported by NOAA, then the economic impacts for commercial salmon harvests at 'normal' 2004 and 2005 levels would have been:

[1] Sales impacts = Sales by California businesses.

P.O. Box 6435 Fernandina Beach Florida 32035
904-277-9765 904-261-1145 (fax)
Rob@southwickassociates.com www.southwickassociates.com

Sales impacts (total sales that occur in the CA economy): $1.17 billion
Income impacts (salaries/wages/benefits, sole proprietor earnings): $608 million
Employment (full and part time): 21,480

All data for these commercial salmon impacts were not produced by Southwick Associates but instead were obtained directly from the National Marine Fisheries Service's (NMFS) annual report *Fisheries Economics of the United States, 2006* (Economic and Sociocultural Analysis Division, National Marine Fisheries Service, NOAA, Silver Spring, MD. 2007). The 2006 impacts provided in my estimates were not changed in any way as reported by NMFS. This source provided information on the number of fish harvested, the dollars per pound received by fishermen, and the economic impacts of these dollars, including the multiplier effects. These data were produced by NOAA Fisheries economists and statisticians. The commercial impact calculations were produced in a straightforward fashion. We assumed the impacts per fish would be the same as in 2006, and simply matched the impacts per pound with the total pounds harvested in 2004-05.

Looking back, salmon landings in 2004 and 2005 (6.06 million lbs) were well under historic landings from previous decades. If salmon can be re-established to historic levels, annual commercial harvests could realistically reach 25 million pounds. At such levels, assuming no change in the economic impacts per pound of fish landed from current levels, economic impacts from commercial salmon landings could reach:

Sales impacts (total sales that occur in the CA economy): $4.83 billion
Income impacts (salaries/wages/benefits, sole proprietor earnings): $2.51 billion
Employment (full and part time): 88,672

Recreational Fisheries:

Recreational impacts were produced using several sources. The number of salmon fishing trips in California in 2006 was measured by the California Department of Fish and Game via its *California Recreational Fisheries Survey* (CRFS). This same data source reported the total number of recreational fishing trips for salmon and all other species combined. With these data, we estimated the percentage of all California marine recreational fishing attributable to salmon.

The economic impacts generated by each marine sportfishing trip in California were also obtained directly from the National Marine Fisheries Service's (NMFS) *Fisheries Economics of the United States, 2006.* Just like the commercial fisheries data, the impact information including multipliers obtained from NMFS were not changed in any way. We matched the two data sources to estimate impacts attributable to recreational salmon fishing.

Economic impacts were not available specifically for salmon fishing. Instead, they were only available by fishing method such as fishing from a boat or from shore. Considering most salmon fishing is done from boats, we first determined the impacts generated by California marine anglers using boats. Next, an adjustment was made to account only for boat trips targeting salmon. According to CRFS, in 2004 and 2005, 14.82% of California's marine boat fishing trips targeted salmon. Assuming the economic impacts per trip are consistent regardless of species targeted, the economic impacts associated with salmon trips would have been expected to average approximately:

Total sales impacts (total sales that occur in the CA economy): $204.8 million
Value-added impacts (salaries/wages/benefits, proprietors & property income, dividends, excise & sales taxes): $107.2 million
Employment (full and part time): 1,345

Just like the commercial fisheries analysis presented earlier, the recreational analysis is based on 2004-2005 data. A healthy, well-managed fishery would reasonably be expected to allow for additional recreational fishing trips. If recreational fisheries could also increase by the same amount as commercial landings as described above (4.13 times greater than 2004-05 levels), and assuming the impacts for the additional trips remain consistent, the economic impacts could reach up to:

Total sales impacts (total sales that occur in the CA economy): $845.8 million
Value-added impacts (salaries/wages/benefits, proprietors & property income, dividends, excise & sales taxes): $442.7 million
Employment (full and part time): 5,555

Combined Commercial and Recreational Impacts:

By adding the result for the commercial and recreational analyses above, California had nearly 23,000 jobs related to salmon, and nearly $1.4 billion in economic activity:

SOUTHWICK ASSOCIATES
FISH AND WILDLIFE ECONOMICS AND STATISTICS

	Sales Impacts	Jobs:
Commercial	$ 1.170 billion	21,480
Recreational	$ 205 million	1,345
	--------------	---------------
Total	$1.375 billion	22,825

If historical salmon harvests could be reached again, the impacts would increase significantly:

	Sales Impacts	Jobs:
Commercial	$ 4.830 billion	88,672
Recreational	$ 846 million	5,555
	--------------	---------------
Total	$5.676 billion	94,227

We expect the former 2004-05 levels to be more realistic, but the latter results may hopefully encourage California to strive for greater habitat restoration goals.

If you have any questions, please do not hesitate to let me know. Thank you.

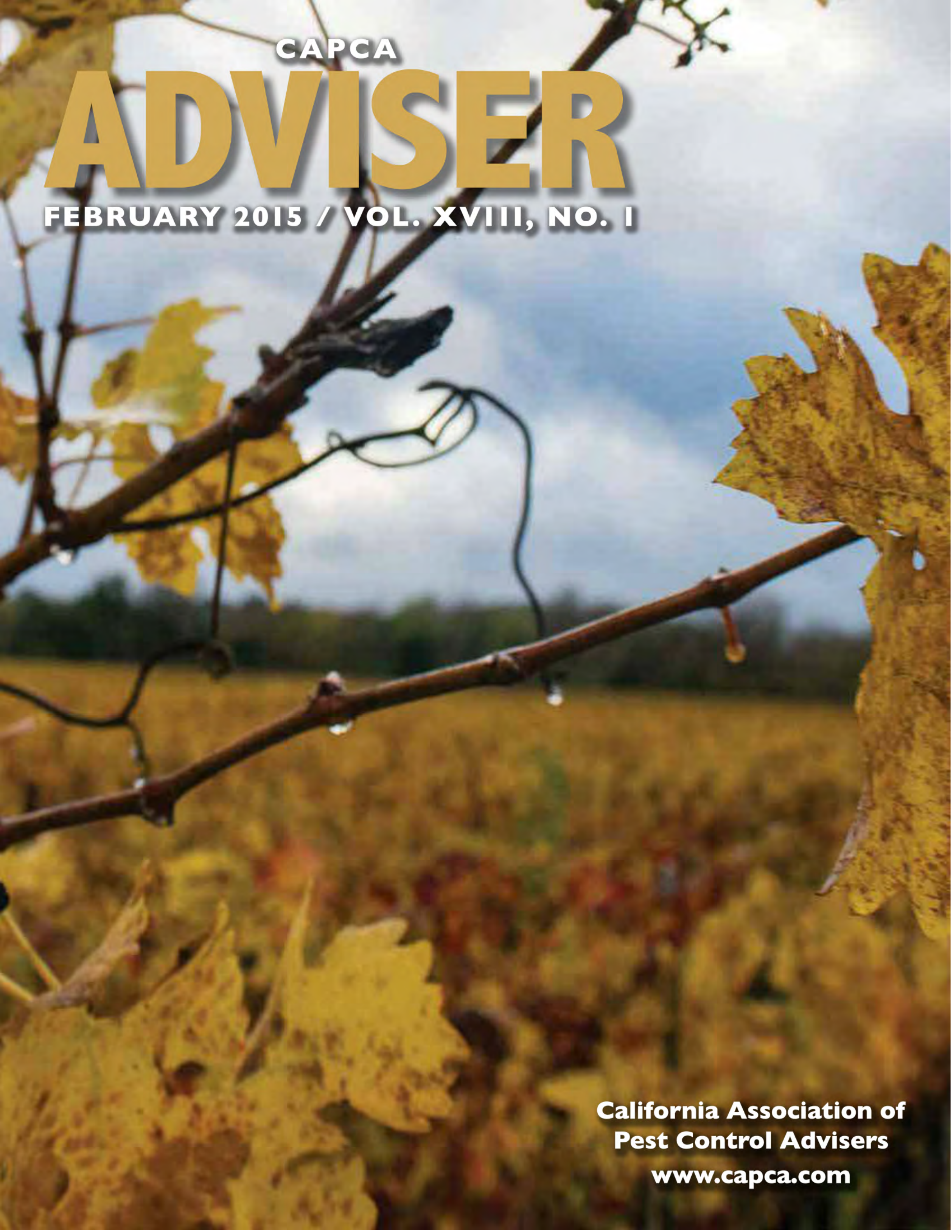
Sincerely,

Rob Southwick ,
President

P.O. Box 6435 Fernandina Beach Florida 32035
904-277-9765 904-261-1145 (fax)
Rob@southwickassociates.com www.southwickassociates.com

Attachment 7

2015 RWQCB Article in Crop Advisor Magazine



CAPCA ADVISER

FEBRUARY 2015 / VOL. XVIII, NO. 1

California Association of Pest Control Advisers

www.capca.com

date information that impacts PCAs. I think you will find the article very informative. In my mind, there is a very clear message in the information. Agriculture has done a good job of in reducing the pesticide levels for chlorpyrifos and Diazinon. The CCRWQCB says "this is a very encouraging sign, and shows that changes in grower practices and usage can have relatively rapid effects on the environmental conditions". However, the use of Pyrethroids has dramatically increased and so has the toxicity findings. Now, Pyrethroids have become a priority of the CCRWQCB and DPR.

Current Issues Related to Pesticide Toxicity in Central Coast Surface Waters

Karen Worcester, CCRWQCB

Looking forward to the Central Coast's Ag Order renewal, growers and PCAs can expect a reassessment of test organisms and other monitoring requirements used to evaluate toxicity levels in response to shifting chemical usage. Toxicity testing is a tool used by water quality monitoring programs to test for the presence of pesticides or other toxicants in stream water or sediments. Test organisms, such as *Ceriodaphnia* - the water flea, are placed in water collected from a site to determine whether those organisms can survive, grow and/or reproduce. Toxicity can be found associated with pesticides in both urban and agricultural areas.

Many past research studies as well as data from the ag industry's Central Coast Cooperative Monitoring Program for Agriculture (CMP) have shown extensive toxicity in agricultural areas, particularly in the lower Salinas and Santa Maria valleys, due to the organophosphate (OP) pesticides chlorpyrifos and diazinon. More recently, DPR changes to label uses associated with these products, and the Water Board's tiering requirements that went into effect in 2012, have resulted in growers considering the use of other chemical products. Growers have changed their patterns of usage, and more recent trends associated with these chemicals are downward, in terms of total pounds applied, water column concentrations, and water toxicity levels. For example, the CMP reports that their average measured chlorpyrifos concentrations have dropped below the water quality target of 25 ng/L; prior to 2009, averages were more than twice the target concentration. Pounds applied have fallen dramatically. For example, in the Pajaro watershed, approximately 10,000 pounds of these chemicals were applied in 2000, compared to well under 1,000 pounds in 2012. This is a very encouraging sign, and shows that changes in grower practices and usage can have relatively rapid effects on environmental conditions. It also shows that our environmental monitoring programs, in particular the CMP, are set up in a way that can effectively detect these changes.

However, we cannot declare the toxicity story a victory. As applications of chlorpyrifos and diazinon have decreased, they have been replaced with other pesticides. This is true in both urban and agricultural areas. In fact, recent statewide monitoring through the Stream Pollution Trends program (SPOT, part of the State Water Board's Surface Water Ambient Monitoring Program) has shown significant sediment toxicity and the pyrethroid pesticide, bifenthrin, associated with major urban areas. There has been a marked increase in applications of pyrethroid pesticides in the Central Coast. For example, in Monterey County bifenthrin applications increased over five-fold from 2000 to 2012. Unlike pesticides like diazinon, which are highly water soluble, pyrethroids tend to adhere to sediments; pyrethroids are more toxic to the sediment dwelling amphipod, *Hyalella*, than they are to the water flea. This means that toxicity associated with these chemicals is more likely to show up in sediment toxicity tests than it is in the standard water test using the water flea. Indeed, a large number of agricultural sites in the lower Salinas and Santa Maria areas are highly toxic in sediment toxicity tests using *Hyalella*. Sediment toxicity data does not show improving trends, and chemical tests show that many sites (including the majority tested in the lower Salinas and Santa Maria areas) exceed chemical concentrations expected to cause toxicity, in some cases by over 15-fold. Though chlorpyrifos remains a small component of this toxicity signal, the majority comes from pyrethroids, with bifenthrin, l-cyhalothrin and cypermethrin being major contributors.

Research toxicologists have performed testing for *Hyalella* toxicity in water, side-by-side with the water flea, in an area of the Central Coast that was historically quite toxic to water fleas due to OP pesticides. They have seen little or no toxicity to water fleas and non-detectable levels of chlorpyrifos and diazinon, but found that water was toxic to *Hyalella*, and the toxicity was attributable to pyrethroid pesticides. The SPOT program has shown that there is a negative correlation between pyrethroid pesticides and stream community health; higher concentrations of pyrethroids are associated with poorer benthic community scores.

Neonicitinoid pesticide use is also on the rise, particularly for imidicloprid. Neonicitinoids are persistent, highly leachable, and toxic to a wide range of invertebrate species and thus represent a high risk for causing toxicity in surface waters. Imidicloprid is currently a pesticide of concern in investigations related to honey bee hive failure. In addition to this concern, the Department of Pesticide Regulation has detected imidicloprid widely (89% of samples) in surface waters of the lower Salinas, Santa Maria and Imperial valleys. In this study, 19% of all samples exceeded the U.S. EPA's toxicity benchmark value, and 40% exceeded this value in the Santa Maria valley. While the water flea is highly sensitive to organophosphate pesticides and the amphipod *Hyalella* is sensitive to pyrethroids, other test species more related to the fly and bee groups, called chironomids, are sensitive to neonicitinoids. Testing by DPR and U.C. Davis being conducted this year will help us understand more about toxicity associated with imidicloprid, but it is clearly a pesticide that carries a high risk for water toxicity and one that growers should use with particular care.

While there have been improvements in the concentrations of diazinon and chlorpyrifos in the water column and associated toxicity to the water flea, it is important that growers and PCAs be aware that the problem is not yet solved; rather, it has morphed in response to new and different chemicals that are still causing toxicity to the environment. Toxicity is still pervasive and detections of pesticides in waterways are still common and problematic. It is as important as ever for growers and PCAs to implement practices that will minimize the discharge of sediment and irrigation water and associated pesticides to our waterways.

Irrigated Lands Regulatory Program

Central Valley Regional Water Quality Control Board

– by Joe Karkoski, Chief, Irrigated Lands Regulatory Program, CVRWQCB

In the prior article about the Central Valley Regional Water Quality Control Board's new regulations, I provided an overview of the new waste discharge requirements (WDRs) adopted by the board. One of the significant drivers of those new regulations is concern about discharges to groundwater from irrigated cropland. A recent report produced by UC Davis, *"Addressing Nitrate in California's Drinking Water"* (*http://groundwaternitrate.ucdavis.edu/*) identified animal manure and chemical fertilizers from cropland as the most significant sources of nitrate in groundwater in the Tulare Lake Basin and Salinas Valley (estimated at over 95% of the total nitrate load).

At elevated levels, nitrate poses the greatest risk to pregnant women and infants – the maximum contaminant limit (MCL) is 10 parts per million, nitrate as nitrogen. Many economically disadvantaged residents of rural communities cannot afford to treat their drinking water or obtain supplies that are not contaminated. Although the water board recognizes the immediate need to assist these communities in obtaining clean drinking water, the Central Valley Regional Water Quality Control Board is also working with the agricultural community to begin reducing the loading of nitrate to our groundwater aquifers.

The Central Valley Regional Water Quality Control Board included two primary tools in its recently adopted WDRs to address the discharge of nitrate to groundwater: 1) requiring growers to develop nitrogen management plans with the goal of minimizing the excess application of nitrogen relative to crop consumption; and 2) requiring coalitions to conduct studies – referred to as a "management practices evaluation program" – to determine which suite of management practices under which conditions are protective of groundwater quality.

All growers must prepare a nitrogen management plan, but only growers in designated high vulnerability areas must have their plans certified and report annually on their previous year's nitrogen use. The high vulnerability areas are identified in Groundwater Quality Assessment Reports prepared by each coalition and approved by the board's Executive Officer. Central Valley Water Board staff has worked with the agricultural community to develop a nitrogen management plan template to assist growers in complying with this requirement of the WDRs. Staff anticipates the final version of the template being available by the end of December 2014.

The nitrogen management plans can be certified in several different ways. One of the approved certifiers is Certified Crop Advisors (CCAs) who have a specific nitrogen management certification. The University of California, Division of Agriculture and Natural Resources, has developed a training program for CCAs to receive specialized nitrogen management plan training (*http://ciwr.ucanr.edu/NitrogenManagement/*) that qualifies those CCAs to be approved certifiers. A grower self-certification training program is also being developed.

One of the key challenges that have been identified is ensuring there are enough qualified certifiers to assist growers with their nitrogen management plans. Since PCAs often assist growers in other aspects of their farming operations, PCAs who have not already done so,

Attachment 8

Creative Solutions to Improve Water Quality, 7/11/2012, from VegetableGrower.com

July 11, 2012

Creative Solutions to Improve Water Quality

Email Print Facebook Google LinkedIn Twitter

Eveh the best managed irrigation systems can be a source of runoff that can transport pesticides to downstream surface water bodies. Overhead sprinkler pipes frequently have leaks that contribute to runoff as the soil becomes saturated. Furrow irrigation also results in tail water because water applied to the top of a field usually does not uniformly advance down the furrows due to differences in slope or soil texture.

The Latest


Cucurbits
January 8, 2017
13 of the Latest Watermelon Varieties [s…


Grapes
January 6, 2017
Meet Wendy Brannen, New Executive Direct…


Apples & Pears
January 5, 2017
Produce Veteran Tapped as New York Apple…


Grapes
January 5, 2017
There are Many Factors Affecting Table G…


Crop Protection
January 5, 2017
Labor, Efficiency, and the Future of Wee…

Crop Protection

Consequently, growers generally collect furrow runoff water in a tail ditch at the lower end of their fields. In irrigation districts where flood irrigation is widely used, tail water returns may be reused for irrigation of farms located further downstream, or used to support aquatic habitat in rivers, creeks, or wetlands.

Pesticides carried in agricultural runoff potentially damage aquatic organisms. Several methods of treating runoff on farms do offer promise for reducing potential pesticide toxicity in surface water. With stricter water quality regulations being implemented in California, many growers are giving these practices a try.

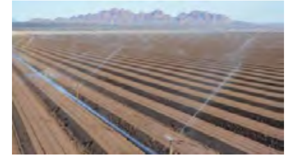
Successful Settlement

Collecting runoff in retention basins or sediment traps can potentially settle out a large fraction of pesticides attached to suspended sediments, such as pyrethroids. The success of these settling practices depends on the water chemistry, basin dimensions, and treatment time. Finely suspended particles will require more time to settle than larger particles. Also, sediments may drop out faster in water with naturally higher concentrations of divalent cations, such as calcium and magnesium.

Sediment traps are designed for removing large-sized particles in runoff that settle out quickly when the flow rate of the runoff slows. Traps are designed for short residence time (less than 30 minutes) and are usually shallow basins that can be easily cleaned out as they fill with sediment. Retention basins are designed to hold a sufficient volume of runoff to provide several days of residence time so that fine sediments can settle to the bottom. The longer residence time also provides time for pesticides to break down.

The Role Of Polymers

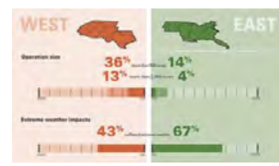
The use of polymers is another practice that can be used to treat pesticides that strongly bind to sediments in runoff. Adding anionic polyacrylamide (PAM) to irrigation water can greatly reduce sediment loads in runoff (Fig. 1). Past research has demonstrated that pyrethroid concentrations were reduced by more than 90% in both furrow and sprinkler induced runoff by adding low concentrations (5 ppm) of PAM to the irrigation water. Liquid formulations of PAM can be injected into pressurized irrigation systems, while granular dry PAM can be added directly to furrow water.


January 5, 2017
Scientists Aim to Improve Nitrogen, Wat…


Vegetables
January 5, 2017
Reduce Soil Compaction for Improved Pla…


Apples & Pears
January 5, 2017
Traditional Varieties Still the Focus of…


Berries
January 4, 2017
Growers Say it's the Best of Times…



Vegetables
January 4, 2017
West vs. East: How Growers Differ from O…

Vegetables
January 4, 2017
The Disappearing Workforce: Vegetable Gr…


Vegetables
January 4, 2017
How Politics Will Impact Vegetable Growe…

Farm Management
January 4, 2017

While polymers may help with pesticides that bind to sediments, they do not provide much benefit for pesticides that are very soluble.

CSIRO, the Australian federal research agency, has developed an enzyme product which can be added directly to runoff water and breakdown organophosphate pesticides such as chlorpyrifos and diazinon to non-toxic metabolites. Although preliminary trials in California have shown that the product is very effective, it is not widely available yet and may initially be expensive to use.

Other Ways To Reduce Toxins

Vegetated waterways, vegetated treatment systems, and constructed wetlands, are other means of treating pesticides in runoff (Fig. 2). These practices have varying levels of success in reducing the concentration of toxins, depending on the type and concentration of pesticides, residence time of the water, and composition of plant species. If optimized, the physical and chemical processes that occur in vegetated treatment systems can be effective in metabolizing pesticides. In most cases where vegetated practices have been successful, the residence time of the water was at least several days. A multi-day residence period may require a large treatment area depending on the volume of runoff.

In the absence of the ability to treat runoff, finding ways to dispose of tail water on a farm may be the next cheapest solution. A common practice on the Central Coast was to capture tail water in retention ponds at the low end of the ranch and reuse the water for pre-irrigations and germination of crops, as well as dust abatement of roads.

Unfortunately, because of food safety concerns on farms where leafy greens are produced, reusing tail water is usually not permitted by produce buyers. In this situation, land may need to be set aside for disposing of captured runoff. Runoff can be diverted to pastures or grassed buffer areas between fields and roadways or ditches.

The Use Of Vegetation

Another option is to develop a vegetated water way for both treating and disposing of runoff. By widening and grading a drainage ditch to a shallow slope, and vegetating it with grasses, drip lines can be used to apply runoff water to the sides of the ditch

California Snowpack Below Average –…

Crop Protection
January 4, 2017
New Potato Insecticide/Fungicide Seed Tr…

Berries
January 4, 2017
Input Needed from Strawberry Growers, In…

Vegetables
January 4, 2017
Common Purslane Needs Diligence to Conqu…

Grapes
January 4, 2017
Grape Growers Say Season Affected by Wea…

Nuts
January 3, 2017
Despite Some Pricing Concerns, Nut Growe…

(Fig. 3). The grasses are able to take up much of the applied water to meet transpiration needs, and excess water flowing down the sides has more time to interact with the vegetation than water applied directly to the bottom of the ditch.

As one can imagine from the solutions outlined, many possible methods could be used for mitigating pesticides in irrigation runoff. Unfortunately, most of these practices can increase costs for farmers either through capital investments in irrigation equipment, more intensive management of existing irrigation systems, or costs associated with treatment and disposal methods.

Growers have always been able to find creative solutions to meet economic challenges. With clear and reasonable targets for water quality, I am optimistic that growers can achieve improved water quality in the upcoming years.

Attachment 9

Environmental Fate of Imidacloprid

Environmental Fate of Imidacloprid

Revised by Scott Wagner
Environmental Monitoring Branch
Department of Pesticide Regulation
1001 I Street
Sacramento, CA 95812-4015
September 1, 2016

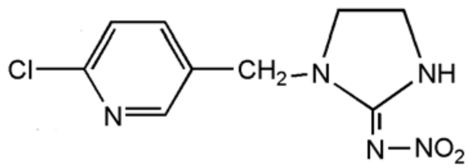
1. Introduction

Imidacloprid is the largest selling insecticide in the world (Simon-Delso et al., 2015). Synthesized by Shinzo Kagabu in 1985, this neonicotinoid insecticide was initially manufactured by Bayer CropScience, but has been off patent since 2006 (Tomizawa and Casida, 2011; Kagabu, 1985). While it is used in both urban and agricultural settings, its largest use is in the agricultural sector. Imidacloprid, like the other neonicotinoids, is a systemic insecticide—it is absorbed by the plant at either the roots or leaves and is translocated throughout the plant. Imidacloprid is also found in veterinary and consumer household products (Simon-Delso et al., 2015). Seed treatment is an especially popular method of imidacloprid application in agriculture since the growing plant is protected from pests by incorporating the insecticide as it grows. The application of neonicotinoids as seed treatments were originally marketed as more environmentally friendly than previous generations of insecticides because of the reduced need for foliar applications (Van Dijk et al., 2013). When piercing and sucking pests like aphids feed on treated plants or treated animals, they ingest the insecticide or are exposed via direct contact following foliar application. Neonicotinoids act by modulating post-synaptic nicotinic acetylcholine receptors (nAChRs), thereby disrupting action potential transmission and ultimately leading to death of the exposed organism (Simon-Delso et al., 2015). Imidacloprid is highly water soluble and is relatively stable in the environment. Imidacloprid and other neonicotinoids have come under scrutiny in the last few years as suspects in pollinator bee colony losses associated with colony collapse disorder (CCD). As such, academia, industry, and regulatory agencies have recently conducted extensive reviews of imidacloprid and neonicotinoids to address the role of these insecticides in CCD (USEPA, 2016; Simon-Delso et al., 2015). In this paper, we update the 2000 and 2006 California Department of Pesticide Regulation reviews and discuss recent findings on imidacloprid's effects on nontarget organisms and its environmental fate (Bacey, 2000; Fossen, 2006).

2. Chemistry

Imidacloprid is a chloronicotinyl nitroguanidine insecticide (Fig. 1). It is a solid at room temperature. Among the neonicotinoids, imidacloprid is grouped with those containing a nitro group (along with clothianidin, nitenpyram, thiamethoxam, and dinotefuran) whereas thiacloprid and acetamiprid are grouped separately as those containing a cyano group (Pisa et al., 2015). Given its low log K_{ow} and high water solubility, imidacloprid is not expected to bind to soils. The physical-chemical properties of imidacloprid are presented in Table 1.

Fig. 1. Molecular Structure:



Chemical Formula: $C_9H_{10}ClN_5O_2$

Table 1. Physical and chemical properties of imidacloprid. All data were submitted in approved studies and obtained from the Pesticide Chemistry Database (California Department of Pesticide Regulation, internal database).

Molecular weight	255.7
Water solubility	514 mg/L (20ºC @ pH 7)
Vapor pressure	1.00 x 10^{-7} mmHg (20ºC)
Hydrolysis half-life	>30 days (25ºC @ pH 7)
Aqueous photolysis half-life	<2 hours (24ºC @ pH 7)
Anaerobic half-life	27.1 days
Aerobic half-life	997 days
Soil photolysis half-life	38.9 days
Field dissipation half-life	26.5–229 days
Henry's constant	6.5 x 10^{-11} atm m^3/mole
(20ºC) Octanol-water coefficient (log K_{ow})	3.7
Soil adsorption coefficient:	
K_d	0.956–4.18
K_{oc}	132–310

3. Chemodynamics

3.1 Soil

Imidacloprid is introduced into soil through direct application or diffusion from treated seeds (Mullins, 1993). Degradation in soil is dependent on characteristics such as soil texture, organic matter content, pH, temperature, sunlight exposure, and sunlight intensity for the region. Imidacloprid is not expected to bind to soils given its high water solubility and low adsorption coefficient (K_d). The US EPA modeled 14 turf insecticides and found that imidacloprid had the highest leaching potential among the modeled insecticides (USEPA, 1993). When sorption was studied in Minnesota-sourced soils, Cox et al. (1997) found that sorption increased with organic carbon content in all soils and at all concentrations tested (0.05, 1.5, 25, and 250 μg/L). The predominant factor influencing sorption to soil was found to be soil organic matter (Liu et al., 2006). Thus, leaching of imidacloprid to groundwater through soil may be expected in low organic matter soils. The calculated half-life ($t_{1/2}$) with initial imidacloprid concentration of 50 mg/kg under standard laboratory conditions (25 °C, 60% field moisture capacity and darkness) in red brown earth–Natrixeralf soil (1.2 % organic carbon) collected from suburban Adelaide, Australia ranged from 100 to 1,230 days (Baskaran, 1999). Imidacloprid has a shorter half-life when applied to field with cover crops ($t_{1/2}$=48 days) compared to fields without ($t_{1/2}$ = 190 days) (Scholz et al., 1992). In soil, another study found that imidacloprid could be taken up by plants in tandem with natural degradation processes such that concentrations in soil rapidly decrease over time (Horwood, 2007). Studying degradation rates of various termiticides in soil *in situ,* Horwood (2007) found that "products may degrade more rapidly *in situ* than indicated by laboratory experiments." Taken together, these varying values and ranges suggest that persistence of imidacloprid in soil is highly dependent on field and environmental conditions like soil type, organic matter content, clay content, and emergent vegetation.

3.2 Water

Contamination of surface water can occur during and following many of the methods of application. Dust can settle into surface water following drilling of dressed seeds, spray droplets can drift into nearby water, runoff from treated fields can be contaminated, coated seeds can leach into soil water and ground water, and systemically treated plants can decompose and reintegrate the insecticide back into the soil and soil water (Kreutzweiser et al, 2007). Detections of imidacloprid in surface water (described below) have increased as sales and use have increased. Given the physico-chemical properties of imidacloprid, contamination of groundwater is also possible. Groundwater contamination is likely through similar routes as surface water contamination, yet is a larger concern through seed treatment since the pesticide is placed under the soil surface upon initial treatment. In fact, imidacloprid has a Groundwater Ubiquity Score (GUS) leaching potential index of 3.76, which is classified as high (Bonmatin et al., 2015).

3.3 Air

Imidacloprid has low volatility given its low vapor pressure (1.00×10^{-7} mmHg) and Henry's law constant (6.5×10^{-11} atm m^3/mol). Given the properties of the insecticide, the Air Monitoring Network of CDPR (California Department of Pesticide Regulation) does not monitor for imidacloprid. If imidacloprid is ever present in the air, it will likely be for a brief period following spray application. Another possibility is contaminated, volatilized dust from abrasion and dispersion from mechanical blowers on seed sowing machines during planting of treated seeds (Bonmatin et al., 2015). In this scenario, mechanical abrasion associated with planting coated seeds using a mechanical planter could loosen some of the pesticide coating on treated seeds and the blower on the planter would subsequently disperse the particulate pesticide coating into the air (Greatti et al., 2003), ultimately landing on the soil where it may be incorporated or transported to surface or groundwater.

4. Environmental Degradation

4.1 Biotic

Phugare et al., (2013) reported that imidacloprid degraded up to 78% within 7 days at 30 °C using the bacteria *Klebsiella pneumoniae* strain BCH1. A soil degradation study performed in a laboratory setting (25 °C, 60% field moisture capacity and darkness) found that imidacloprid degraded via first-order kinetics (Baskaran et al., 1999). The 24-month long study found that 37–40% of applied imidacloprid degraded in the red brown earth–Natrixeralf soil. Here, soil moisture content had little to no effect on the rate of imidacloprid degradation. Another study found that in the absence of light, soil degradation half-lives varied between 130 and 160 days (Tisler et al., 2009).

4.2 Abiotic

Hydrolysis

Hydrolysis of imidacloprid is dependent on pH, with increases in alkalinity corresponding to increases in the rate of degradation (Zheng and Liu, 1999). Water with low or neutral pH (pH=3, 5, or 7, respectively) slowly degrades imidacloprid, with one study reporting 1.5% of the pesticide degraded after 3 months (Zheng and Liu, 1999). In pH 9 water, however, original concentrations of imidacloprid decreased by 20% after 3 months. Furthermore, at pH 10.80 and 11.80, the hydrolysis data fit a first-order kinetics equation, with degradation at the higher pH occurring more rapidly. Liu et al., (2006) compared photodegradation and hydrolysis in the dark with intermittent shaking in a 20 mg/L clay-free solution and clay suspension and found that hydrolysis occurred more slowly than photodegradation due to the higher activation energy required by hydrolysis. Zheng and Liu (1999) also reported detection of only one main hydrolysis product, 1-[(6-chloro-3-pyridinyl)methyl]-2-imidazolidone (imidacloprid urea)—a finding also confirmed by Liu et al., (2006).

Photolysis

Imidacloprid degrades via aqueous photolysis following a first-order reaction rate in a matter of hours, with a reported half-life of 43 minutes in HPLC grade water (Wamhoff and Schneider, 1999). Moza et al. (1998) reported that 90% of imidacloprid in aqueous solution (deionized water) degrades after being irradiated (290 nm) for 4 hours - with a half-life of 1.2 hours. More importantly, degradation of the insecticide in this study did not occur when the aqueous solution was kept in the dark. Using GC-MS, Liu et al. (2006) detected similar photoproducts as Moza et al. (1998) (Fig. 2).

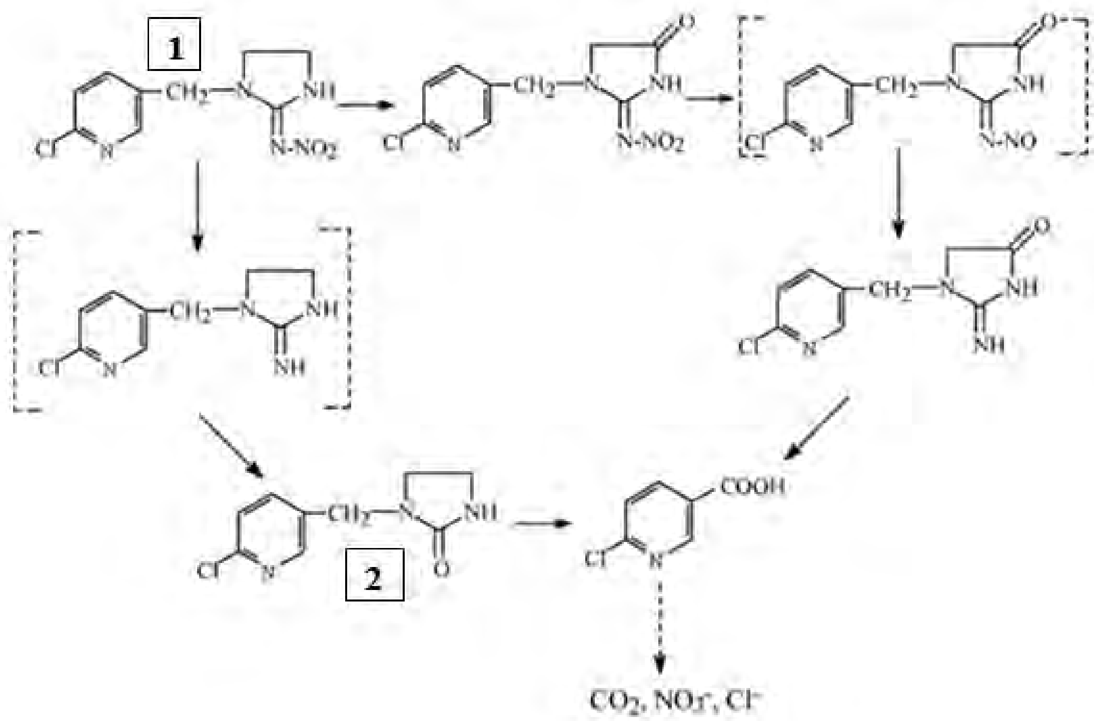


Fig. 2: Proposed pathway for photolysis of imidacloprid in water, adopted from Liu et al. (2006). Dashed brackets represent degradate intermediates. Compound 2, imidacloprid-urea, was the most abundant degradate from the parent imidacloprid, compound 1.

4.3 Use and Detections

Imidacloprid monitoring data, including detections, in California surface water are available beginning in 2000 in the CDPR Surface Water Database (SURF). Unfortunately, there is no data on imidacloprid in the CDPR SURF database for 2006–2009. In 2005, there were 9 detections of imidacloprid (52.9% of the 17 samples analyzed) in California surface water (according to the CDPR SURF Database), but none of the detections exceeded the US EPA chronic invertebrate aquatic life benchmark of 1.05 µg/L (US EPA 2015). However, in 2010, 32 detections (37.2% of the 86 samples analyzed) were recorded with one US EPA benchmark exceedance. By 2014, there were 82 detections of imidacloprid (71.3% of the 115 analyzed samples) in surface water by studies cited in the CDPR SURF database (CDPR, 2016). The newest data for 2015 contain 113 analyzed samples with 78 detections (69.0% detection frequency) and 16 benchmark exceedances. Of the 841 samples stored in the SURF database since records for imidacloprid monitoring became available in 2000, 65 were above the US EPA benchmark (CDPR SURF Database).

Reported use in agricultural settings in California derived from the Pesticide Use Reporting (PUR) database, which does not include seed treatments, in 2014 (the year for which the most-current data is available) totaled 374,061 pounds (CDPR, 2015). The top three sites that were treated with imidacloprid were wine grapes, structural pest control, and grapes (Table 2). Reported imidacloprid agricultural use more than tripled from 2003 to 2013 (Fig. 3). This trend comes as no surprise given the previously reported sales and use figures for imidacloprid (Simon-Delso et al., 2015). Linear regressions were performed between existing benchmark exceedance frequency and imidacloprid use data from PUR for the same year and one year prior. Analysis with PUR of one year prior (i.e., use one year prior chosen to capture all runoff into surface water from previous applications) can give insight into exceedances of the current year and their correlation to product applications from the previous year. The results suggest that benchmark exceedance is correlated with PUR (correlation coefficient=0.708 and 0.859 for PUR of the same year and one year prior, respectively) (Fig. 4, Fig. 5).

Table 2. Top ten use sites for imidacloprid in California in 2014, according to PUR

Site	Pounds imidacloprid
Grape, Wine	56,254
Structural Pest Control	44,093
Grape	36,939
Tomato, Processing	35,344
Orange	22,160
Broccoli	15,970
Landscape Maintenance	15,084
Tangerine	14,244
Pistachio	12,643
Lettuce, Head	12,471

A monitoring study focusing on three agricultural regions in California in 2010 identified the potential for imidacloprid to move off-site and contaminate surface water (Starner and Goh, 2012). This study reported that 14 water samples (19% of total samples) exceeded the US EPA chronic invertebrate aquatic life benchmark. Pursuant to section 13145(d) of the California Food and Agricultural Code, imidacloprid is on the CDPR Groundwater Protection List—a list of pesticides identified by CDPR that have the potential to pollute groundwater. However, a 2009 study by CDPR that monitored for imidacloprid in groundwater did not detect it in any of the 34 wells sampled (Bergin and Nordmark, 2009).

In a study focused on urban surface water monitoring in Southern California, imidacloprid was detected in 73% of the 40 samples analyzed during the July 1, 2014–June 30, 2015 sampling period (Budd, 2016). The Northern California branch of the same monitoring program detected imidacloprid during the same sampling period in 6 of the 36 samples analyzed (Ensminger, 2016).

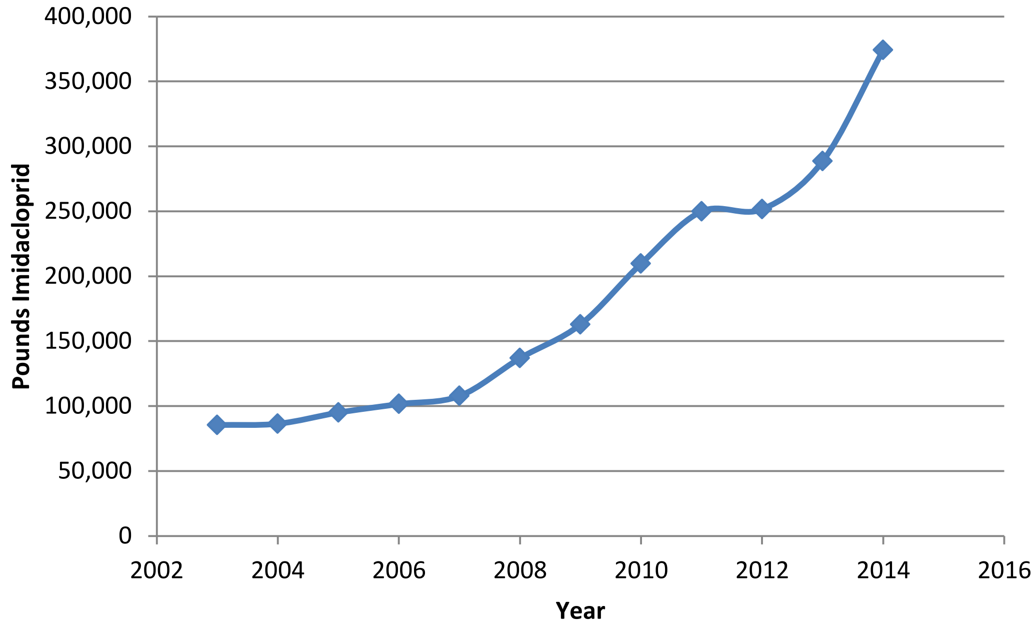


Fig. 3. Imidacloprid pesticide use, California, 2003–2014.

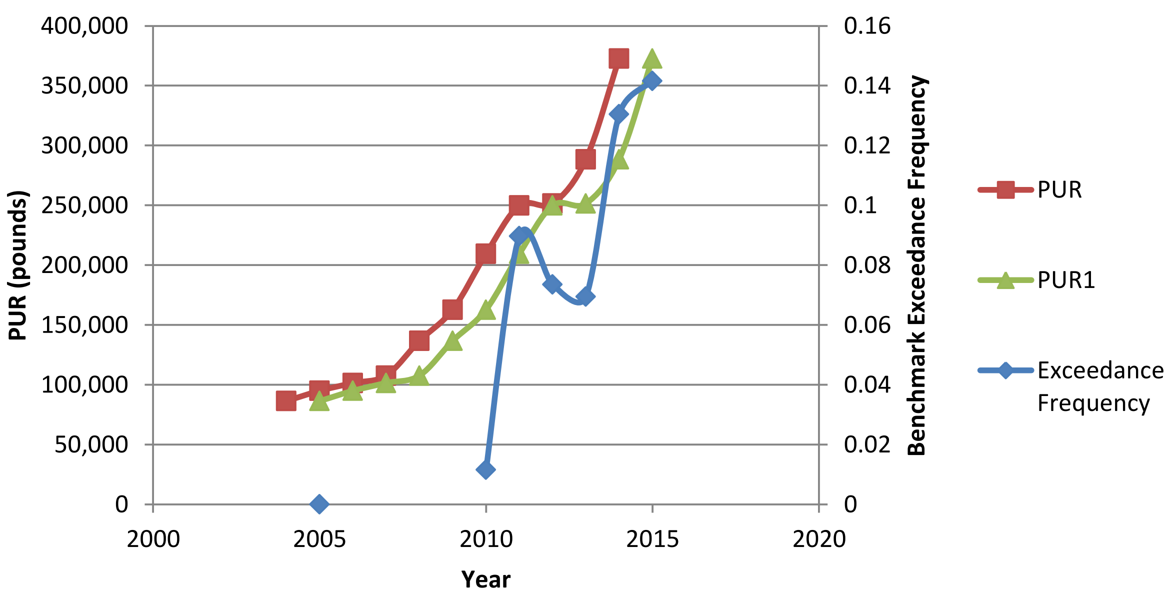


Fig. 4. Imidacloprid pesticide use (PUR) and use one year prior (PUR1) versus chronic aquatic life benchmark exceedance frequency.

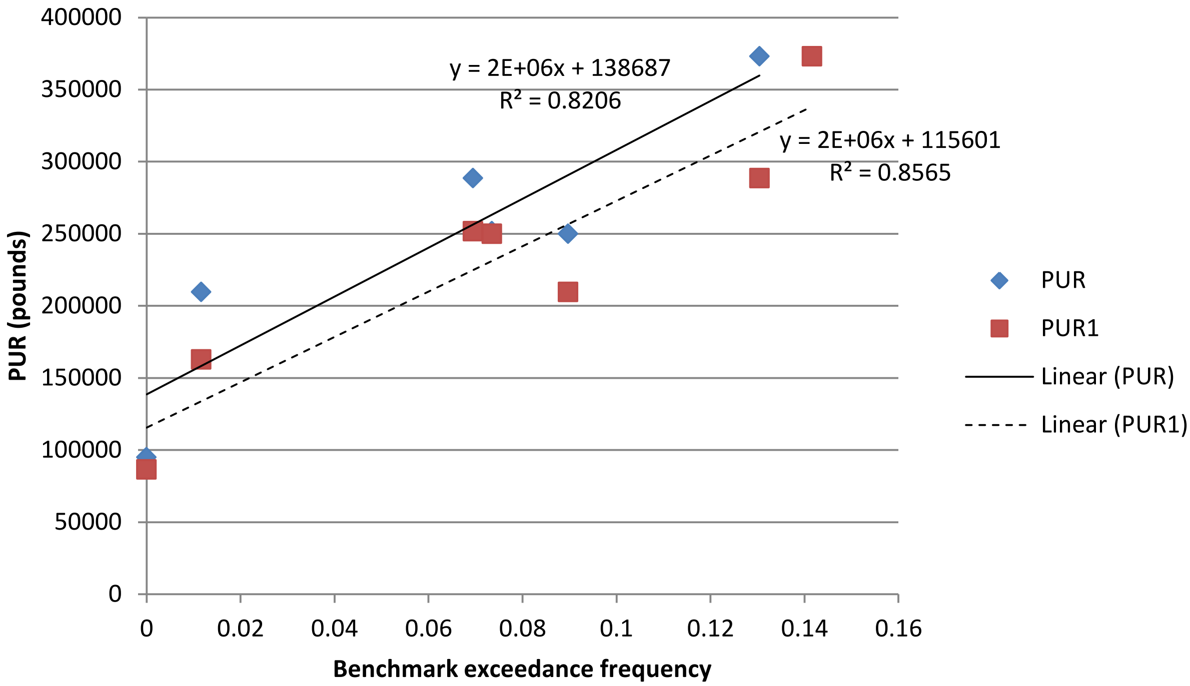


Fig. 5. Linear regressions of pesticide use (PUR) and use one year prior (PUR1) vs benchmark exceedance frequency.

5. Toxicology

5.1 Mode of Action

Imidacloprid acts at the insect nicotinic acetylcholine receptor (nAChR; Liu and Casida, 1993). The insecticide mimics the activity of neurotransmitters by agonistically binding and sending unwarranted neural transmissions. Ultimately, receptors and cells involved in neural transmission become exhausted and fail to function, which results in paralysis (Nishiwaki et al., 2003). Nicotinic receptors with affinity for imidacloprid and other neonicotinoids occur in lower numbers in vertebrates than invertebrates. Thus neonicotinoid toxicity, including imidacloprid, is generally higher in invertebrates than vertebrates (Simon-Delso et al., 2015).

5.2 Aquatic organisms

A large body of published literature exists that addresses the effects of imidacloprid on aquatic macrofauna and other nontarget organisms (Table 3). These studies include lab toxicity tests to stream mesocosm studies to field studies. Fish are less sensitive than invertebrates to the toxic effects of imidacloprid. The LC_{50} values of fish species tested, according to Gibbons et al. (2015), range from 1.2 mg/L for rainbow trout fry to 241 mg/L for zebrafish. These fish sensitivities are orders of magnitude higher than ambient concentrations detected by CDPR. Thus, it is unlikely that mortality from direct exposure to imidacloprid will affect fish species at current ambient concentrations. Investigating effects to more sensitive invertebrates, Stoughton et al. (2008) conducted a 28-day chronic exposure using the aquatic invertebrates *Chironomus tentans* and *Hyalella azteca.* Growth and survival as measured by the Lowest Observed Effect Concentration (LOEC) were inhibited in *C. tentans* at concentrations >1.14 µg/L. Likewise, *H. azteca* had a 28-d LOEC of 11.46 µg/L. The reported 28-day LC_{50} for *C. tentans* in this same study was 0.91 µg/L. Sanchez-Bayo et al. (2006) reports that ostracods, a class of crustaceans, (48-hour LC_{50}=301–715 µg/L) are orders of magnitude more sensitive to acute imidacloprid exposure than cladocerans, an order of crustaceans (48-hour LC_{50}=65–133 mg/L). Chen et al. (2010) reported a 48-hour LC_{50} of imidacloprid to *Ceriodaphnia dubia* as 2.1 µg/L. The same study found that 19% of the exposed population survived (relative to the control) following chronic exposure at a concentration of 0.3 µg/L. The US EPA chronic invertebrate aquatic life benchmark for imidacloprid is 1.05 µg/L (US EPA, 2015). However, this benchmark was developed in 2008 and there are recent calls for the benchmark value to be lowered drastically in an effort to reflect newer data (Morrissey et al., 2015; Smit et al., 2015). Morrissey et al., (2015) and Smit et al., (2015) agree that the acute threshold should be 0.2 µg/L in order to avoid chronic effects on the most sensitive invertebrate species, but each realizes a different chronic threshold—0.035 µg/L and 0.0083 µg/L, respectively. Nevertheless, concentrations of imidacloprid, especially in agricultural areas of California, are reported in the SURF database (CDPR, 2016) at levels capable of causing short- and long-term impacts on aquatic invertebrate species.

Table 3. Range of LC_{50} values for different taxa

Taxon	96-hr LC_{50} range	Reference
Mammal	131–475 mg/kg	SERA, 2005
Bird	13.9–283 mg/kg	SERA, 2005; Fossen, 2006; Anon 2012
Fish	1.2–241mg/L	SERA, 2005; Cox, 2001
Amphibia	82–366 mg/L	Feng et al., 2004; Nian 2009
Coccinellid	17.25–364 mg/kg	Khani et al., 2012; Youn et al., 2003
Hemiptera	0.3–5,180 mg/kg (residual contact)	Delbeke et al., 1997; Prabhaker et al., 2011
Branchiopoda	.0021–10.4 mg/L	Song et al., 1997; Chen et al., 2010

5.3 Mammals and Birds

Much of the focus in toxicology research has been on invertebrates, especially pollinators (discussed below). Nevertheless, a number of studies have focused on effects to birds and mammals. Imidacloprid can affect birds and mammals directly through toxicity or indirectly through effects to the food chain (Gibbons et al., 2015; Mineau and Palmer, 2013). While imidacloprid is more toxic at lower concentrations to invertebrates than vertebrates, the latter still experiences toxicity from imidacloprid (Gibbons et al., 2015). The 96-hour LC_{50} for different vertebrate taxa varies greatly (Table 2). The LD_{50} for the range of bird species tested spans from 13.9 mg/kg bodyweight for the gray partridge to 283 mg/kg bodyweight for the mallard (Gibbons et al., 2015). While direct exposure is a concern, the indirect effects like growth, development, and reproduction on vertebrate wildlife pose unique challenges as well. One hypothesized indirect effect is the relationship between sensitive invertebrate prey and the vertebrate wildlife that depend on them as a food source. The evidence is not clear as to whether there is a link between pesticide use resulting in decreased invertebrate prey and a decline in vertebrate wildlife populations (Gibbons et al., 2015). Given that indirect effect endpoints like growth and development are difficult to assess, more research is needed to characterize the potential role of imidacloprid to cause sublethal effects.

5.4 Pollinators

Honeybees (*Apis mellifera*) have been widely studied and discussed in recent years since pollinators responsible for a large portion of food crop pollination have seen steady population declines associated with CCD (Pisa et al., 2015). Given the high toxicity of imidacloprid and other neonicotinoids to bees and non-target invertebrates, studies have recently focused on the relationship between neonicotinoid use, CCD, and the health of the global bee population. Mullin (2010) reported an average bee LD_{50} of 280 ng/g bee despite other values ranging from 4 to 104 ng/honeybee (Johnson and Pettis, 2014). Bonmatin et al. (2005) reported that imidacloprid has an acute LD_{50} to bees of 3.7 ng/bee. To put this in perspective, the LD_{50} for DDT is 27,000 ng/bee. Other reported values for the LD_{50} of imidacloprid are higher. Risk assessments focusing on bees reported the LD_{50} to be 490 ng/bee (DEFRA, 2007; 2009). This large discrepancy in reported values may be explained by the differences between oral and contact toxicity, with oral ingestion serving as the more sensitive route of exposure (Pisa et al., 2015).

Sublethal effects of imidacloprid on bees have also been studied. Blanken et al. (2015) studied the relationship between imidacloprid and the parasitic mite *Varroa destructor* with respect to flight capacity of forager bees. Previous studies found that imidacloprid and neonicotinoids could reduce homing of forager bees by altering orientation abilities (Henry et al., 2012). Blanken et al. (2015) found that exposure to *V. destructor* reduced flight distance but the effect increased when bee colonies were exposed to both *V. destructor* and imidacloprid. Despite the increased focus of research efforts on neonicotinoids and honeybees, as Pisa et al., (2015) point out, “No single cause for high losses has been identified, and high losses are associated with multiple factors including pesticides, habitat loss, pathogens, parasites, and environmental factors.”

An extensive risk assessment was released in January 2016 by the US EPA that analyzed the risk imidacloprid poses to bees on different crops (US EPA 2016). This assessment found that imidacloprid sprayed on citrus and cotton posed a risk to bee colony health. A no-observable adverse effect concentration (NOAEC) was set to 25 µg/L for nectar with a lowest-observable adverse effect concentration (LOAEC) at 50 µg/L. Citrus and cotton were identified as risks in the study given the pollen and nectar exposure routes for bees. In these two crops, nectar and pollen may contain imidacloprid above the NOAEC. Other studied crops like corn, which do not contain nectar, are not serious risks to bees for imidacloprid exposure.

6. Summary

Imidacloprid, the predominant neonicotinoid and largest selling insecticide in the world, was initially synthesized in 1985. It is a systemic insecticide applied predominantly in agriculture as a seed treatment to protect against crop damage from biting-sucking pests. Following ingestion, imidacloprid disrupts action potential transmission in the pest by agonistically binding to post-synaptic nAChR receptors. The predominant environmental route for breakdown of imidacloprid is through aqueous photolysis, which has a half-life of <2 hours. The insecticide is highly water soluble (514 mg/L) with a Henry’s Law constant of 6.5×10^{-11} atm m^3/mole. Thus, volatilization is not a major dissipation pathway. While not a concern in air, imidacloprid remains a threat to sensitive species in surface water—prompting calls for a reduced chronic aquatic life benchmark. Imidacloprid is on the CDPR Groundwater Protection List, but CDPR studies monitoring for imidacloprid have not detected it in the state.

The science behind the effect of imidacloprid on honey bees and other pollinators, especially with respect to CCD, is still not settled. The recently published US EPA risk assessment on imidacloprid identified cotton and citrus as the only two crops which, when treated with imidacloprid, could introduce bees to toxic concentrations. It is important to note that other stressors like the *V. destructor* mite, habitat loss, and nutrition quality are factors in the reported decline of pollinators nationwide. More research and analysis of existing data is needed in order to decisively identify the relationships between pollinator stressors and CCD.

References

Anon. 2012. Addendum 7 to the draft assessment report; confirmatory data; imidacloprid. EU Commission.

Bacey, J. 2000. Environmental fate of imidacloprid. Environmental Monitoring and Pest Management Branch. Department of Pesticide Regulation. Sacramento, CA.

Baskaran, S., Kookana, R.S., and Naidu, R. 1999. Degradation of bifenthrin, chlorpyrifos and imidacloprid in soil and bedding materials at termiticidal application rates. *Pesticide Science.* 55: 1222-1228.

Bergin, R and Nordmark, C. 2009. GW 09: Ground Water Monitoring for Imidacloprid and Four Degradates in High Use Areas in California. California Department of Pesticide Regulation. Sacramento, CA.

Blanken, L.J., van Langevelde, F., and van Dooremalen, C. 2015. Imteraction between *Varroa destructor* and imidacloprid reduces flight capacity of honeybees. *Proc. R. Soc. B.* 282:20151738. http://dx.doi.org/10.1098/rspb.2015.1738

Bonmatin, J. M., Giorio, C., Girolami, V., Goulson, D., Kreutzweiser, D.P., Krupke, C., Liess, M., Long, E. Marzaro, M., Mitchell, E.A.D., Noome, D.A., Simon-Delso, N., and Tapparo, A. 2015. Environmental fate and exposure; neonicotinoids and fipronil. *Environ Sci Pollut Res Int*. 22: 35-67.

Bonmatin, J.M., Moineau, I., Charvet, R., Colin, M.E., Fleche, C., Bengsch, E.R. 2005. Behaviour of imidacloprid in fields. Toxicity for honeybees. In: Lichtfouse, E; Scharzbauer, J; Robert, D (eds). Environmental chemistry. Springer, Berlin. Pp. 483-494.

Budd, Robert. 2016. Urban Monitoring in Southern California Watersheds FY 2014-2015. Ambient Monitoring Report. California Department of Pesticide Regulation. http://www.cdpr.ca.gov/docs/emon/pubs/ehapreps/report_270_Budd_FY14_15_V4.pdf

CDPR, California Department of Pesticide Regulation. 2015. Pesticide Use Reporting. http://ziram.lawr.ucdavis.edu/PURwebGIS.html

CDPR, California Department of Pesticide Regulation. 2016. Surface Water Database. [Online]. Sacramento, CA. http://www.cdpr.ca.gov/docs/emon/surfwtr/surfcont.htm

Chen X.D., Culbert E., Herbert V., Stark J.D. 2010. Mixture effects of the adjuvant R-11 and the insecticide imidacloprid on population growth rate and other parameters of Ceriodaphnia dubia. *Ecotoxicol Environ Saf* 73:132‑137

Cox, C. 2001. Insecticide factsheet: imidacloprid. *J Pestic Reform.* 21:15–21.

Cox, L., Koskinen, W., and Yen, P. 1997. Sorption–desorption of imidacloprid and its metabolites in soils. *J Agric Food Chem*. 45: 1468–1472.

DEFRA. 2007. Assessment of the risk posed to honeybees by systemic pesticides. PS2322, CSL York, UK.

DEFRA. 2009. Intermittent exposure in terrestrial invertebrates – a case study with honeybees. PS 2341, CSL York, UK.

Delbeke, E., Vercruysse, P., Tirry, L., de Clercq, P., Degheele, D. 1997. Toxicity of diflubenzuron, pyriproxyfen, imidacloprid and diafenthiuron to the predatory bug *Orius laevigatus* (Het.: Anthocoridae). *Entomophaga* 42:349‑358.

Ding, T., Jacobs, D., and Lavine, B.K. 2011. Liquid chromatography-mass spectrometry identification of imidacloprid photolysis products. *Microchemical Journal.* 99: 535-541.

Ensminger, Mike. 2016. Ambient and Mitigation Monitoring in Urban Areas in Northern California. Ambient Monitoring Report. California Department of Pesticide Regulation. http://www.cdpr.ca.gov/docs/emon/pubs/ehapreps/report_269_ensminger_FY14_15.pdf

Feng, S., Kong, Z., Wang,X., Zhao, L., and Peng, P. 2004. Acute toxicity and genotoxicity of two novel pesticides on amphibian, *Rana N Hallowell. Chemosphere*. 56:457-463.

Fossen, M. 2006. Environmental fate of imidacloprid. Environmental Monitoring Branch. Department of Pesticide Regulation. Sacramento, California.

Gibbons, D., Morrissey, C., and Mineau, P. 2015. A review of the direct and indirect effects of neonicotinoids and fipronil on vertebrate wildlife. *Environ Sci Pollut Res.* 22:103-118.

Greatti, M., Sabatini, A.G., Barbattini, R., Rossi, S., and Stravisi, A. 2003. Risk of environmental contamination by the active ingredient imidacloprid used for corn seed dressing. Preliminary Results. *Bulletin of Insectology*. 56:69-72.

Henry, M., Beguin, M., Requier, F., Rollin, O., Odoux, J.F., Aupinel, P., Aptel, J., Tchamitchian, S., Decourtye, A. 2012. A common pesticide decreases foraging success and survival in honey bees. Science 336, 348–350. (doi:10.1126/science.1215039)

Horwood, M.A. 2007. Rapid degradation of termiticides under field conditions. *Australian Journal of Entomology*. 46:75-78.

Johnson, J. D. and J. S. Pettis. 2014. A Survey of Imidacloprid Levels in Water Sources Potentially Frequented by Honeybees (Apis mellifera) in the Eastern USA. *Water Air and Soil Pollution.* 225(11).

Kagabu, Shinzo. 2011. Discovery of imidacloprid and further developments from strategic molecular designs. *J. Agric. Food Chem.* 59: 2887-2896.

Kreutzweiser, D.P., Good, K., Chartrand, D., Scarr, T., Thompson, D. 2007. Non-target effects on aquatic decomposer organisms of imidacloprid as a systemic insecticide to control emeral ash borer in riparian trees. *Ecotoxicol. Environ. Saf.* 68:315-325.

Khani, A., Ahmadi, F., Ghadamyari, M. 2012. Side effects of imidacloprid and abamectin on the Mealybug destroyer, *Cryptolaemus montrouzieri. Trakia J Sci.* 10:30‑35.

Liu, M.Y. and Casida, J.E. 1993. High affinity binding of [^{3}H] Imidacloprid in the insect acetylcholine receptor. *Pesticide Biochemistry and Physiology.* 46: 40-46. Doi: 10.1006/pest.1993.1034.

Liu, W., Zheng, W., Ma, Y., and Liu, K. 2006. Sorption and Degradation of Imidacloprid in Soil and Water. *Journal of Environmental Science and Health, Part B.* 41:623-634.

Miles, Inc. 1992. Premise termiticide- Environmental fate: Terrestrial field dissipation for California site. Volume No. 51950-0032. Department of Pesticide Regulation, Sacramento, CA.

Mobay Chemical Corp. 1992. Premise termiticide- Environmental fate: Hydrolysis; Aqueous and soil photolysis. Volume No. 51950-0027. Department of Pesticide Regulation, Sacramento, CA.

Mineau P. and Palmer, C. 2013. The impact of the nation's most widely used insecticides on birds. American Bird Conservancy, USA

Morrissey, C. A., Mineau, P., Devries, J.H., Sanchez-Bayo, F., Liess, M., Cavallaro, M.C., and Liber, K. 2015. Neonicotinoid contamination of global surface waters and associated risk to aquatic invertebrates: A review. *Environ Int* 74: 291-303.

Moza, P.N., Hustert, K., Feicht, E., and Kettrup, A. 1998. Photolysis of imidacloprid in aqueous solution. *Chemosphere.* 36: 497-502.

Mullin CA, Frazier M, Frazier JL, Ashcroft S, Simonds R, van Engelsdorp D, Pettis JS. High levels of miticides and agrochemicals in North American apiaries: implications for honey bee health. PloS One. 2010;5(3):e9754. doi: 10.1371/journal.pone.0009754.

Mullins, J.W. 1993. Imidacloprid. A new nitroguanidine insecticide. Am Chem Soc Symp Ser. 524:183-198.

Nian, Y. 2009. Study on toxicity of triazophos, trichlorphon and imidacloprid on *Rana limnocharis* tadpole. *J Anhui Agric Sci*. 2009: 18.

Nishiwaki, H., Nakagawa, Y., Kuwamura, M., Sato, K., Akamatsu, M., Matsuda, K., Komai, K., and Miyagawa, H. 2003. Correlations of the electrophysiological activity of neonicotinoids with their binding and insecticidal activities. *Pest Manag Sci.* 59:1023-1030.

Pesticide Chemistry Database. California Department of Pesticide Regulation, internal database.

Phugare, S.S., Kalyani, D.C., Gaikwad, Y.B., and Jadhav; J.P. 2013. Microbial degradation of imidacloprid and toxicological analysis of its biodegradation metabolites in silkworm (*Bombyx mori*). *Chemical Engineering Journal*. 230:27-35.

Pisa, L.W., Amaral-Rogers, V., Belzunces, L.P., Bonmatin, J.M., Downs, C.A., Goulson,D., Kreutzweiser, D.P., Krupke, C., Liess, M., McField, M., Morrissey, C.A., Noome, D.A., Settele, J., Simon-Delso, N., Stark, J.D., Van der Sluijs, J.P., Van Dyck, H., Wiemers, M. 2015. Effects of neonicotinoids and fipronil on non-target invertebrates. *Environ Sci Pollut Res Int* 22: 68-102.

Prabhaker, N., Castle, S.J., Naranjo, S.E., Toscano, N.C., Morse, J.G. 2011. Compatibility of two systemic neonicotinoids, imidacloprid and thiamethoxam, with various natural enemies of agricultural pests. *J Econ Entomol*. 104:773‑781.

Sanchez-Bayo F, Goka K (2006a) Influence of light in acute toxicity bioassays of imidacloprid and zinc pyrithione to zooplankton crustaceans. *Aquat Toxicol* 78: 262–271. doi: 10.1016/j.aquatox.2006.03.009

Scholz, K. and Spiteller, M. 1992. Influence of groundcover on the degradation of ^{14}C-imidacloprid in soil. Proc. Brighton Crop Protection Conference- Pests and Dis. 883 – 888.

SERA. 2005. Imidacloprid—human health and ecological risk assessment—final report. Report from Syracuse Environmental Research Associates to USDA, Forest Service.

Simon-Delso, N., Amaral-Rogers, V., Belzunces, L.P., Bonmatin, J.M., Chagnon, M., Downs, C., Furlan, L., Gibbons, D.W., Giorio, C., Girolami, V., Goulson, D., Kretzweiser, D.P., Krupkpe, C.H., Liess, M., Long, E., McField, M., Mineau, P., Mitchell, E.A.D., Morrissey, C.A., Noome, D.A., Pisa, L., Settele, J., Stark, J.D., Tapparo, A., Van Dyck, H., Van Praagh, J., Van der Sluijs, J.P., Whitehorn, P.R. and Wiemers, M. 2015. Systemic insecticides (neonicotinoids and fipronil): trends, uses, mode of action and metabolites. *Environ Sci Pollut Res Int* 22: 5-34.

Smit, C. E., Posthuma-Doodeman, C., van Vlaardingen, P.L.A., and de Jong, F.M.W. 2015. Ecotoxicity of Imidacloprid to Aquatic Organisms: Derivation of Water Quality Standards for Peak and Long-Term Exposure. *Human and Ecological Risk Assessment* 21(6): 1608-1630.

Song, M.Y., Stark, J.D., Brown, J.J. 1997. Comparative toxicity of four insecticides, including imidacloprid and tebufenozide, to four aquatic arthropods. *Environ Toxicol Chem*. 16:2494‑2500.

Starner, K. and Goh, K.S. 2012. Detections of the Neonicotinoid Insecticide Imidacloprid in Surface Waters of Three Agricultural Regions of California, USA, 2010-2011. *Bulletin of Environmental Contamination and Toxicology* 88(3): 316-321.

Stoughton S.J, Liber, K., Culp, J., Cessna, A. 2008. Acute and Chronic Toxicity of Imidacloprid to the Aquatic Invertebrates *Chironomus tentans* and *Hyalella azteca* under Constant- and Pulse-Exposure Conditions. Arch Environ Contam Toxicol 54: 662-673.

Tisler, T., Jemec, A., Mozetic, B., and Trebse, P. 2009. Hazard identification of imidacloprid to aquatic environment. *Chemosphere.* 76: 907-914.

Tomizawa, M. and Casida, J.E. 2011. Neonicotinoid insecticides: highlights of a symposium on strategic molecular designs. *J Agric Food Chem.* 59: 2883-2886.

US EPA. 1993. Comparison of the leaching potential of imidaclprid (NTN) to other turf insecticides considered in the preliminary turf cluster assessment. Memo from J. Wolf, soil scientist, to H. Jacoby, chief. Washington, D.C. June 15.

US EPA. 2015. Aquatic Life Benchmarks. Accessed 21 December 2015. http://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/aquatic-life-benchmarks-pesticide-registration

USEPA. 2016. Preliminary Pollinator Assessment to Support the Registration Review of Imidacloprid. http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPP-2008-0844-0140

Van Dijk, T. C., Van Staalduinen, M.A. and Van der Sluijs, J.P. 2013. Macro-Invertebrate Decline in Surface Water Polluted with Imidacloprid. *Plos One* 8(5): 1-10.

Wamhoff, H and Schneider, V. 1999. Photodegradation of Imidacloprid. *J Agric Food Chem.* 47(4): 1730-1734. DOI: 10.1021/jf980820j

Youn, Y.N., Seo, M.J., Shin, J.G., Jang, C., Yu, Y.M. 2003. Toxicity of greenhouse pesticides to multicolored Asian lady beetles, *Harmonia axyridis* (Coleoptera: Coccinellidae). *Biol Control*. 28:164‐170.

Zheng, W. and Liu, W. 1999. Kinetics and mechanism of the hydrolysis of imidacloprid. *Pestic Sci.* 55: 482-485.

Attachment 10

Shimek Declaration 2017

Case No. C080530

IN THE COURT OF APPEAL OF THE STATE OF CALIFORNIA

THIRD APPELLATE DISTRICT

MONTEREY COASTKEEPER, ET AL.

Respondents,

v.

STATE WATER RESOURCES CONTROL BOARD,

Appellants.

Appeal from the Superior Court of California,
County of Sacramento
Case No. 34-2012-80001324
Honorable Timothy M. Frawley, Presiding

DECLARATION OF STEVEN SHIMEK IN SUPPORT OF RESPONSE BRIEF OF MONTEREY COASTKEEPER, ET AL.

Deborah A. Sivas, CBN 135446
Alicia E. Thesing, CBN 211751
John Ugai, PTLS 39538
Duncan Pickard, PTLS 41539
ENVIRONMENTAL LAW CLINIC
Mills Legal Clinic
at Stanford Law School
559 Nathan Abbott Way
Stanford, California 94305-8610
Telephone: (650) 723-0325
Facsimile: (650) 723-4426

Helen H. Kang, CBN 124730
Tovah Trimming, CBN 300163
Collin McCarthy, CBN 305489
M. Tyler Sullivan, PTLS 41048
ENVIRONMENTAL LAW AND
JUSTICE CLINIC
Golden Gate University
School of Law
536 Mission Street
San Francisco, CA 94105-2968
Telephone: (415) 442-6647
Facsimile: (415) 442-2450

Attorneys for Respondents
MONTEREY COASTKEEPER, et al.

I, Steven Shimek, declare:

1. I am the Program Director for Petitioner Monterey Coastkeeper, a program of The Otter Project, and I am also Executive Director of The Otter Project. The matters set forth herein are based on my personal knowledge, and, if called upon to testify, I could and would testify competently to them.

2 On December 28, 2016, I received a response to my Public Acts request from the Central Coast Regional Water Quality Board. The response included a letter and attachments, attached here as Exhibit 1.

3. The response indicates that Tier 3 includes 24 ranches covering 20,003 acres, out of 4,376 ranches and 422,006 total acres. These numbers reflect that Tier 3 represents just 0.5% of the total ranches and 4.7% of the total acreage.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this Declaration was executed on January 4, 2017, in Monterey, California.

STEVEN SHIMEK

EXHIBIT 1

CALIFORNIA
Water Boards

Edmund G. Brown Jr.
Governor

Matthew Rodriquez
Secretary for
Environmental Protection

Central Coast Regional Water Quality Control Board

December 28, 2016

Steve Shimek
The Otter Project/Monterey Coastkeeper
exec@otterproject.org

Via Electronic Mail Only

Dear Mr. Shimek:

PUBLIC RECORDS ACT REQUEST REGARDING SPECIFIED DATA FOR ACTIVELY ENROLLED RANCHES, TIER ADJUSTMENTS INCLUDING REASONING AND OUTCOME, DISCRETIONARY REVIEW REPORTS, AND TIER 3 FARMS NOT CONDUCTING INDIVIDUAL DISCHARGE MONITORING AND JUSTIFICATION FOR NO MONITORING

The Central Coast Regional Water Quality Control Board (Central Coast Water Board) received your completed Public Records Review Request form via e-mail on December 19, 2016.Your PRA request was submitted on behalf of The Otter Project and Monterey Coastkeeper. This letter is an initial response to your PRA request.

We understand that you are requesting information related to files or records maintained by the Central Coast Water Board for irrigated agricultural operations in the Central Coast region. Specifically, you requested records containing the following information:

1. Number of active enrolled ranches in each tier, including total acreage in each tier.
2. Listing of active enrolled ranches that have requested tier adjustments, date of the request, reasons for the adjustment, whether the adjustment was granted or not, and date the adjustment was granted, if granted.
3. All quarterly "Reports of discretionary items" as articulated by the November 2014 EO Report, including:
    a. Any list of discretionary review items (including lists the Ag Order adoption in March 2012. There is a reference in a staff report of 130 requests for tier change);
    b. Lyris announcement of the availability of quarterly reports for "Discretionary Review by Regional Board."
4. Listing of tier 3 farms including name, acreage, and ranch location, including latitude and longitude, if available.
5. Listing of tier 3 farms that claim they do not need to conduct discharge monitoring and their justification.

The Central Coast Water Board has documents that are responsive to your request. We are providing information requested in bullets 1, 2, 4, and 5 above, with this letter.

Our staff is in the process of gathering other responsive documents related to bullet 3 above. Due to current workload and staffing resources during this holiday season, we anticipate that it will take approximately two weeks to gather the records and provide them to you.

Government Code section 6253 requires our agency to specify within ten days of the request whether it has disclosable public records. As noted above, the Central Coast Water Board does have documents responsive to your request. Upon compilation and our review of the remaining records, we will identify those that can be disclosed and will forward to you or will be withheld from disclosure based on any exemptions from the PRA.

If you have any questions, please contact **Christopher Rose at** (805) 542-4770 or chris.rose@waterboards.ca.gov.

Sincerely,

for John M. Robertson
Executive Officer

Attachments: Items_1_4_5.xlsx, item_2.zip

cc:

Jessica Jahr, Jessica.Jahr@waterboards.ca.gov
Chris Rose, Chris.Rose@waterboards.ca.gov
Tamarin Austin, Tamarin.Austin@waterboards.ca.gov
Lori Okun, Lori.Okun@waterboards.ca.gov
Marnie Ajello, Marnie.Ajello@waterboards.ca.gov

r:\rb3\shared\ag-ilrp\14 - pra request\2016\shimek_19dec2016\response\responsivenessltr_shimek_23dec2016.doc.docx bc:

XXX/xxx
xdate
document5
ECM#

	Ranches	Acreage
Tier 1	2,169	156,804
Tier 2	2,153	244,056
Tier 3	24	20,003
Newly Enrolled - Tier Pending	30	1,142
Total	4,376	422,006

AGRANCHID	AW_NUM	RANCH_NAME	LATITUDE	LONGITUDE	IRRIGATED _ACRES	RANCH _FARM _TIER	Required to Monitor?	Justification_If_ No_Monitoring
20003194	AW0326	Jim Fanoe, Inc.	36.6422877	-121.550546	700	3	NO	No discharge
20016902	AW0550	Lonoak Ranch	36.2014818	-121.075344	605	3	NO	No discharge
20001171	AW1807	Fanoe Brothers	36.5327778	-121.434288	700.7	3	YES	
20003051	AW0706	Ranch 1 - Broome Ranch	36.5488798	-121.508017	880.7	3	NO	No discharge
20001178	AW1807	Johnson Ranch	36.5860015	-121.490293	556.2	3	YES	
20018062	AW1494	Broome Ranch	36.3881929	-121.282282	1792	3	NO	No discharge
20003874	AW1494	Los Coches	36.3937894	-121.275716	1000.7	3	YES	
20000601	AW1496	SAN LUCAS ROW CROP	36.18094	-121.02215	2341.1	3	NO	No discharge
20004507	AW1523	Betteravia Investments - Harris Ranch	34.7619931	-120.425692	660.9	3	YES	
20004603	AW1523	LeRoy (1,27,29)	34.9717817	-120.529718	540	3	YES	
20010045	AW1523	Ferini/Vecchioli	34.9252082	-120.547657	644.1	3	YES	
20007385	AW1072	Guggia Farms	34.97772	-120.513696	391.2	3	YES	
20004281	AW1748	Callaghan	36.4462111	-121.379871	1054.42	3	YES	
20007541	AW1634	Romie Ranch	36.5608765	-121.538229	536	3	NO	No discharge
20001360	AW1683	Hacienda	36.2893934	-121.185422	740.1	3	NO	No discharge
20004286	AW1748	Arnold Ranch	36.4353706	-121.360645	671.07	3	YES	
20004302	AW1748	Pryor Ranch	36.4562908	-121.395235	874.58	3	YES	
20000632	AW1496	BELLA VISTA	36.17467	-121.10456	1536.3	3	YES	
20000527	AW1793	Upper (East)	36.2122684	-121.086287	644.8	3	NO	No discharge
20000615	AW1496	Culver/Rainbow	36.22389	-121.10944	743.97	3	YES	
20014783	AW3651	Turri	36.5641856	-121.497545	430.7	3	YES	
20007438	AW1819	Freyer	36.4707177	-121.400728	590.6	3	NO	No discharge
20010222	AW3544	HUDSON	36.3587529	-121.253958	582.5	3	NO	No discharge
20002651	AW0699	Ferry Morse	36.8384504	-121.494713	785.51	3	YES	
20017165	AW3736	Taix	36.8634848	-121.548615	69.8	2	Three Oaks	
20017166	AW3736	Dowdy	36.8659569	-121.552391	52.9	2	Three Oaks	
20017167	AW3736	Prescott	36.8597078	-121.546469	51.1	2	Three Oaks	
20017162	AW3736	Feeney	36.8775266	-121.559687	93.3	2	Three Oaks	
20017163	AW3736	Botelho	36.8731667	-121.550503	187.7	2	Three Oaks	
20003832	AW1477	Freeway	36.7592409	-121.757054	110.9	2	Willoughby	
20003923	AW1477	Lights	36.8958217	-121.783383	48	2	Willoughby	

PROOF OF SERVICE

ALICIA E. THESING declares:

I am over the age of eighteen years and not a party to this action. My business address is 559 Nathan Abbott Way, Stanford, California 94305-8610. On January 4, 2017, I served the foregoing DECLARATION OF STEVEN SHIMEK IN SUPPORT OF RESPONSE BRIEF OF MONTEREY COASTKEEPER, ET AL. by placing a true and correct copy thereof in a sealed envelope, with postage thereon fully prepaid, in the United States Mail at Stanford, California, addressed as follows:

Clerk
Superior Court of California
County of Sacramento
720 9th Street
Sacramento, California 95814

I declare under penalty of perjury that the foregoing is true and correct, and that this declaration was executed January 4, 2017 at Stanford, California.

ALICIA E. THESING

Attachment 11

Inter-Agency Nitrate Report

2013

California Water Boards

Protecting California's Water

RECOMMENDATIONS ADDRESSING NITRATE IN GROUNDWATER

STATE WATER RESOURCES CONTROL BOARD

REPORT TO THE LEGISLATURE

20 February 2013

CALIFORNIA
Water Boards
STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS

STATE OF CALIFORNIA
Edmund G. Brown Jr., Governor

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
Matthew Rodriquez, Secretary

STATE WATER RESOURCES CONTROL BOARD
P.O. Box 100 Sacramento, CA 95812
(916) 341-5250
Homepage: http://www.waterboards.ca.gov

Contents

Executive Summary

This report is being submitted in compliance with Chapter 1 of the Second Extraordinary Session of 2008 (SBX2 1, Perata), which requires the State Water Resources Control Board (State Water Board) to develop pilot projects focusing on nitrate in groundwater in the Tulare Lake Basin and Salinas Valley and to submit a report to the Legislature on the scope and findings of the pilot projects, including recommendations, within two years of receiving funding.

Nitrate pollution in groundwater is a widespread water quality problem that can pose serious health risks to pregnant women and infants if consumed at concentrations above the Maximum Contaminant Level (MCL) of 45 milligrams per liter (mg/L) (as NO_3) set by the California Department of Public Health. Nitrate contaminated groundwater is a particularly significant problem in the Tulare Lake Basin and Salinas Valley areas, where about 2.6 million people, including many of the poorest communities in California, rely on groundwater for their drinking water. Many other areas of the State, however, also have nitrate contaminated groundwater making it the most frequently detected anthropogenic chemical above an MCL in drinking water sources.

SBX2 1 requires the State Water Board to develop the nitrate contamination pilot projects in the Tulare Lake Basin and Salinas Valley to "improve understanding of the causes of groundwater contamination, identify potential remediation solutions and funding sources to recover costs expended by the state for the purposes of this section to clean up or treat groundwater, and ensure the provision of safe drinking water to all communities." SBX2 1 specifically requires the State Water Board to:

- Identify sources, by category of discharger, of groundwater contamination due to nitrate.
- Estimate proportionate contributions to groundwater contamination [by nitrate] by source and category of discharger.
- Identify and analyze options within the State Water Board's current authority to reduce current nitrate levels and to prevent continuing nitrate contamination, and to estimate costs associated with exercising this authority.
- Identify methods and costs associated with the treatment of nitrate-contaminated groundwater for use as drinking water.
- Identify methods and costs to provide an alternative water supply to groundwater-reliant communities in the pilot project areas.
- Identify potential funding sources to provide resources for cleanup, treatment, and provision of an alternative drinking water supply.
- Develop recommendations for developing a groundwater cleanup program for the Central Valley Water Quality Control Board Region and Central Coast Water Quality Control Board Region based on the pilot project results.

UC Davis Report

As a first step in the development of the pilot projects, the State Water Board contracted with the University of California, Davis (UC Davis) in 2010 to conduct an independent study on the nitrate pilot projects in the Tulare Lake Basin and the Salinas Valley. The UC Davis Nitrate Report was delivered to the State Water Board in March 2012 and is included in Appendix B. The associated technical reports are available online at http://www.waterboards.ca.gov/water_issues/programs/nitrate_project/index.shtml. In its report, UC Davis made eight major findings and identified numerous "promising actions" to address the identified problems. The major findings of the UC Davis report are:

1. Nitrate problems will likely worsen for decades. For more than half a century, nitrate from fertilizer and animal waste has infiltrated into Tulare Lake Basin and Salinas Valley aquifers. Most nitrate detected in drinking water wells today was originally applied to the surface decades ago.

2. Agricultural fertilizers and animal wastes applied to cropland are by far the largest regional sources of nitrate in groundwater. Other sources can be locally important.

3. Nitrate loading reductions are possible, some at modest cost. Large reductions of nitrate loads to groundwater can have substantial economic cost.

4. Traditional pump and treat remediation to remove nitrate from large groundwater basins is extremely costly and not technically feasible. Instead, "pump-and-fertilize" and improved groundwater recharge management are less costly long-term alternatives.

5. Drinking water supply actions such as blending, treatment, and alternative water supplies are most cost-effective. Blending will become less available in many cases as nitrate pollution continues to spread.

6. Many small communities cannot afford safe drinking water treatment and supply actions. High fixed costs affect small systems disproportionately.

7. The most promising revenue source is a fee on nitrogen fertilizer use in these basins. A nitrogen fertilizer fee could compensate affected small communities for mitigation expenses and effects of nitrate pollution.

8. Inconsistency and inaccessibility of data prevent effective and continuous assessment of California's groundwater quality. A statewide effort is needed to integrate diverse water-related data-collection activities by many state and local agencies.

State Water Board Report to Legislature

In this report, the State Water Board makes specific recommendations for addressing nitrate contaminated groundwater. In developing this report, the State Water Board relied on the UC Davis report as a foundation, and obtained significant input from the Interagency Task Force (ITF), which included representatives from the California Department of Public Health, the Department of Food and Agriculture, the Department of Pesticide Regulation, California Environmental Protection Agency, and local environmental health agencies. Recommendations were also informed by the findings of a task force convened by the Governor's office to address safe drinking water issues.

The State Water Board makes 15 recommendations to address the issues associated with nitrate contaminated groundwater. These recommendations are reflected in Table ES-1.

These recommendations reflect a comprehensive strategy focused on the following key areas:

- **Providing Safe Drinking Water**. Creating a reliable, stable funding source, integrated with institutional changes, to provide long-term safe drinking water infrastructure and interim solutions for the small disadvantaged communities impacted by nitrate contamination.

- **Monitoring, Assessment, and Notification.** Developing and managing the data necessary to identify and effectively manage nitrate contaminated groundwater, with particular attention focused on (1) defining nitrate high-risk areas in order to prioritize regulatory oversight and assistance efforts in these areas, (2) notifying groundwater users in nitrate high-risk areas, and (3) requiring property owners to sample their well as part of a property title transfer or purchase.

- **Nitrogen Tracking and Reporting.** Developing and implementing a nitrogen mass balance tracking and reporting system to manage the application of nitrogen fertilizing materials.

- **Protecting Groundwater.** Developing an effective system for minimizing discharges of nitrates to groundwater including (1) establishing a nitrogen management training and certification program which recognizes the importance of water quality protection, (2) continuing and improving agricultural nitrate education and research programs, (3) convening a panel of experts to recommend improvements in agricultural nitrate control programs and implementing the recommendations, and (4) evaluating the effectiveness of existing permits to address nitrate contamination in high-risk areas.

Funding to Implement Recommendations

Many recommendations in this report will require a source of funding. The regulatory, monitoring, education and research recommendations fall within existing programs with defined funding sources, but the increased level of effort to implement some of these recommendations will require augmentation of these funding sources. Expansion of existing funding sources will be proposed by the responsible state agencies and considered through the state budget process.

The provision of safe drinking water for disadvantaged communities, however, will require a new funding source. The funding sources presently available for these communities are the Safe Drinking Water State Revolving Fund (SRF), which is capitalized with federal grants, and state bond funds. Experience shows that these sources cannot meet the drinking water needs of disadvantaged communities. The first recommendation in this report addresses the need for a new funding source, which can be used in combination with existing funding sources, to design, build, operate and maintain safe drinking water systems for disadvantaged communities. This action is critical to meet the goals of Chapter 524, Statutes of 2012 (Assembly Bill 685, Eng) which specified the policy of the state that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes.

Table ES-1: Water Board Recommendations to Address Nitrate in Groundwater

Water Board Recommendation	Lead Agencies/ Participants	Requires Legislation?
Providing Safe Drinking Water *An impediment to providing safe drinking water to small Disadvantaged Communities (DACs) impacted by nitrate contamination is the lack of a stable, long-term funding source. A stable funding source integrated with institutional changes is critical in providing long-term safe drinking water infrastructure and interim solutions for the small DACs impacted by nitrate contamination.*		
1. The most critical recommendation in this report is that a new funding source be established to ensure that **all** Californians, including those in DACs, have access to safe drinking water, consistent with AB 685. The Legislature should provide a stable, long-term funding source for provision of safe drinking water for small DACs. Funding sources include a point-of-sale fee[1] on agricultural commodities, a fee on nitrogen fertilizing materials, or a water use fee. In addition, the Legislature also should authorize CDPH to assess a fee in lieu of interest on Safe Drinking Water State Revolving Fund loans, or to assess other fees associated with these loans, to generate funds for expanded assistance to water systems.	California Department of Public Health (CDPH), Water Boards, California Department of Food and Agriculture (CDFA), and Local Government Agencies	Yes
2. The State Water Board and Regional Water Quality Control Boards (collectively referred to as "the Water Boards") will use their authority under the Porter-Cologne Water Quality Control Act (Porter-Cologne) (Water Code, §13000 et seq.) to order parties responsible for nitrate contamination to provide replacement water to impacted communities, as appropriate.	Water Boards, CDPH	No
3. The Legislature should enact legislation to establish a framework of statutory authorities for CDPH, regional organizations, and county agencies to have the regulatory responsibility to assess alternatives for providing safe drinking water and to develop, design, implement, operate, and manage these systems for small DACs impacted by nitrate.[2]	CDPH, County Agencies	Yes
4. State funding agencies should continue to increase access to safe drinking water funding sources for small DACs by streamlining funding applications, providing planning grants, and providing technical assistance.	CDPH, Department of Water Resources (DWR)	No

Table ES-1: Water Board Recommendations to Address Nitrate in Groundwater

Water Board Recommendation	Lead Agencies/ Participants	Requires Legislation?
5. DWR should give preference in the Proposition 84 Integrated Regional Water Management (IRWM) Grant Program to proposals with IRWM Plans that include an evaluation of nitrate impacts, including the access of safe drinking water to small DACs, for areas that have been identified as nitrate high-risk areas	DWR	No
Monitoring, Assessment, and Notification *A groundwater monitoring and assessment program is a critical element in effectively managing groundwater quality.*		
6. The Water Boards will define and identify nitrate high-risk areas in order to prioritize regulatory oversight and assistance efforts in these areas.[2]	Water Boards	No
7. The Legislature should enact legislation that establishes a framework of statutory authority for the Water Boards, in coordination with other state and local agencies, to improve the coordination and cost effectiveness of groundwater quality monitoring and assessment, enhance the integration of monitoring data across departments and agencies, and increase public accessibility to monitoring data and assessment information.[2]	Water Boards, other State and local agencies	Yes
8. The Legislature should enact legislation that establishes a funding source for the State Water Board's Groundwater Ambient Monitoring and Assessment (GAMA) Program.	Water Boards	Yes
9. The Legislature should require state and local agencies to notify groundwater users in nitrate high-risk areas and recommend that the well owners test their wells to evaluate drinking water quality. The Water Boards, CDPH, and local public health agencies will coordinate in identifying private domestic wells and small, unregulated water systems in nitrate high-risk areas.[2]	Water Boards, CDPH, local public health agencies	Yes

Table ES-1: Water Board Recommendations to Address Nitrate in Groundwater

Water Board Recommendation	Lead Agencies/ Participants	Requires Legislation?
10. The Legislature should require property owners with private domestic wells or other unregulated groundwater systems (2 to 14 service connections) to sample their well as part of a point of sale inspection before property title transfer or purchase.	Water Boards, CDPH, local public health agencies	Yes
Nitrogen Tracking and Reporting *According to the UC Davis Nitrate Report, nitrogen fertilizing material application is the main source of nitrate in groundwater. A system to track the application of nitrogen fertilizing materials is a critical element in managing groundwater quality.*		
11. CDFA, in coordination with the Water Boards, should convene a Task Force to identify intended outcomes and expected benefits of a nitrogen mass balance tracking system in nitrate high-risk areas. The Task Force should identify appropriate nitrogen tracking and reporting systems, and potential alternatives, that would provide meaningful and high quality data to help better protect groundwater quality.	CDFA, Water Boards, county agriculture commissioners, local agencies	No
Protecting Groundwater *Contaminated groundwater results in treatment, well closures, or new well construction, which increases costs for consumers and the public. Regulating groundwater is essential in maintaining a safe drinking water supply.*		
12. The Water Boards should continue to provide technical assistance for CDFA's ongoing work with University of California Cooperative Extension (UCCE) and other experts in establishing a nitrogen management training and certification program that recognizes the importance of water quality protection.[2]	CDFA	No
13. CDFA should maintain the mill fee on fertilizing materials at its fully authorized amount to support and develop crop-specific nutrient application rates, Best Management Practices (BMPs), and nutrient management programs via the Fertilizer Research and Education Program (FREP). The information should continue to be made available on-line.	CDFA	No

Table ES-1: Water Board Recommendations to Address Nitrate in Groundwater

Water Board Recommendation	Lead Agencies/ Participants	Requires Legislation?
14. The Water Boards will convene a panel of experts to assess existing agricultural nitrate control programs and develop recommendations, as needed, to ensure that ongoing efforts are protective of groundwater quality. The Water Boards and CDFA will use the findings to inform ongoing regulatory and non-regulatory efforts.[2]	Water Boards, CDFA	No
15. The Water Boards will evaluate all existing Waste Discharge Requirements to determine whether existing regulatory permitting is sufficiently protective of groundwater quality at these sites. The Water Boards will use the findings to improve permitting activities related to nitrate. [2]	Water Boards	No

[1] Although the term fee is used throughout this report, it is beyond the scope of this report to assess whether the fee is a fee or tax under Proposition 26. The term is simply used for convenience and consistency.

[2] Additional funding will be required to adequately implement these strategies.

1.0 Introduction

Nitrate is one of California's most prevalent groundwater contaminants, and can pose significant health risks at concentrations above the public health drinking water standard Maximum Contaminant Level (MCL) of 45 mg/L (as NO_3). High concentrations of nitrate in groundwater are primarily caused by human activities, including fertilizer application (synthetic and manure), animal operations, industrial sources (wastewater treatment and food processing facilities), and septic systems. Agricultural fertilizers and animal wastes applied to cropland are by far the largest regional sources of nitrate in groundwater, although other sources can be locally important. Nitrate in groundwater affects public water systems and groundwater users, requiring treatment or alternative supplies, often at great cost. Small water systems, disadvantaged communities, and private domestic well owners may not be able to afford treatment or development of alternative water supplies.

Due to California's reliance on groundwater, and because many communities are entirely reliant on groundwater for their drinking water supply, nitrate contamination has far-reaching consequences. Solutions to nitrate-contaminated drinking water are achievable, but require additional funding and resources that are currently not available. Access to safe drinking water for every Californian will not take place without additional funding.

Groundwater is an essential part of California's water supply. More than 85 percent of community public water systems, serving roughly 30 million people, rely on groundwater for at least part of their drinking water supply. While nearly all of these water systems provide safe drinking water that meets health standards, a certain number of groundwater supplies have contaminants that are not treated before delivery. In addition, approximately two million residents rely on groundwater from either a private domestic well or a small water system not regulated by the state. For these residents, there is little or no information on the quality of their drinking water.

Groundwater also plays a vital role in supplying water for agricultural and industrial needs. Reduction in surface water availability due to drought, global climate change, and increasing demands from population growth may further increase the state's reliance on groundwater.

Nitrate is one of California's most prevalent groundwater contaminants. While nitrate can form through natural processes, it is primarily present at concentrations above the MCL due to anthropogenic (man-made) activities. A recent report to Legislature[1] by the State Water Board showed that between 2002 and 2010, over 200 community water systems in California had two or more detections of nitrate above the drinking water standard in their groundwater supply. Many of these community water systems serve smaller disadvantaged communities (DAC)[2] that often do not have the resources and financial means to treat their drinking water and provide continuing operation and maintenance (O&M) for a groundwater treatment system. Some small, unregulated groundwater systems and private domestic well owners may also have nitrate-contaminated groundwater; however, the extent of this risk is unknown due to the lack of readily available water quality information for these groundwater users.

1.1 Background on SBX2 1

In 2008, the Governor signed Chapter 1 of the Second Extraordinary Session, Statutes of 2008 (SBX2 1, Perata) into law, requiring the State Water Resources Control Board (State Water Board), in consultation with other agencies, to develop pilot projects in the Tulare Lake Basin and the Salinas Valley (pilot project study areas) that focus on nitrate in groundwater. A copy of the statute is included in Appendix A. SBX2 1 requires the State Water Board to:

- Identify sources, by category of discharger, of groundwater contamination due to nitrate.
- Estimate proportionate contributions to groundwater contamination [by nitrate] by source and category of discharger.
- Identify and analyze options within the State Water Board's current authority to reduce current nitrate levels and to prevent continuing nitrate contamination, and to estimate costs associated with exercising this authority.
- Identify methods and costs associated with the treatment of nitrate-contaminated groundwater that is used for drinking water.
- Identify methods and costs to provide an alternative water supply to groundwater-reliant communities in the pilot project areas.
- Identify potential funding sources to provide resources for cleanup, treatment, and provision of an alternative drinking water supply.
- Develop recommendations for developing a groundwater cleanup program for the Central Valley Water Quality Control Board Region and Central Coast Water Quality Control Board Region based on pilot project results.

[1] "Communities that Rely on a Contaminated Groundwater Source for Drinking Water," Report to the Legislature by the State Water Resources Control Board, February, 2013.
[2] According to the California Health and Safety Code, a DAC is a community where the median household income is less than 80 percent of the statewide average. The definition used in this report includes community water systems and communities that rely on smaller (2-14 connections) unregulated water systems that meet these criteria.

The State Water Board contracted with the University of California, Davis (UC Davis) to conduct an independent study on the nitrate pilot projects in the Tulare Lake Basin and the Salinas Valley (Figure 1). The UC Davis report was delivered to the State Water Board in March 2012 (UC Davis Nitrate Report). The UC Davis report and eight associated technical reports are available online at http://groundwaternitrate.ucdavis.edu/.

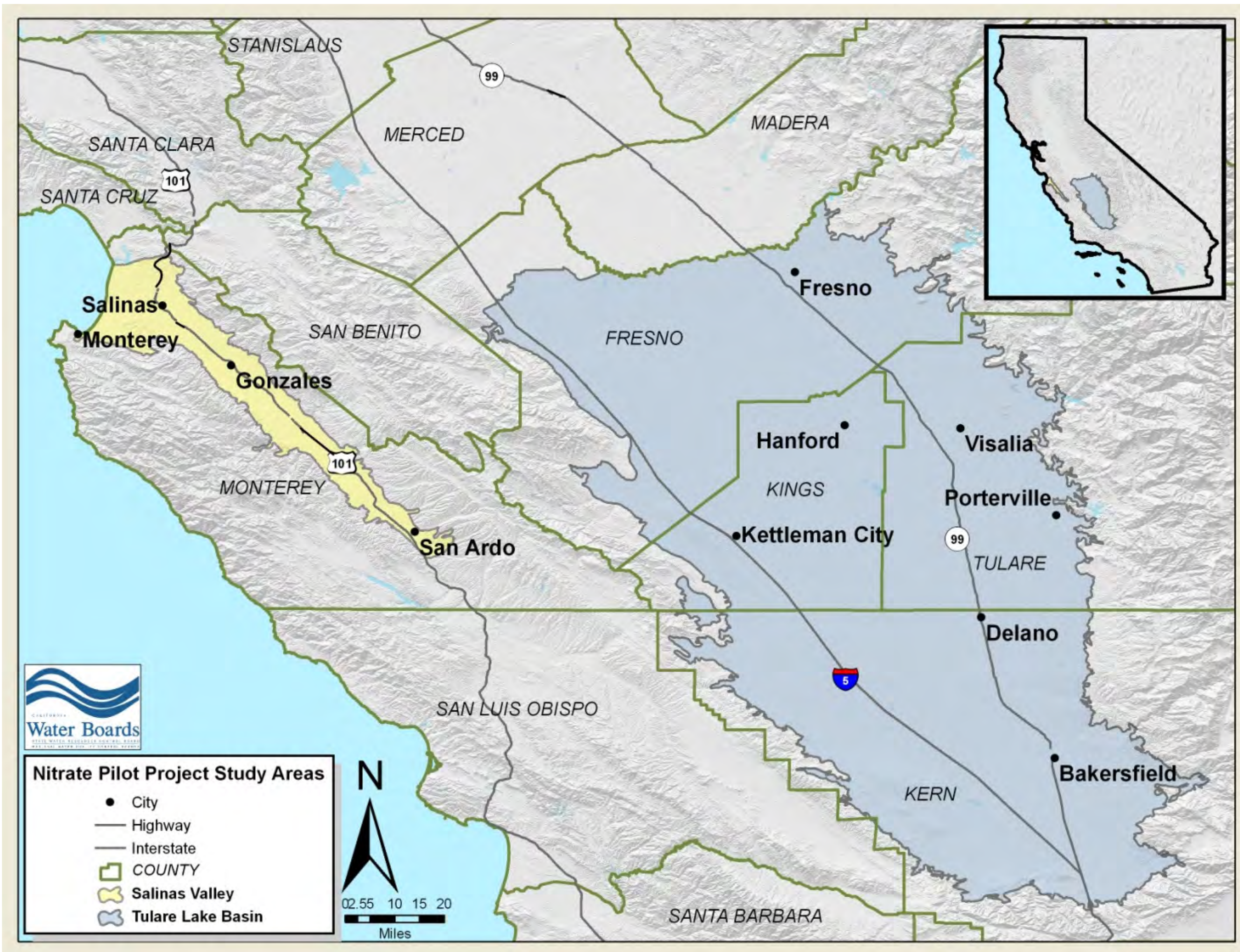


Figure 1: Salinas Valley and Tulare Lake Basin Pilot Project Study Areas (source: *UC Davis Nitrate Report)*.

1.2 Key Findings of the Tulare Lake Basin and the Salinas Valley Pilot Projects

Nitrate loading to groundwater in gigagrams nitrate per year (Gg NO_3/yr) is shown in Figure 2. The UC Davis Nitrate Report identified irrigated agriculture (cropland) as the single largest source of nitrate to groundwater, accounting for 96 percent of the 207 Gg of nitrate delivered to groundwater in the pilot project study areas each year. The 207 Gg is equivalent to approximately 440 million pounds, or 220,000 tons, of nitrate per year. Nitrogen is applied to cropland in the form of synthetic fertilizers or as animal manure. The nitrogen in these fertilizers transforms to nitrate and is carried to groundwater by the percolation of water through the soil column (vadose zone), anytime water from irrigation or rainfall percolates below the root zone. According to the UC Davis Nitrate Report, nitrate loading from irrigated agriculture has occurred at a large scale throughout the pilot project study areas for several decades. It should be noted that from 1990 to 2005 manure use as a fertilizer has increased, the use of synthetic fertilizer has been leveling off and the amount of food produced on the same land has increased.

Other sources of nitrate loading to groundwater include municipal wastewater treatment facilities and food processors (WWTP-FP; 3.2 Gg NO_3/yr), lagoons and ponds associated with confined animal operations (lagoons 0.2 and corrals 0.5 Gg NO_3/yr, respectively), septic tanks (2.3 Gg NO_3/yr), and urban sources (0.9 Gg NO_3/yr).

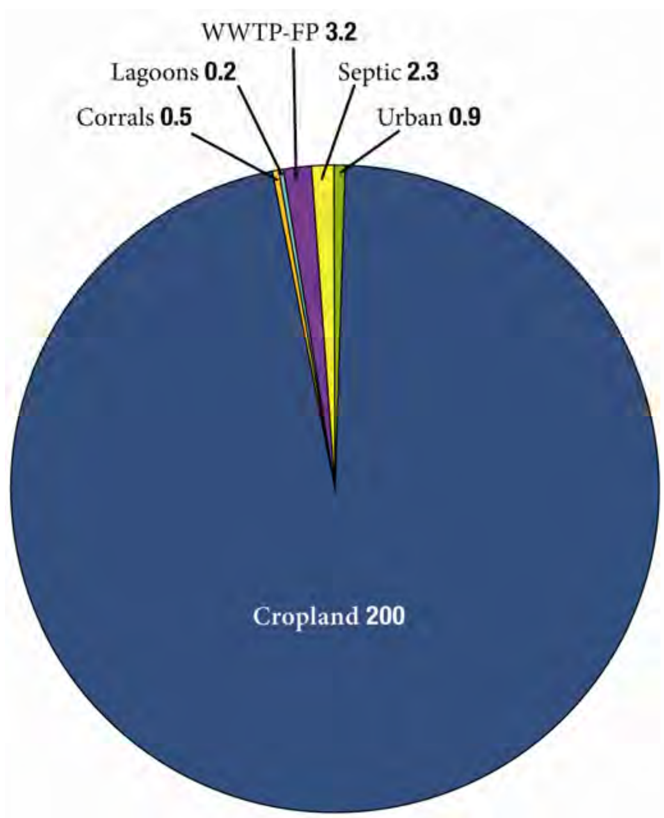


Figure 2: Estimated Nitrate Loading to Groundwater from Major Sources within the Tulare Lake Basin and Salinas Valley (Gg NO_3/yr). 1 gigagram = 1,100 tons or 2.2 million pounds.
Source: UC Davis Nitrate Report

Summary of key findings in the UC Davis Nitrate Report:

1. Nitrate problems will likely worsen for decades. For more than half a century, nitrate from fertilizer and animal waste has infiltrated into Tulare Lake Basin and Salinas Valley aquifers. Most nitrate detected in drinking water wells today was originally applied to the surface decades ago.

2. Agricultural fertilizers and animal wastes applied to cropland are by far the largest regional sources of nitrate in groundwater. Other sources can be locally important.

3. Nitrate loading reductions are possible, some at modest cost. Large reductions of nitrate loads to groundwater can have substantial economic cost.

4. Traditional pump and treat remediation to remove nitrate from large groundwater basins is extremely costly and not technically feasible. Instead, "pump-and-fertilize" and improved groundwater recharge management are less costly long-term alternatives.

5. Drinking water supply actions such as blending, treatment, and alternative water supplies are most cost-effective. Blending will become less available in many cases as nitrate pollution continues to spread.

6. Many small communities cannot afford safe drinking water treatment and supply actions. High fixed costs affect small systems disproportionately.

7. The most promising revenue source is a fee on nitrogen fertilizer use in these basins. A nitrogen fertilizer fee could compensate affected small communities for mitigation expenses and effects of nitrate pollution.

8. Inconsistency and inaccessibility of data prevent effective and continuous assessment of California's groundwater quality. A statewide effort is needed to integrate diverse water-related data-collection activities by many state and local agencies.

2.0 Recommendations Addressing Nitrate in Groundwater

SBX2 1 requires that the State Water Board submit recommendations to the Legislature for developing a groundwater cleanup program for the Central Valley and Central Coast Regional Water Boards. However, the UC Davis Nitrate Report states that traditional pump and treat groundwater cleanup in these pilot study areas is not technically feasible and would cost billions of dollars over many decades.

The recommendations included here focus on addressing the impacts of existing groundwater nitrate contamination, and highlight options that will be effective in preventing future contamination. Additional recommendations are included to address monitoring groundwater quality and tracking nitrogen application.

The State Water Board considered input and findings from various sources in the development of this report's recommendations. Sources include input from the Interagency Task Force or ITF (as required by SBX2 1), findings of the UC Davis Nitrate Report, public input from a State Water Board workshop held in May 2012, findings of a special drinking water taskforce convened by the Governor's office, and existing efforts by the Regional Water Quality Control Boards (Regional Water Boards).

The ITF consisted of representatives from the California Department of Public Health (CDPH), Department of Pesticide Regulation (DPR), Department of Water Resources (DWR), Department of Toxic Substances Control (DTSC), California Department of Food and Agriculture (CDFA), California Environmental Protection Agency (Cal/EPA), and county environmental health departments.

The UC Davis Nitrate Report (Appendix B) lists eighteen "Promising Actions" that could be implemented to address nitrate contamination within the study areas.

The Governor's Drinking Water Stakeholder Group (Governor's Stakeholder Group) is comprised environmental justice advocates, agricultural representatives, and other stakeholders, with technical support from state agencies. They addressed: 1) developing a shared understanding of the O&M and other challenges encountered to access agency programs; 2) identifying promising solutions (which may focus on the Tulare and Salinas regions); 3) developing a plan to address identified challenges and promising solutions with a high likelihood of success; and 4) making a recommendation to the Governor's Office. The Governor's Stakeholder Group submitted a final report to the Governor's Office on August 20, 2012, which summarized findings and legislative recommendations. A copy of this report is included as Appendix C.

The State Water Board and Regional Water Boards (collectively, the Water Boards) are currently engaged in numerous efforts to address nitrate contamination in groundwater. The State Water Board is implementing the Recycled Water Policy (State Water Board Resolution 2009-0011), which requires local water agencies, wastewater facilities, and salt and nutrient contributing stakeholders to fund locally-driven collaborative processes to prepare salt and nutrient management plans for each groundwater basin/sub-basin in California. The State Water Board also adopted and is beginning implementation of its Water Quality Control Policy for Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems (State Water Board Resolution 2012-0032), which addresses septic tank systems throughout the State. The Central Valley Water Board and State Water Board are actively participating in the stakeholder driven Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) initiative to develop a Central Valley wide salt and nitrate management plan that contains both short and long-term implementation components to enhanced water quality and economic sustainability for the region. The program is investigating methods to address safe water access for communities currently utilizing nitrate contaminated groundwater. The Central Valley Water Board is also addressing groundwater nitrate contamination through an on-going Groundwater Quality Protection Strategy, which aims to develop a roadmap for future regulatory and control activities that will be implemented in the next five to 20 years. The Central Coast Regional Board's actions include efforts associated with their agricultural regulatory program, public outreach efforts, and issuance of waste discharge permits that are protective of groundwater quality. These programs (and others) are summarized in Appendix D.

State Water Board Recommendations

The State Water Board grouped its recommendations into four main categories:

- Providing Safe Drinking Water
- Monitoring, Assessment and Notification
- Nitrogen Tracking and Reporting
- Protecting Groundwater

The recommendations in this report address groundwater nitrate contamination within the Tulare Lake Basin and Salinas Valley pilot project study areas, but may also be appropriate for statewide implementation.

Many of the listed recommendations are outside the scope of the Water Boards' current authority, and other recommendations may require new legislation. A summary of the recommendations, highlighting lead agencies and need for legislation, is provided in Table 1.

Funding to Implement Recommendations

Many recommendations in this report will require a source of funding. The regulatory, monitoring, education and research recommendations fall within existing programs with defined funding sources, but the increased level of effort to implement some of these recommendations will require augmentation of these funding sources. Expansion of existing funding sources will be proposed by the responsible state agencies and considered through the state budget process.

The provision of safe drinking water for disadvantaged communities, however, will require a new funding source. The funding sources presently available for these communities are the Safe Drinking Water State Revolving Fund (SRF), which is capitalized with federal grants, and state bond funds. Experience shows that these sources cannot meet the drinking water needs of disadvantaged communities. The first recommendation in this report addresses the need for a new funding source, which can be used in combination with existing funding sources, to design, build, operate and maintain safe drinking water systems for disadvantaged communities. This action is critical to meet the goals of Chapter 524, Statutes of 2012 (Assembly Bill 685, Eng) which specified the policy of the state that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes.

Potential funding sources are described in detail in the text of the recommendations below.

Table 1: Water Board Recommendations to Address Nitrate in Groundwater

Water Board Recommendation	Lead Agencies/ Participants	Requires Legislation?
Providing Safe Drinking Water *An impediment to providing safe drinking water to small Disadvantaged Communities (DACs) impacted by nitrate contamination is the lack of a stable, long-term funding source. A stable funding source integrated with institutional changes is critical in providing long-term safe drinking water infrastructure and interim solutions for the small DACs impacted by nitrate contamination.*		
1. The most critical recommendation in this report is that a new funding source be established to ensure that **all** Californians, including those in DACs, have access to safe drinking water, consistent with AB 685. The Legislature should provide a stable, long-term funding source for provision of safe drinking water for small DACs. Funding sources include a point-of-sale fee[1] on agricultural commodities, a fee on nitrogen fertilizing materials, or a water use fee. In addition, the Legislature also should authorize CDPH to assess a fee in lieu of interest on Safe Drinking Water State Revolving Fund loans, or to assess other fees associated with these loans, to generate funds for expanded assistance to water systems.	California Department of Public Health (CDPH), Water Boards, California Department of Food and Agriculture (CDFA), and Local Government Agencies	Yes
2. The Water Boards will use their authority under the Porter-Cologne Water Quality Control Act (Porter-Cologne) (Water Code, §13000 et seq.) to order parties responsible for nitrate contamination to provide replacement water to impacted communities, as appropriate.	Water Boards, CDPH	No
3. The Legislature should enact legislation to establish a framework of statutory authorities for CDPH, regional organizations, and county agencies to have the regulatory responsibility to assess alternatives for providing safe drinking water and to develop, design, implement, operate, and manage these systems for small DACs impacted by nitrate.[2]	CDPH, County Agencies	Yes
4. State funding agencies should continue to increase access to safe drinking water funding sources for small DACs by streamlining funding applications, providing planning grants, and providing technical assistance.	CDPH, Department of Water Resources (DWR)	No

Table 1: Water Board Recommendations to Address Nitrate in Groundwater

Water Board Recommendation	Lead Agencies/ Participants	Requires Legislation?
5. DWR should give preference in the Proposition 84 Integrated Regional Water Management (IRWM) Grant Program to proposals with IRWM Plans that include an evaluation of nitrate impacts, including the access of safe drinking water to small DACs, for areas that have been identified as nitrate high-risk areas	DWR	No
Monitoring, Assessment, and Notification *A groundwater monitoring and assessment program is a critical element in effectively managing groundwater quality.*		
6. The Water Boards will define and identify nitrate high-risk areas in order to prioritize regulatory oversight and assistance efforts in these areas.[2]	Water Boards	No
7. The Legislature should enact legislation that establishes a framework of statutory authority for the Water Boards, in coordination with other state and local agencies, to improve the coordination and cost effectiveness of groundwater quality monitoring and assessment, enhance the integration of monitoring data across departments and agencies, and increase public accessibility to monitoring data and assessment information.[2]	Water Boards, other State and local agencies	Yes
8. The Legislature should enact legislation that establishes a funding source for the State Water Board's Groundwater Ambient Monitoring and Assessment (GAMA) Program.	Water Boards	Yes
9. The Legislature should require state and local agencies to notify groundwater users in nitrate high-risk areas and recommend that the well owners test their wells to evaluate drinking water quality. The Water Boards, CDPH, and local public health agencies will coordinate in identifying private domestic wells and small, unregulated water systems in nitrate high-risk areas.[2]	Water Boards, CDPH, local public health agencies	Yes

Table 1: Water Board Recommendations to Address Nitrate in Groundwater

Water Board Recommendation	Lead Agencies/ Participants	Requires Legislation?
10. The Legislature should require property owners with private domestic wells or other unregulated groundwater systems (2 to 14 service connections) to sample their well as part of a point of sale inspection before property title transfer or purchase.	Water Boards, CDPH, local public health agencies	Yes
Nitrogen Tracking and Reporting *According to the UC Davis Nitrate Report, fertilizing material application is the main source of nitrate in groundwater. A system to track the application of fertilizing materials is a critical element in managing groundwater quality.*		
11. CDFA, in coordination with the Water Boards, should convene a Task Force to identify intended outcomes and expected benefits of a nitrogen mass balance tracking system in nitrate high-risk areas. The Task Force should identify appropriate nitrogen tracking and reporting systems, and potential alternatives, that would provide meaningful and high quality data to help better protect groundwater quality.	CDFA, Water Boards, county agriculture commissioners, local agencies	No
Protecting Groundwater *Contaminated groundwater results in treatment, well closures, or new well construction, which increases costs for consumers and the public. Regulating groundwater is essential in maintaining a safe drinking water supply.*		
12. Water Boards should continue to provide technical assistance for CDFA's ongoing work with University of California Cooperative Extension (UCCE) and other experts in establishing a nitrogen management training and certification program that recognizes the importance of water quality protection.[2]	CDFA	No
13. CDFA should maintain the mill fee on fertilizing materials at its fully authorized amount to support and develop crop-specific nutrient application rates, Best Management Practices (BMPs), and nutrient management programs via the Fertilizer Research and Education Program (FREP). The information should continue to be made available on-line.	CDFA	No

Table 1: Water Board Recommendations to Address Nitrate in Groundwater

Water Board Recommendation	Lead Agencies/ Participants	Requires Legislation?
14. The Water Boards will convene a panel of experts to assess existing agricultural nitrate control programs and develop recommendations, as needed, to ensure that ongoing efforts are protective of groundwater quality. The Water Boards and CDFA will use the findings to inform ongoing regulatory and non-regulatory efforts.[2]	Water Boards, CDFA	No
15. The Water Boards will evaluate all existing Waste Discharge Requirements to determine whether existing regulatory permitting is sufficiently protective of groundwater quality at these sites. The Water Boards will use the findings to improve permitting activities related to nitrate.[2]	Water Boards	No

[1] Although the term fee is used throughout this report, it is beyond the scope of this report to assess whether the fee is a fee or tax under Proposition 26. The term is simply used for convenience and consistency.
[2] Additional funding will be required to adequately implement these strategies.

2.1 Providing Safe Drinking Water

Small DACs face specific challenges related to their drinking water systems. Due to their small customer base, DACs often cannot provide the economies of scale necessary to build and maintain adequate drinking water infrastructure. Small rural communities generally face higher per capita O&M costs and capital costs that result in higher water rates.

The challenges DACs face generally result from a lack of adequate financial resources and technical expertise. DACs are often unable to retain qualified water system operators. When their drinking water violates safe water quality standards, they often lack the resources to address the problem. Even if these communities obtain financial resources to improve their drinking water systems, often they lack sufficient technical expertise to determine the best project alternative, or to appropriately plan for long-term O&M.

Addressing the human health and water quality problems associated with nitrate, and in particular those that face DACs, is a major goal for California.

Providing Safe Drinking Water: Recommendation 1

Recommendation 1

The most critical recommendation in this report is that a new funding source be established to help ensure that ***all*** *Californians, including those in DACs, have access to safe drinking water, consistent with AB 685. The Legislature should provide a stable, long-term funding source for provision of safe drinking water for small DACs. Funding sources could include a point-of-sale fee on agricultural commodities, a fee on synthetic and organic nitrogen fertilizers and fertilizing materials, or a water use fee. In addition, the Legislature also should authorize CDPH to assess a fee in lieu of interest on Safe Drinking Water State Revolving Fund loans, or to assess other fees associated with these loans, to generate funds for expanded assistance to water systems.*

AB 685 defines access to safe drinking water as a fundamental human right. The single most important action that can be taken to help ensure safe drinking water for all Californians is to provide a stable, long-term source(s) of funding to assist those impacted by nitrate-contaminated groundwater. Solutions to nitrate-contaminated drinking water are achievable, but require significant additional funding and resources that are currently not available. Without additional funding, access to safe drinking water for all Californians will not be achieved.

Additional funding would augment the existing Safe Drinking Water SRF program to address the needs of small water systems and small DACs. Additional funding could be used to pay for long-term treatment of nitrate contaminated drinking water, O&M costs for small DACs that cannot afford the extra costs associated with nitrate treatment, development of alternative drinking water sources, and short-term interim safe drinking water measures (such as point-of-use systems) in small DACs. Funding could be prioritized to include both community water systems and groundwater users that do not qualify for traditional Safe Drinking Water SRF funding, such as private domestic well users. In order to meet the goals of AB 685, the Legislature should establish a new revenue source to address safe drinking water needs that are unmet by current funding sources.

The UC Davis Nitrate Report estimated that up to $36 million is needed annually to fund long-term safe drinking water solutions for nitrate in the pilot study areas; statewide costs will be significantly higher. Three funding sources could address the estimated need:

- point-of-sale fee[3] on agricultural commodities,
- fee on nitrogen fertilizers, or
- water use fee.

[3] Although the term fee is used throughout this report, it is beyond the scope of this report to assess whether the fee is a fee or tax under Proposition 26. The term is simply used for convenience and consistency.

A point-of-sale fee on agricultural commodities, similar to the timber fee passed by the Legislature and signed into law in 2012, would generate significant revenue to address agriculture-related water quality issues. The UC Davis report found that nitrogen from confined animal facilities is a major source of nitrogen to groundwater. As a result, products from these industries are likely candidates for initial point of point-of-sale assessments. The fee could apply not only to California produced goods, but also to imports and therefore would not place California-produced products at a competitive disadvantage. However, such fees can be burdensome on low-income residents. Additionally, this type of fee does not provide an economic incentive to reduce total nitrogen load to the environment.

A fee on nitrogen fertilizing materials of approximately $100 to $180 per ton of nitrogen would generate between $20 million and $36 million per year. The UC Davis Nitrate Report identified a fee on nitrogen fertilizer as the most promising source of additional revenue, in part because the economic disadvantage of paying for excess nitrogen fertilizer would function as an incentive to reduce total nitrogen loading to the environment. A fertilizer fee would require that the predominant source of nitrogen groundwater pollution in the study area pay to address the problem. However, the fee may increase costs for California's farmers and ranchers, and some of the costs could be passed on to consumers, including low-income residents. In addition, while the cost of this alternative will mostly fall on existing farming operations the present groundwater nitrate contamination is the result of past agricultural operations because of the lag time for nitrogen to reach groundwater.

A water use fee would generate funding for safe drinking water needs, would be distributed to all public water users, and would not disproportionately impact California farmers and ranchers. The fee could be tailored to include municipal users, agricultural users, or both. However, a water use fee may be viewed as a burden on low-income residents, and would not incentivize reductions in nitrogen loading to groundwater.

The Legislature should restrict the use of revenues generated from the point of sale fee or nitrogen fertilizing materials fee to address only drinking water issues related to agriculture. Sources of nitrate contamination related to non-agricultural activities (septic systems, point-source discharges) can be locally significant and should be addressed using other methods, including existing Water Board authority to require groundwater cleanup and alternative water supplies.

In addition, the Legislature also should authorize CDPH to assess a fee in lieu of interest on Safe Drinking Water State Revolving Fund loans, or to assess other fees associated with these loans, to generate funds for expanded assistance to water systems, to the extent allowed by federal law. This authority could be similar to the authority provided to the State Water Board by Chapter 609, Statutes of 2008 (AB 2356, Arambula) which allows the State Water Board to assess a fee, in lieu of interest on loans financed from the Clean Water SRF to provide grants to small DACs for wastewater collection, treatment or disposal projects. Similarly, Chapter 632, Statutes of 2007 (AB 1742, Committee on Environmental Safety and Toxic Materials) allows the State Water Board to assess a fee, in lieu of interest on loans from the Clean Water State Revolving Fund to pay for the costs of the administering the loan program. These types of fees can provide valuable funding for DACs with no increased costs to the borrowers.

In summary, a stable, long-term source(s) of funding is critical to assist those impacted by nitrate-contaminated groundwater, and to ensure safe drinking water. Without additional funding, this will not be achievable. The three funding sources described above: point of sale fee, nitrogen fertilizing materials fee, and/or water use fee, are all options to generate the necessary funding. Each funding source has its advantages and disadvantages. Any of these funding sources, or a combination, should be used to generate the necessary long-term funds to address safe drinking water needs.

SUMMARY OF CURRENT FUNDING SOURCES AND NEEDS

There are many sources of funding for safe drinking water infrastructure repair and improvements, including state, federal, and non-profit organizations. However, many of these funding sources are limited and not available on a long-term basis. The Governor's Stakeholder Group report includes a summary of resources that are available to address safe drinking water issues (Appendix C).

Critical problems face California with respect to funding safe drinking water issues. The U.S. Environmental Protection Agency (USEPA) Infrastructure Needs Assessment in 2009 estimated that over the next 20 years California would need nearly $40 billion in drinking water infrastructure upgrades and improvements. However, California only receives a fraction of this overall need, approximately $2 billion annually. The largest source of continuous public funding is the Safe Drinking Water SRF, administered by CDPH. The Safe Drinking Water SRF provides low-interest loans to public water systems to address known drinking water issues. The Safe Drinking Water SRF loans between $100 million and $200 million annually statewide and is funded by the loan repayments, USEPA capitalization grants, state matching funds, and interest on loan repayments. Despite the significant level of Safe Drinking Water SRF funding, the amount needed to address statewide safe drinking water issues far exceeds what is available. In the pilot project study areas only, the UC Davis Nitrate Report has calculated that up to $36 million per year is needed for safe drinking water solutions to address nitrate contamination; statewide costs are estimated to be significantly higher. This illustrates the gap between the revenue needed to address groundwater nitrate contamination and the funding that is currently available. Under existing state and federal law the Safe Drinking Water SRF can only be used to pay for capital costs (construction, equipment, planning), and cannot be used to fund long-term O&M. Presently, a community water system can only receive Safe Drinking Water SRF money after showing that it can pay for long-term O&M. It is often difficult for small communities to pay for costly treatment systems and associated O&M. This can lead to situations where community water systems are unable to receive funding for a known water quality issue because they cannot afford to support the operation of the treatment system.

Private domestic wells and other small, unregulated water systems cannot use Safe Drinking Water SRF money. Safe Drinking Water SRF money is only available for public water systems (15 or more service connections or serving 25 or more permanent residents per year). The water quality of private domestic wells and other small, unregulated water systems (2 to 14 service connections) in California is largely unknown, because there are no state requirements to test the water quality in these types of systems. Regional groundwater quality information suggests that these wells are typically shallower which makes them more vulnerable to surface contamination. There are limited options for private domestic wells contaminated by nitrate, such as point-of-use or point-of-entry treatment, or drilling a new well. Helping private domestic well owners and other small, unregulated water systems address nitrate contamination by funding treatment or new well construction will require a clear funding source.

Providing Safe Drinking Water: Recommendation 2

Recommendation 2

The Water Boards will use their authority under the Porter-Cologne Water Quality Control Act (Porter-Cologne) (Water Code, §13000 et seq.) to order parties responsible for nitrate contamination to provide replacement water to impacted communities, as appropriate.

Other means of addressing nitrate contamination will need to be further pursued if a stable, long-term funding source addressing nitrate-related drinking water issues is not developed. Under Water Code Section 13304, the Water Boards have the authority to require the provision of, or payment for, uninterrupted replacement water service as part of a cleanup and abatement order. Replacement water may include both short and long-term solutions, such as providing bottled water or installing wellhead treatment and point-of-use systems.

The Water Boards will take enforcement actions against responsible agricultural parties and others who contribute to nitrate groundwater contamination, and require them to provide replacement water as an interim solution, if a stable, long-term funding source is not developed.

Providing Safe Drinking Water: Recommendation 3

Recommendation 3

The Legislature should enact legislation to establish a framework of statutory authorities for CDPH, regional organizations, and county agencies to have the regulatory responsibility to assess alternatives for providing safe drinking water and to develop, design, implement, operate, and manage these systems for small DACs impacted by nitrate.

Many small DACs lack the resources to fund, manage, and operate a water treatment system or alternative water supply. CDPH has a legislatively defined role in addressing drinking water quality; however, there are statutory limits on the types of water systems that are eligible to receive aid and CDPH's options for helping to address the needs of small DACs. The Legislature should update the existing institutional framework to expand the regulatory and oversight authority of CDPH, regional organizations, and county agencies, so that these agencies can use the funding identified in Recommendation 1 to address safe drinking water needs.

Under these updated statutory authorities, CDPH, regional organizations, and county agencies would be responsible for evaluating the needs of small DACs (including systems with 2 to 14 connections) and for ensuring the provision of safe drinking water in those communities. The responsible agencies should have broad authority in determining the best course of action to provide safe drinking water, including shared solutions (consolidation or regionalization), long-term treatment measures, and installation of point-of-use systems.

The legislation should mandate that the development, design, implementation, operation, and management of safe drinking water solutions in small DACs is the responsibility of either CDPH, a regional or non-governmental organization, or county agency when the small DAC cannot implement a safe drinking water solution on its own.

Providing Safe Drinking Water: Recommendation 4

Recommendation 4

State funding agencies should continue to increase access to safe drinking water funding sources for small DACs by streamlining funding applications, providing planning grants, and providing technical assistance.

The Governor's Stakeholder Group identified increasing access to existing funding sources for small DACs as critical for both long-term and interim safe drinking water solutions. In addition, the Governor's Stakeholder Group recommended making existing funding systems and requirements easier to navigate.

Existing state funding agencies, which include the State Water Board, CDPH, and DWR, should continue to evaluate their funding applications and determine whether the application process can be streamlined for small DACs. State agencies also should continue to evaluate whether small DACs need additional technical assistance to navigate the funding process.

State and Federal law prohibits small DACs with less than 15 service connections from receiving Safe Drinking Water SRF funds. However, the proposed funding source(s) in Recommendation 1 could be used for local planning and grants for small DACs, regardless of the system size. The funding agency could establish less restrictive criteria on who can apply for these funds. A fee in lieu of interest or an administrative fee set aside on financing agreements within the Safe Drinking Water SRF could also provide funding for planning grants.

Providing Safe Drinking Water: Recommendation 5

Recommendation 5

DWR should give preference in the Proposition 84 Integrated Regional Water Management (IRWM) Grant Program to proposals with IRWM Plans that include an evaluation of nitrate impacts, including the access of safe drinking water to small DACs, for areas that have been identified as nitrate high-risk areas.

IRWM is a collaborative effort to manage all aspects of water resources in a given region. IRWM crosses jurisdictional, watershed, and political boundaries; involves multiple agencies, stakeholders, individuals, and groups; and attempts to address the issues and differing perspectives of all the entities involved through mutually beneficial solutions.

DWR has a number of IRWM Grant Program funding opportunities, including grants for planning and implementation. DWR should give preference in the IRWM Grant program to proposals with IRWM Plans in nitrate high-risk areas that include an evaluation of nitrate impacts, including the access of safe drinking water to small DACs.

2.2 Monitoring, Assessment, and Notification

Monitoring and assessment are necessary elements of an effective program addressing nitrate in groundwater. Monitoring is required to evaluate the populations affected by nitrate groundwater contamination and to evaluate the effectiveness of groundwater protection measures.

Monitoring, Assessment, and Notification: Recommendation 6

Recommendation 6

The Water Boards will define and identify nitrate high-risk areas in order to prioritize regulatory oversight and assistance efforts in these areas.

Existing water quality, land-use, and geology can result in certain areas being more susceptible to nitrate groundwater contamination. Consequently, different management methods may be necessary in areas that are at greater risk for nitrate contamination. Identification of nitrate high-risk areas will help prioritize regulatory oversight and assistance efforts.

The Water Boards will develop a definition of a nitrate high-risk area, using both the hydrogeologically vulnerable areas identified by the State Water Board (http://www.waterboards.ca.gov/gama/docs/hva_map_table.pdf) as well as current DPR Groundwater Protection Areas (http://www.cdpr.ca.gov/docs/emon/grndwtr/gwpa_locations.htm), in addition to other available hydrogeologic data. The State Water Board will make maps of the nitrate high-risk areas publicly available, which allow them to also be used by other state and local agencies for regulatory and planning purposes. CDFA, in coordination with the Water Boards, will convene a Task Force to evaluate whether tracking nitrogen mass loading in the high-risk areas will better protect groundwater quality (Recommendation 11). Components of existing agricultural nitrate control programs for managing nitrate in groundwater also will be evaluated in identified nitrate high-risk areas (Recommendation 14).

The Water Boards will reassess the nitrate high-risk area boundaries as groundwater quality data are submitted and will re-evaluate the nitrate high-risk area boundaries every five years to coincide with publication of DWR's California Water Plan.

Monitoring, Assessment, and Notification: Recommendation 7

Recommendation 7

The Legislature should enact legislation that establishes a framework of statutory authority for the Water Boards, in coordination with other state and local agencies, to improve the coordination and cost effectiveness of groundwater quality monitoring and assessment, enhance the integration of monitoring data across departments and agencies, and increase public accessibility to monitoring data and assessment information.

Monitoring and assessment is an essential part of an effective program to address nitrate in groundwater, and to establish a baseline of ambient conditions. Currently, multiple state and local agencies collect groundwater quality data. A statewide effort to coordinate and establish general approaches and protocols for collecting, housing, and sharing groundwater quality data is critical in effectively managing California's groundwater.

The Legislature should establish a framework of statutory authority for the Water Boards to improve the coordination and cost effectiveness of groundwater quality monitoring and assessment throughout the state. The Water Boards should coordinate with other state and local agencies, similar to the successful effort undertaken by the California Water Quality Monitoring Council established by Chapter 750, Statutes of 2006 (SB 1070, Kehoe).

The legislation also should authorize the Water Boards to address data integration across departments and agencies, and make groundwater quality monitoring data publicly accessible, when possible, on the groundwater information system developed for the State Water Board's Groundwater Ambient Monitoring and Assessment (GAMA) Program called GeoTracker GAMA. To make data more easily accessible to regulators and the public, submission of all future groundwater data collected for any State or Regional Water Board permit, order, or action will be in a format compatible with GeoTracker GAMA.

Monitoring, Assessment, and Notification: Recommendation 8

Recommendation 8

The Legislature should enact legislation that establishes a funding source for the State Water Board's GAMA Program.

GeoTracker GAMA compiles groundwater quality data from multiple sources, and makes it available to the public. It is a potential repository for groundwater data collected by agencies and could be used to coordinate groundwater monitoring and assessments (Recommendation 7). The proposed funding sources described in Recommendation 1 could be used to fund the GAMA Program.

The GAMA Program implements the plan required by the Groundwater Quality Monitoring Act of 2001 (Water Code Section 10781, added by Statutes of 2001, Chapter 522 (AB 599)). The program currently has two funding sources: the Waste Discharge Permit Fund, which is funded from regulatory fees, and Proposition 50 bond funding.

Current funding supports four active GAMA projects: Priority Basin, Special Studies, Domestic Wells and the GeoTracker GAMA online groundwater information system. The majority of GAMA funding comes from Proposition 50 bond sales that will expire in 2017, leaving key projects unfunded.

The groundbreaking GAMA Priority Basin Project is a joint effort between the State Water Board, United States Geological Survey (USGS), and Lawrence Livermore National Laboratory (LLNL). The project analyzes groundwater quality in basins that supply over 95 percent of the groundwater used for drinking water, evaluates baseline water quality in those basins, and examines trends in groundwater quality to determine future threats to California's groundwater supply. It has recently added a shallow aquifer element to assess groundwater primarily used by private domestic well users and other small, unregulated water systems. If Proposition 50 funding cannot be replaced by 2014, the State Water Board will be required to discontinue sampling for the Priority Basin Project, and if no funding is provided by 2017, the Priority Basin Project will end. The Legislature should enact legislation that establishes a stable funding source for the GAMA Program by 2014.

Monitoring, Assessment, and Notification: Recommendation 9

Recommendation 9

The Legislature should require state and local agencies to notify groundwater users in nitrate high-risk areas and recommend that the well owners test their wells to evaluate drinking water quality. The Water Boards, CDPH, and local public health agencies will coordinate in identifying private domestic wells and small, unregulated water systems in nitrate high-risk areas.

Private domestic well users and small, unregulated groundwater systems (2 to 14 service connections) typically rely on shallow groundwater, which can be at greater risk of nitrate contamination. The State does not require water quality testing from private domestic wells and unregulated small groundwater systems. As a result, many of these groundwater users are unaware of their drinking water quality and potential health risks.

The State Water Board, CDPH, and local public health agencies should coordinate to help identify areas with private domestic wells and small, unregulated water systems, and develop public outreach programs to encourage water well testing in nitrate high-risk areas. The State Water Board should provide online support to assist these well owners in sampling their wells and interpreting the results.

Small DACs and private domestic well owners with nitrate test results above the public drinking water standard (MCL) would be eligible for financial and technical assistance, including funding as discussed in Recommendation 1.

Monitoring, Assessment, and Notification: Recommendation 10

Recommendation 10

The Legislature should require property owners with either a private domestic well or other unregulated groundwater system (2 to 14 service connections) to sample their well and disclose its water quality as part of a point of sale inspection before property title transfer or purchase.

Approximately two million Californians rely on groundwater from either a private domestic well or a smaller water system that is not regulated by the state. The quality of drinking water supplied by these wells is largely unknown. In addition, these water systems typically tap into shallow groundwater that is more susceptible to contamination.

The State Water Board's GAMA Domestic Well Project was developed in order to address the lack of domestic well water quality data. Since 2002, the Domestic Well Project has sampled over 1,100 private domestic wells in six county focus areas; however, this represents only a small percentage of the estimated 250,000 to 600,000 unregulated drinking water wells in the state. Results show that nitrate can be a significant water quality issue, such as in Tulare County where over 40 percent of the wells sampled detected nitrate above the MCL. Continued private domestic well sampling will help identify local and regional nitrate issues that may affect well owners.

The Legislature should require property owners with either a private domestic well or other unregulated groundwater system to sample their well as part of a point of sale inspection before a property title transfer or purchase to inform property owners and potential property owners, on the water quality of their well. The water quality results should be disclosed to property tenants through property owner notifications.

2.3 Nitrogen Tracking and Reporting

The UC Davis Nitrate Report found that approximately 440 million pounds of nitrate leach into groundwater each year within the pilot project study areas, and that a significant percent of this total comes from lands that are currently used for irrigated agriculture (including dairy cropland).

Nitrogen mass balance is an important part of a farmer's nitrogen management program. The outcomes and benefits of a nitrogen mass balance tracking system that provides meaningful and high quality data should be evaluated, and alternative methods of nitrogen tracking and reporting should also be evaluated. The recommendation below is aimed at helping regulators and growers track nitrogen use within the study area.

Nitrogen Tracking and Reporting: Recommendation 11

Recommendation 11

CDFA, in coordination with the Water Boards, should convene a Task Force to identify intended outcomes and expected benefits of a nitrogen mass balance tracking system in nitrate high-risk areas. The Task Force should identify appropriate nitrogen tracking and reporting systems, and potential alternatives, that would provide meaningful and high quality data to help better protect groundwater quality.

CDFA, in coordination with the Water Boards, should convene a Task Force to identify intended outcomes and expected benefits of a nitrogen mass balance tracking system in nitrate high-risk areas (Recommendation 6). The Task Force should identify appropriate nitrogen tracking and reporting systems, and potential alternatives, that will provide meaningful and high quality data to help CDFA and the Water Boards better protect groundwater quality. The Task Force should include appropriate state and local agencies as well as stakeholder groups. The Task Force should consider evaluating existing models such as the Central Coast and Central Valley Regional Water Board models.

Accounting for nutrient management at the farm scale is important for growers to control costs, ensure quality, maximize yield, and minimize the risk of excess nutrients in the environment. Accounting for nitrogen is also an important component of compliance with the Water Boards' agricultural regulatory program requirements. A system to track nitrogen in nitrate high risk areas may be essential to help assess whether nitrogen loading is a threat to water quality and whether additional regulatory actions are necessary (Recommendation 14).

The Task Force should report their findings and any appropriate nitrogen mass balance tracking methods and alternatives to CDFA and the State Water Board to use in the design of any nitrogen fertilizer tracking program that could be implemented in nitrate high-risk areas (Recommendation 6) through new regulatory approaches (Recommendation 14).

2.4 Protecting Groundwater

The UC Davis Nitrate Report has identified that traditional groundwater remediation of nitrate on a basin or study area-wide scale is not technically feasible since it would cost billions of dollars over many decades. Once nitrate contaminates groundwater it will remain contaminated until natural denitrification lowers concentrations, or until the source is removed and the aquifer is replenished. These are very slow processes. Preventing contamination is the best long-term option to manage groundwater quality.

Protecting Groundwater: Recommendation 12

Recommendation 12

The Water Boards should continue to provide technical assistance for CDFA's ongoing work with University of California Cooperative Extension (UCCE) and other experts in establishing a nitrogen management training and certification program that recognizes the importance of water quality protection.

The Water Boards and CDFA have responsibilities to protect water quality from the adverse effects of agricultural use of nitrogen fertilizing materials (synthetic fertilizers, manure, compost and other organic nitrogen supplements). The state will benefit from establishing a more formal, unified, and cooperative program between the Water Boards and CDFA to balance nitrogen use and agricultural productivity with water quality protection.

Water Boards should continue to provide technical assistance for CDFA's ongoing work with University of California Cooperative Extension (UCCE) and other experts in establishing a nitrogen management training and certification program as a tool to manage nitrogen application rates that are appropriate for the crop being grown. The training and certification program, should recognize the complexity of nitrogen management in California and the importance of water quality protection. A major goal of a professionalized nitrogen management training and certification program, overseen by CDFA, is to assist farmers in managing agricultural uses of nitrogen and ultimately reduce nitrate loading to groundwater. Development of a nitrogen management training and certification program will help reduce the need to propose new control measures to address nitrate in groundwater (Recommendation 14).

Protecting Groundwater: Recommendation 13

Recommendation 13

CDFA should maintain the mill fee on fertilizing materials at its fully authorized amount to support and develop crop-specific nutrient application rates, best management practices (BMPs), and nutrient management programs via the Fertilizer Research and Education Program (FREP). The information should continue to be made available online.

Food and Agriculture Code Section 14611 authorizes CDFA to assess a fee of up to one mill ($0.001) per dollar of sales assessment on fertilizing materials to fund fertilizer research and related work. Assembly Bill 2174 (Alejo, Chapter 198, Statutes of 2012) clarified that funds from the FREP can be used to pursue research and provide technical assistance to farmers on nitrate and greenhouse gas emission management related to the application of fertilizers. CDFA should maintain their assessment of one mill, which, depending on fertilizing materials sales, generates approximately $2 million annually, to help fund studies and provide technical and professional assistance to growers to maintain and improve soil health and crop needs, while minimizing the risk of nutrient emissions to the environment.

In addition, CDFA should continue compiling FREP research and reports into an easily accessible online system, where growers can access available information on nutrient BMPs and technology. Using this type of system will help to mitigate excess nitrogen in groundwater. The Water Boards recommend continued development of this system, and additional outreach to help growers access and understand this resource. Implementation of BMPs will lead to better groundwater protection and nutrient management, and limit the need for the Water Boards to further regulate fertilizer application.

.

CURRENT ADVANCEMENTS IN THE MANAGEMENT OF NITROGEN

According to the UC Davis Nitrate Report, since the 1970s the gap between synthetic nitrogen applied and harvested nitrogen has decreased more than 60 percent. Since the 1980s, synthetic fertilizer inputs have been leveling off while cropland has slightly decreased. During this time period, the use of manure and other organic nitrogen sources has increased. Many voluntary activities have led to the leveling-off of synthetic fertilizer use in California due to many contributing efforts.

CDFA's FREP, UC Cooperative Extension, USDA, commodity groups, individual farmers and collaborative efforts have all contributed valuable research and implementation funds, training and technical assistance into high priority areas. This has led to a better understanding and adoption of nitrogen management practices. Certified Crop Advisor training includes nitrogen management in nearly all sessions. Both the International Plant Nutrition Institute and the fertilizer industry provide education on the "4Rs" of nutrient management – the right source of nutrient, at the right rate, at the right time, in the right place.

Agronomic improvements have also lead to greater nitrogen use efficiency. Crop genetics have continued to improve to allow greater yields without additional nitrogen fertilizer. Advances in pest management and weed control also allow more of the nitrogen fertilizer to be recovered in the harvested portion of the plant. Water use efficiency, irrigation and storage improvements, drip irrigation, and laser leveling have reduced the amount of water applied, thus reducing nutrient runoff and leaching. Global positioning systems have aided in planning, planting, and mapping, enabling more targeted application of nitrogen. Soil, water, and foliage testing have increased, as have the use of cover crops and buffer strips. Plant breeding, irrigation methods, fertilizer management, crop protection, and a general improved understanding of the crops needs has led to increased productivity.

There is a continuing shift in the nitrogen fertilizer products sold in California. Liquid nitrogen fertilizers are increasingly replacing solid nitrogen fertilizers, allowing farmers to apply them in irrigation water. The fertilizer industry is continually developing new and innovative products that deliver nutrients more efficiently. Since 2002, there have been important developments in controlled-release nitrogen technology and nitrogen fertilizer additives. These materials were once considered "specialty products", but their use is continuing to expand.

cdfa

Protecting Groundwater: Recommendation 14

Recommendation 14

The Water Boards will convene a panel of experts to assess existing agricultural nitrate control programs and develop recommendations, as needed, to ensure that ongoing efforts are protective of groundwater quality. The Water Boards and CDFA will use the findings to inform ongoing regulatory and non-regulatory efforts.

The Regional Water Boards have made progress in addressing nitrate contamination by implementing several regulatory programs (detailed in Appendix D). These programs approach nitrate contamination in groundwater differently, applying different regulatory requirements and management tools. A regulatory approach that capitalizes on the lessons learned from these programs will allow the Water Boards to address agricultural nitrate in groundwater in a more effective manner.

The Water Boards will convene a panel of experts to assess existing agricultural nitrate control programs and develop recommendations, as needed, to ensure that ongoing efforts are protective of groundwater quality. The panel will evaluate ongoing agricultural control measures that address nitrate in groundwater, and will propose new measures, if necessary. In their assessment of existing agricultural nitrate control programs and development of recommendations for possible improvements in the regulatory approaches being used, the panel will consider methods used as part of the European Union's Nitrate Directive (see summary in Appendix E), as well as groundwater monitoring, mandatory adoption of BMPs, tracking and reporting of nitrogen fertilizer application, estimates of nitrogen use efficiency or a similar metric, and farm-specific nutrient management plans as source control measures and regulatory tools. The panel's findings and recommendations will be evaluated by the Water Boards and the CDFA and, where appropriate, implemented in the Water Boards' agricultural nitrate control programs to the extent funding is available.

The Water Boards will periodically evaluate their programs to avoid duplication with new programs and to avoid unnecessary costs.

Protecting Groundwater: Recommendation 15

Recommendation 15
The Water Boards will evaluate all existing Waste Discharge Requirements to groundwater, to determine whether existing regulatory permitting is sufficiently protective of groundwater quality at these sites. The Water Boards will use the findings to improve permitting activities related to nitrate.

The Water Boards require point source dischargers to obtain a Waste Discharge Requirements (WDR) permit, or a conditional waiver of WDRs, before discharging to land and groundwater. Although the UC Davis Nitrate Report shows that point source dischargers contribute less than five percent of the total nitrogen load to groundwater within the study areas, point source discharges can be significant local nitrate sources, especially when the discharge occurs near a drinking water well.

The Water Boards will evaluate all the existing WDR permits to determine whether existing regulatory requirements at these sites is protective of nitrate groundwater quality. Specifically, the Water Boards will examine whether the point source discharge is likely to be a source of nitrogen, whether the facility monitors nitrogen in the waste stream, whether the facility monitors groundwater near percolation ponds or agricultural fields, and the age of the permit. Water Boards staff will prepare a report summarizing the findings that will be used to improve permitting activities related to nitrate.

3.0 Conclusions

The primary recommendation of this report centers on the fundamental right for Californians to have access to safe drinking water as identified in Assembly Bill 685 (Eng, Chapter 524, Statutes of 2012). Nitrate in groundwater is a serious concern in the state, especially to the residents of the Tulare Lake Basin and Salinas Valley that rely on water exceeding the health standard. Nitrate contamination is also an issue in other parts of the state including the Inland Empire, the Delta, and in shallow groundwater aquifers.

Legacy and ongoing nitrate groundwater contamination will not be solved overnight, or by a single state or federal agency. Cooperation between regulators and the regulated communities will be vital in managing the state's groundwater, and will require coordinated efforts between stakeholders, state agencies, and local agencies.

The UC Davis Nitrate Report concluded that traditional groundwater remediation for nitrate was not feasible in the pilot project areas. As a result, the State Water Board recommendations in this report focus on the provision of safe drinking water and prevention of further nitrate groundwater contamination.

The recommendations in this report are contingent upon a secure and stable source of funding. Potential funding sources include those covered through existing state budgeting processes, and those that require a new revenue source. Addressing safe drinking water needs requires an additional long-term revenue source. The three long-term funding sources for safe drinking water described in this report: point of sale fee, nitrogen fertilizing materials fee, and/or water use fee, are all potential options to generate additional long-term funding. Consideration should be given to any one or combination of these three potential funding sources to help generate the needed long-term safe drinking water funds. Without an additional funding source(s), ensuring safe drinking water for all Californians as defined in AB 685 will not be achievable.

Appendix A: Excerpted Text of Chapter 1, Statutes of 2007-2008 Second Extraordinary Session (SBX2 1, Perata)

BILL NUMBER: SBX2 1 CHAPTERED
BILL TEXT

CHAPTER 1
FILED WITH SECRETARY OF STATE SEPTEMBER 30, 2008
APPROVED BY GOVERNOR SEPTEMBER 30, 2008
PASSED THE SENATE AUGUST 31, 2008
PASSED THE ASSEMBLY AUGUST 28, 2008
AMENDED IN ASSEMBLY AUGUST 28, 2008
AMENDED IN ASSEMBLY AUGUST 28, 2008
AMENDED IN ASSEMBLY AUGUST 4, 2008

INTRODUCED BY Senators Perata, Machado, and Steinberg
(Principal coauthor: Assembly Member Bass)
(Coauthors: Assembly Members Arambula, Eng, Feuer, Huffman, Jones, Krekorian, Laird, Salas, and Wolk)

SEPTEMBER 14, 2007

An act to add and repeal Section 65595.5 of the Government Code, and to add Sections 127.5 and 134.5 to, to add Division 33 (commencing with Section 83000) to, and to repeal and add Part 2.2 (commencing with Section 10530) of Division 6 of, the Water Code, relating to water, and making an appropriation therefor.

83002.5. To improve understanding of the causes of groundwater contamination, identify potential remediation solutions and funding sources to recover costs expended by the state for the purposes of this section to clean up or treat groundwater, and ensure the provision of safe drinking water to all communities, the State Water Resources Control Board, in consultation with other agencies as specified in this section, shall develop pilot projects in the Tulare Lake Basin and the Salinas Valley that focus on nitrate contamination and do all of the following:

(a) (1) In collaboration with relevant agencies and utilizing existing data, including groundwater ambient monitoring and assessment results along with the collection of new information as needed, do all of the following:

(A) Identify sources, by category of discharger, of groundwater contamination due to nitrates in the pilot project basins.

(B) Estimate proportionate contributions to groundwater contamination by source and category of discharger.

(C) Identify and analyze options within the board's current authority to reduce current nitrate levels and prevent continuing nitrate contamination of these basins and estimate the costs associated with exercising existing authority.

(2) In collaboration with the State Department of Public Health, do all of the following:

(A) Identify methods and costs associated with the treatment of nitrate contaminated groundwater for use as drinking water.

(B) Identify methods and costs to provide an alternative water supply to groundwater reliant communities in each pilot project basin.

(3) Identify all potential funding sources to provide resources for the cleanup of nitrates, groundwater treatment for nitrates, and the provision of alternative drinking water supply, including, but not limited to, state bond funding, federal funds, water rates, and fees or fines on polluters.

(4) Develop recommendations for developing a groundwater cleanup program for the Central Valley Water Quality Control Region and the Central Coast Water Quality Control Region based upon pilot project results.

(b) Create an interagency task force, as needed, to oversee the pilot projects and develop recommendations for the Legislature. The interagency task force may include the board, the State Department of Public Health, the Department of Toxic Substances Control, the California Environmental Protection Agency, the Department of Water Resources, local public health officials, the Department of Food and Agriculture, and the Department of Pesticide Regulation.

(c) Submit a report to the Legislature on the scope and findings of the pilot projects, including recommendations, within two years of receiving funding.

(d) Implement recommendations in the Central Coast Water Quality Control Region and the Central Valley Water Quality Control Region pursuant to paragraph (4) of subdivision (a) within two years of submitting the report described in subdivision (c) to the Legislature.

(e) For the Salinas Valley Pilot Project, the State Water Resources Control Board shall consult with the Monterey County Water Resources Agency.

Appendix B: Main UC Davis Nitrate Report - March 2012

The full report can be found at the following link:
http://groundwaternitrate.ucdavis.edu/

Appendix C: Governor's Drinking Water Stakeholder Group Report - August 2012

GOVERNOR'S DRINKING WATER STAKEHOLDER GROUP

August 20, 2012

To: Martha Guzman- Aceves
Cliff Rechtschaffen

Cc: Drinking Water Stakeholder Group members
Tom Howard, Executive Officer, SWRCB

Subject: Report of the Drinking Water Stakeholder Group

On behalf of the Drinking Water Stakeholder Group, we are pleased to provide this *Report of Agreements and Recommendations* that will advance efforts to provide safe drinking water to disadvantaged communities in unincorporated areas impacted by nitrates in groundwater.

The Group reached consensus on six key agreements in principle and put forward for your consideration a number of recommended actions. In addition, the group developed three urgent legislative concepts for this legislative session, which we have already provided to your office in advance of this report and are attached here in the form that they were approved by the Group on August 1st.[1] Since that time, however, a number of significant revisions have been recommended on these concepts through continued review by state agencies and stakeholders. Several issues pertaining to these concepts

[1] Because the legislative concept language attached here has been and continues to be significantly revised, please do not include this attachment in any final report. We are providing that attachment merely to document generally the three urgent legislative concepts that were unanimously agreed upon by the Stakeholder group.

continue to be refined and clarified through continued work with the stakeholder group, state agencies, and others through the legislative process.

It is our understanding that the CDPH has recommended that a number of pieces of these urgent legislative concepts would be best implemented administratively, outside of the legislative process, or need additional time to develop. Based on that agency's recommendations, we understand that two pieces of these legislative concepts, 1) the renewed source of funding for emergency projects through a fee in lieu of interest, and 2) the concepts to clarify and provide additional flexibility around disadvantaged community applicant and project eligibility, will be pursued separately from this year's legislative actions. It is our understanding that the first will be developed further for proposed legislative consideration this coming January, and that the second will be implemented administratively through the Intended Use Plan beginning in January 2013. We appreciate the Governor's commitment to the urgent nature of these actions and look forward to supporting the implementation of all of these Recommended Actions both administratively and through the legislative process.

Considerable time was spent developing a shared understanding of existing funding sources and the challenges to accessing those sources for disadvantaged communities in unincorporated areas. The participating state agencies were extremely helpful and supportive throughout this process and we would not have been able to accomplish as much as we did without their considerable efforts. However, there were many more detailed ideas and concepts that were brainstormed through this process that we did not have time to fully develop and reach consensus due to the accelerated timeframe and diversity of the group. Therefore, we believe that the Group has the potential to contribute more than what is contained in this report.

Based on the significant success we had in developing consensus recommendations in the short-term, we believe there are considerable opportunities to further advance the development and implementation of these concepts through continued discussion. We would request that some resources be made available for a professional facilitator to support any continued process going forward, as that was absolutely essential to the success we were able to achieve thus far.

We both thank you for the opportunity to lead this diverse group of interests to the successes and opportunities described in this Report. We stand ready to assist you further in whatever capacity you deem appropriate to develop and implement safe drinking water solutions for these communities.

Sincerely,

David Orth & Laurel Firestone

Co-Chairs of the Drinking Water Stakeholder Group

GOVERNOR'S DRINKING WATER STAKEHOLDER GROUP

AGREEMENTS AND LEGISLATIVE RECOMMENDATIONS

DEFINING THE PROBLEM[1]:

Significant numbers of people lack access or are at risk of lacking access to safe drinking water because nitrates contaminate their groundwater in the Salinas Valley and the Tulare Lake Basin. State and Federal programs exist to attempt to solve the problem, but there are many barriers that prevent communities from making use of those programs, leaving those communities to pay for their unsafe water and the additional cost of purchasing bottled water. According to the UC Davis Nitrate Pilot Project Report, the majority of the nitrates contaminating drinking water are from the agricultural sector.

According to the communities and organizations that advocate on their behalf, and according to the State Water Plan Update, 2009 (page 15-15) two of the most pervasive problems are lack of funds to cover the cost of operations and maintenance and organizational challenges. Because the systems at the highest risk of being entirely without safe water tend to be small systems (serving between 15 and 3300 connections) they cannot achieve the economies of scale necessary to afford the operations and maintenance costs of currently available treatment technologies. If a community cannot demonstrate that they can afford operations and maintenance on their proposed system project they are not eligible to receive most of the available grant dollars from the State or Federal Governments.

Small systems face a number of organizational challenges. There are numerous efforts to address these challenges at the local level. Occasionally creative solutions are difficult to work through our state and federal funding programs, adding one more hurdle for these communities.

STAKEHOLDER GROUP CHARGE:

The Stakeholder Group was asked to:

Develop a shared understanding of the O&M challenges and the challenges encountered by creative solutions accessing state agency programs.

2. Identify promising solutions (which may focus on the Tulare and Salinas regions).
3. Develop a plan with a high likelihood of closing these two gaps.
4. Make a recommendation to the Governor's Office.

THE APPROACH[2]:

[1] As defined by the "Stakeholder Process on Drinking Water Contaminated by Nitrates" document prepared by the Governor's office and provided to the Drinking Water Group at the initial meeting on June 14.

[2] As defined by the Governor's Office in email dated May 29 inviting the Stakeholder group to the initial meeting of June 14.

SBX2 1 (Perata, 2008) directed the State Water Resources Control Board (Water Board) to study the relationship between nitrate contamination and access to safe drinking water in the Tulare Lake Basin and the Salinas Valley. SBX2 1 also directed the Water Board to provide a report and recommendations to the Legislature. The Water Board contracted with researchers at UC Davis to produce a scientific report that is being used to inform the Water Board's report to the Legislature.

The UC Davis report focused broadly on the nitrates issue and provided a range of promising actions. The Governor's Office convened this Drinking Water Stakeholder Group to identify specific, creative, viable solutions focused in two critical areas; covering the costs of operations and maintenance for small systems, while maintaining affordable water rates[3].; and state agency actions to make funding programs, regulations, and implementation more flexible and proactive in supporting creative solutions.
The Stakeholder Group was challenged with an aggressive timeline to coincide with the Water Board's development of their report and the remaining 2011-12 Legislative calendar. The Group was convened in mid-June and met regularly together and through workgroups on key issues (governance, navigation, legal/regulatory, legislation). With significant support from participating State agencies, the Group reviewed and discussed existing funding sources (summarized in Attachment A), the barriers from multiple perspectives to achieving sustainable drinking water solutions (Attachment B), as well as local and regional projects that are pursuing safe drinking water solutions for disadvantaged communities in unincorporated areas. Agreements in Principle, Recommended Actions and legislative concepts for this legislative session were discussed and agreed upon at the August 1, 2012 meeting of the full Stakeholder Group and are summarized in this Report.

DECISION-MAKING CRITERIA

From the June 27th meeting, the Stakeholders identified these criteria to help reach consensus:

1. Solutions should be replicable, sustainable, scalable
    a. "Both/and" solutions
    b. *Options* for communities to consider vs. a 'prescription' for what to do
2. Solutions should not harm other areas of the State

Solutions that might be used for more than one pollutant

Avoid creating 'winning' and 'losing communities.

3. Leverage existing, available resources
4. Creative solutions
5. Move closer to safe drinking water for all Californians
6. Accelerate what is working
7. Solution-oriented

Interim solutions must be sustainable.

[3] As defined by the US EPA (*not reviewed or discussed by the Stakeholder Group)*

O&M FUNDING

The Stakeholder Group discussed methods to address and develop sustainable O&M funding, both in terms of creating additional revenue sources and reducing costs through efficiencies and economies of scale. The Group believes that, in general, in the long-term, systems should have the ability to cover operations and maintenance costs while maintaining affordable rates. However, the Group did not rule out the need for additional outside funding sources in the short-term, particularly for disadvantaged communities in unincorporated areas impacted by increased costs due to source contamination. In order to address this challenge, the Group developed recommendations particularly aimed at fostering locally and regionally viable "shared solutions" that allow for increased economies of scale, as well as reducing unnecessary costs for small systems. The Group recognized, however, that the best solution for each community will differ among a variety of options that are not limited to "shared solutions." While the Group discussed possible revenue sources to support interim O&M funding challenges, each of the identified options present significant legal and political challenges, and thus require additional discussion and effort for any to become viable.

AGREEMENTS IN PRINCIPLE

The Stakeholder Group developed the following Agreements in Principle to guide development of recommendations contained in this Report:

- It is important to comprehensively and uniformly identify drinking water needs of disadvantaged communities and small systems between 2-14 connections to improve data collection and management.
- There is a need to incentivize and promote sustainable safe drinking water solutions within disadvantaged communities in unincorporated areas.
- It is essential to ensure that all disadvantaged communities in unincorporated areas have access to immediate, interim sources of safe drinking water.
- It is critical to increase access to existing funding sources for disadvantaged communities in unincorporated areas for both long-term and interim safe drinking water solutions and to make it easier for communities to 'navigate' the agency/funding systems and requirements.
- A key element in achieving sustainability is to reduce costs for disadvantaged communities in unincorporated areas to secure and sustain drinking water solutions.
- There is a need for continued engagement between a diverse stakeholder group and appropriate State agencies (CDPH, SWRCB, DWR, CalEPA) to develop programs to support sustainable solutions to the drinking water challenges in disadvantaged communities in unincorporated areas of California.

Agreements with Additional Detail and Recommendations for Action

- **It is important to comprehensively and uniformly identify drinking water needs of disadvantaged communities and small systems between 2-14 connections in unincorporated areas to improve data collection and management.**

  The scope and magnitude of the drinking water problems for disadvantaged communities and small systems in unincorporated areas is not fully understood, due to limits in or a lack of current and ongoing assessment of conditions. Additional efforts are necessary to collect and manage information to inform planning and implementation of solutions.

  Recommended Actions:

1. Continue to establish, maintain, integrate, and improve data collection tools to help inform planning, prioritization and implementation of interim and long-term solutions.

- **There is a need to incentivize and promote sustainable safe drinking water solutions within unincorporated disadvantaged communities.**

  Efforts are necessary to actively foster more sustainable, effective, and affordable drinking water solutions and decrease drinking water system vulnerability for very small disadvantaged communities in unincorporated areas lacking sufficient resources or scale to "stand alone," through a variety of locally-driven solutions, including (but not limited to) efficient, effective shared services and facilities, technical support and outreach and education. The exact model will be different for different communities, but may include a wide variety of technical and/or management/institutional options. (For the purposes of this Report, the term "shared services" is used to describe solutions/strategies between and across communities that facilitate increased economies of scale.)

  Recommended Actions:

  - Identify water supply needs and potential opportunities for promoting and incentivizing sustainable local drinking water solutions for disadvantaged communities in unincorporated areas
  - Directly target funding for IRWMs (or other entity where appropriate) to develop an inventory of need and a plan for local solutions (including shared solutions) for disadvantaged communities in unincorporated areas in each hydrologic region of the state as is being used in the Tulare Lake Basin Disadvantaged Community Water Study (SBX2 1 (Perata, 2008)).

1. Begin with the Salinas Valley.
2. Coordinate these efforts with local health departments, local NGOs, academic institutions and local agencies.

- Support and fund project planning to foster local, sustainable solutions (including, but not limited to, shared solutions, inter-community planning facilitation, engineering, legal, financial or managerial analysis, environmental documentation, and other project development activities).
  1. Directly augment funding to regional planning agencies (e.g. IRWMPs or other appropriate entity) to develop community-driven shared solutions where practical for unincorporated disadvantaged communities. (Model this after work begun in IRWM DAC pilots)
  2. Drinking water regulatory agencies at local and State levels should more actively identify and address technical, managerial, and financial (TMF) capacity issues.

- Improve accessibility of funding pathways for shared services/facilities projects in communities with highest public health priority as identified by regulatory agencies, including but not limited to:
  - Carve out a set-aside of existing drinking water funding.
  - Provide strong incentives for shared solutions among local systems and provide funding for NGOs/local agencies/universities for increased outreach and education.
  - Promote and incentivize more robust investigation of shared solutions as part of feasibility or planning studies.

- **It is essential to ensure that all disadvantaged communities in unincorporated areas have access to immediate, interim sources of safe drinking water.** *Currently many of California's poorest small disadvantaged communities in unincorporated areas are left without access to safe drinking water for years as they wait to secure financing to develop a long-term safe drinking water source. These communities are often left paying twice for water, as they continue to pay for unsafe water service and have to buy alternative water sources on top of those costs. It is vital that communities have an affordable option to access safe drinking water in their community through an interim source as they are developing a sustainable long-term solution.*

  Recommended Actions:

  - Direct rapid, easily accessible funding to support immediate, interim sources of safe drinking water for disadvantaged communities in unincorporated areas.

- Create a renewable funding source for immediate interim solution funding.
- Clarify types of solutions eligible for funding including (but not limited to): point of use treatment, point of entry treatment, central high-volume vending machine point, water hauling, etc. Once projects are deemed eligible, develop integrated permitting process to allow for expedited project permitting.

- **Increase access to existing funding sources for disadvantaged communities in unincorporated areas for both long-term and interim safe drinking water solutions.**

  CDPH, SWRCB and DWR each administer funds to support, develop, and/or implement drinking water solutions. Limits and restrictions, in state and federal law, regulation and guidelines, affect the availability and access to these funds. Processes to access these funds can be difficult and cumbersome, demanding resources and expertise lacking at the local disadvantaged community level. Simplified and expedited processes and additional technical support can increase access to safe drinking water solutions.

  Attention to disadvantaged communities in unincorporated areas without a public water system (less than 15 connections) to improve their access to safe drinking water is required. Many disadvantaged communities in unincorporated areas are not served by a public water system but rely on contaminated private wells or unregulated very small systems. In many cases, these communities lack sufficient information on drinking water quality, and wells are often more vulnerable to contamination due to shallow depth and/or construction. However, most existing funding sources are not available for improvements for private wells or infrastructure that is not part of a public water system.

  Recommended Actions:

  - Help small disadvantaged communities in unincorporated areas better navigate funding opportunities across agencies

    1. Create an interagency 'team' (or "one-stop shop") of existing staff from all State agencies with a role in the funding, regulation, and/or planning of safe drinking water systems in disadvantaged communities in unincorporated areas. This 'one stop' center for DACs will provide technical assistance, professional services, and general guidance to small communities trying to navigate the maze of State agencies and funding/application requirements.
    2. Create a single point of entry for communities needing assistance.

- Create expedited requirements for funding applications for small disadvantaged communities in unincorporated areas.

- Improve, support and add access to technical assistance programs, including but not limited to: an ombudsmen program housed in a state agency or the Governor's Office; technical assistance from UCs/ CSUs; local government assistance.

- Create fund specifically for project planning for disadvantaged communities in unincorporated areas that is easily accessible and less restricted in who must be actual legal applicant.
    1. Utilize local set aside in SRF for local planning and grant directly to IRWMPs to develop solutions for disadvantaged communities without safe drinking water within their boundaries.

- Utilize existing technical assistance and set-aside programs to fund non-profits or public agencies to do low-income assistance programs. (e.g. Self Help Enterprises well rehabilitation funding program)

- Expand eligibility for funding and assistance programs for disadvantaged communities in unincorporated areas without a public water system (less than 15 connections).

- Fund non-profit or county programs that support monitoring, planning, maintenance, and improvements for low-income private well owners or systems less than 15 connections in unincorporated areas.

- **Reduce costs for disadvantaged communities in unincorporated areas to secure and sustain affordable drinking water solutions.**

  The high cost of specific elements of operation and maintenance and other ongoing costs (e.g., financing costs, the cost of administrative requirements, financial audits, and certain regulatory requirements) impact the ability to achieve sustainable and affordable solutions in certain communities.

  Recommended Actions:

  1) Reduce high-cost regulatory and administrative requirements for small systems.

a. Ease burdens of data reporting and streamline application submission process.

b. Reduce level of audit requirements for small systems

2) Address cash flow problems for small systems (for example, advancing electronic reimbursements or advance payments).

3) Address reserve fund burden by creating or supporting a pooled reserve fund for small disadvantaged communities in unincorporated areas.

- **There is a need for continued engagement between a diverse stakeholder group and appropriate State agencies (CDPH, SWRCB, DWR, CalEPA) to develop programs to support sustainable solutions to the drinking water challenges in disadvantaged communities in unincorporated areas of California.**

  Development and implementation of solutions will require ongoing and coordinated effort between local stakeholders and appropriate state agencies. Additional discussion to expand concepts contained in this report is warranted.

  Recommended Actions:

1. Support the continuation of this Stakeholder Group as the forum to continue this work, resolve 'open' issues and work to advance the interests of all stakeholders.

ATTACHMENTS

1.Existing Funding Matrix
2.Legislative concept recommendations for current legislative session

Potential Funding Sources for Drinking Water Treatment

Agency	Program (year passed or created)	Funding Provided (in million $)	Funding Remaining/Available (in million $)	Limitations/Barriers on Use of Funds for Drinking Water Treatment (capital or O&M)
California Department of Public Health (CDPH)	Safe Drinking Water State Revolving Fund (SDWSRF) (1996) (grants and loans)	Generally \$100–\$150: Low-interest loans and some grants to support water systems with technical, managerial, and financial development and infrastructure improvements.	\$130-\$150 (revolving funds) (annually)	1. 20 to 30% of annual federal contribution can be used for grants. The remainder must be committed to loans. 2. Funds can be used only for capital costs. Cannot be used for O&M 3. Only loans (not grants) for privately owned water systems. 4. Some funds available for feasibility and planning studies for eligible projects/systems. 5. Can only be used for Public Water Systems (not domestic wells or State Small Systems)
	Proposition 84 (2006) (grants)	\$180: Small community improvements. --- \$60: Protection and reduction of contamination of groundwater sources. \$50 Matching funds for federal DWSRF --- \$10: Emergency and urgent projects.	\$0 (Over subscribed) ------------------------------------- \$0 (Fully allocated) Will be fully committed with the current year grant but not yet liquidated ------------------------------------- ~\$7	1. Funds can be used only for capital costs. Cannot be used for O&M. 2. Some funding available for feasibility and planning studies for eligible projects/systems. 3. Can only be used for Public Water Systems not domestic wells or State Small Systems --- 4. Used to address sudden unanticipated emergency situation such as fires, earthquakes and mud slides that damage critical water infrastructure. May fund short term mitigations such as hauled water.
	Proposition 50 (2002) (grants) (fully allocated)	\$50: Water security for drinking water systems. --- \$69: Community treatment facilities and monitoring programs. --- \$105: Matching funds for federal grants for public water system infrastructure improvements.	\$0 (fully allocated) ------------------------------------- \$0 (fully allocated) ------------------------------------- \$0 fully allocated, mostly	1. Can only be used for capital costs. Cannot be used for O&M. 2. Can only be used for Public Water Systems not domestic wells or State Small Systems

Potential Funding Sources for Drinking Water Treatment

Agency	Program (year passed or created)	Funding Provided (in million $)	Funding Remaining/Available (in million $)	Limitations/Barriers on Use of Funds for Drinking Water Treatment (capital or O&M)
			liquidated	
State Water Resources Control Board (State Water Board)	Clean Water State Revolving Fund (Expanded Use Program) (CWSRF) (1987) (loans)	$200–$300 per year: Water quality protection projects, wastewater treatment, nonpoint source contamination control, and watershed management.	$50 per agency per year; can be waived	Eligible Uses: Stormwater treatment and diversion, sediment and erosion control, stream restoration, land acquisition. Drinking water treatment generally not eligible except under certain Expanded Use scenarios. Capital cost only. O&M not eligible.
	Small Community Groundwater Grants(Prop 40) (2004, amended 2007) (grants)	$9.5. Assist small disadvantaged communities (<20,000pp) with projects where the existing groundwater supply exceeds maximum contaminant levels, particularly for arsenic or nitrate	$1.4 remaining - $0.3 available to encumber; $1.1 available to appropriate	$ can go to local govt or NGO. Must demonstrate financial hardship. Can only provide alternate water supply. No O&M costs. Program not currently active due to staff resource limitations
	State Water Quality Control Fund: Cleanup and Abatement Account (2009)	$10 in 2012 (varies annually): Projects to (a) clean up waste or abate its effects on waters of the state, when there is no viable responsible party, or (b) address a significant unforeseen water pollution problem (regional water boards only). Funds can be allocated to: Public Agencies, specified tribal governments, and not-for profit organizations that serve disadvantaged communities	$10, but varies.	Eligible Uses: Emergency cleanup projects; projects to clean up waste or abate its effects on waters of the state; regional water board projects to address a significant unforeseen water pollution problem. Recipient must have authority to clean up waste. Under certain circumstances this fund has been used to provide drinking water O&M for limited durations.
	Integrated Regional Water Management (IRWM) (2002) (grants) (fully allocated)	$380 (Prop 50): Planning ($15) and implementation ($365) projects related to protecting and improving water quality.	$0, fully committed	
California Department of	Integrated Regional Water Management (IRWM) (2002) (grants)	$600 remaining (Prop 84): Regional water planning and implementation.	~$28 (central coast projects)	Must be consistent with an adopted IRWM Plan and other program requirements.

Potential Funding Sources for Drinking Water Treatment

Agency	Program (year passed or created)	Funding Provided (in million $)	Funding Remaining/Available (in million $)	Limitations/Barriers on Use of Funds for Drinking Water Treatment (capital or O&M)
Water Resources (DWR)			~ $33 (Tulare/Kern projects)	For capital investment only
	Contaminant treatment or removal technology pilot and demonstration studies (2002) (grants)	Up to $5 per grant	$15 million available	Eligible applicants are public water systems under the regulatory jurisdiction of CDPH and other public entities For capital investment only
	Safe Drinking Water Bond Law (Prop 81) (1988)	Up to $74 to be awarded to current priority list. $0.025 max per project	Remaining balance to be determined.	Provides funding for projects that investigate and identify alternatives for drinking water system improvements
	Drinking water disinfecting projects using UV technology and ozone treatment (2002) (grants)	$0.05 minimum, up to $5 m per grant	$19 m remaining	Eligible applicants are public water systems under the regulatory jurisdiction of CDPH For capital investment only
iBank (CA Infrastructure and Development Bank)	Infrastructure State Revolving Fund (ISRF) Program (2000) (loans)	$0.25 to $10 per project to finance water infrastructure that promotes job opportunities. Eligible projects include construction or repair of publicly owned water supply, treatment, and distribution systems.	$52.6 million approved to date for Water Supply,Water Treatment and Distribution Applications continually accepted	Finances system capital improvements only. Must show job creation. Special loan tier for DACs was discontinued.

Recommended Legislative Concepts for Current Legislative Session
Aug 1, 2012

1. Salinas Valley Pilot Project

The department (DWR) shall allocate $2million to the Greater Monterey County IRWM group for development of an integrated water quality and wastewater treatment program plan to address the drinking water and wastewater needs of disadvantaged communities in the Salinas Valley. Funds allocated pursuant to this paragraph shall be available for assessment and feasibility studies necessary to develop the plan, and the plan shall include recommendations for planning, infrastructure, and other water management actions that achieve affordable and sustainable solutions for disadvantaged communities, including communities without public water systems. The Greater Monterey County IRWM group shall consult with appropriate stakeholders, including representatives of disadvantaged communities, when preparing the plan. The department, in consultation with the State Department of Public Health, shall submit the plan to the Legislature by January 2016.

2. Emergency Funding & Interim Solutions

Section 1. the Health & Safety Code Section 116475 shall be amended to read:

116475. (a) The Emergency Clean Water Grant Fund is hereby established in the General Fund and, notwithstanding Section 13340 of the Government Code, is continuously appropriated to the department, without regard to fiscal years, to provide financial assistance to public water systems and to fund emergency actions by the department to ensure that safe drinking water supplies are available to all Californians who are served by public water systems.
(b) The department may expend funds in the Emergency Clean Water Grant Fund for the purposes specified in subdivision (a), including, but not limited to, payment for all of the following actions:
(1) The provision of alternative water supplies and bottled water.
(2) Improvements of the existing water supply system.
(3) Hookups with adjacent water systems.
(4) Design, purchase, installation, and operation and maintenance of water treatment technologies.
(5) Providing interim water treatment or water supplies to disadvantaged communities that lack safe drinking water and that have applied for long-term solutions through the Safe Drinking Water State Revolving Fund or other state or federal funding sources. Interim shall be defined as the time period between the submittal of a pre-application for funding and the completion of a

construction project that will deliver safe drinking water. Nothing in this section shall obligate the Department to provide funding for any or all interim sources of safe drinking water, beyond what is provided through a funding agreement.
(c) The department shall develop and revise guidelines for the allocation and administration of moneys in the Emergency Clean Water Grant Fund. These guidelines shall include, but are not limited to, all of the following:
(1) A definition of what constitutes an emergency requiring an alternative or improved water supply.
(2) Priorities and procedures for allocating funds.
(3) Repayment provisions, as appropriate.
(4) Procedures for recovering funds from parties responsible for the contamination of public water supplies.
(5) The guidelines are not subject to Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code
(d) Grants and expenditures shall not exceed $250,000 per project, and $50,000 for interim solution projects.
(e) Direct expenditures for the purposes of this section shall be exempt from contracting and procurement requirements to the extent necessary to take immediate action to protect public health and safety.

Section 2. Section 116760.30 of the Health and Safety Code is amended to read:

116760.30. (a) There is hereby created in the State Treasury the Safe Drinking Water State Revolving Fund for the purpose of implementing this chapter, and, notwithstanding Section 13340 of the Government Code, the fund is hereby continuously appropriated, without regard to fiscal years, to the department to provide, from moneys available for this purpose, grants or revolving fund loans for the design and construction of projects for public water systems that will enable suppliers to meet safe drinking water standards. The department shall be responsible for administering the fund.
(b) Notwithstanding Section 10231.5 of the Government Code, the department shall report at least once every two years to the policy and budget committees of the Legislature on the implementation of this chapter and expenditures from the fund. The report shall describe the numbers and types of projects funded, the reduction in risks to public health from contaminants in drinking water provided through the funding of the projects, and the criteria used by the department to determine funding priorities. Commencing with reports submitted on or after January 1, 2013, the report shall include the results of the United States Environmental Protection Agency's most recent survey of the infrastructure needs of California's public water systems, the amount of money available through the fund to finance those needs, the total dollar amount of all funding agreements executed pursuant to this chapter since the date of the previous report, the fund utilization rate, the amount of unliquidated obligations, and the total dollar amount paid to funding recipients since the previous report. *Commencing January 1, 2013, the Department shall identify funding commitments made in the previous two years for systems of less than 200 connections, for disadvantaged and severely disadvantaged communities, and for projects that achieve coordination or consolidation of multiple water systems, and make that information publicly available through a public notice and on its website. The Department shall*

also identify projects in health-based funding categories that have been bypassed for at least two years and provide information on steps being taken to address the health threat posed to residents of those communities, and make that information publicly available through a public notice and on its website.

(c) Notwithstanding any other law, the Controller may use the moneys in the Safe Drinking Water State Revolving Fund for loans to the General Fund as provided in Sections 16310 and 16381 of the Government Code. However, interest shall be paid on all moneys loaned to the General Fund from the Safe Drinking Water State Revolving Fund. Interest payable shall be computed at a rate determined by the Pooled Money Investment Board to be the current earning rate of the fund from which loaned. This subdivision does not authorize any transfer that will interfere with the carrying out of the object for which the Safe Drinking Water State Revolving Fund was created.

Section 3. Section 116760.40 of the Health and Safety Code is amended to read:

116760.40. The department may undertake any of the following actions to implement the Safe Drinking Water State Revolving Fund:
(a) Enter into agreements with the federal government for federal contributions to the fund.
(b) Accept federal contributions to the fund.
(c) Use moneys in the fund for the purposes permitted by the federal act.
(d) Provide for the deposit of matching funds and other available and necessary moneys into the fund.
(e) Make requests, on behalf of the state, for deposit into the fund of available federal moneys under the federal act.
(f) Determine, on behalf of the state, that public water systems that receive financial assistance from the fund will meet the requirements of, and otherwise be treated as required by, the federal act.
(g) Provide for appropriate audit, accounting, and fiscal management services, plans, and reports relative to the fund.
(h) Take additional incidental action as may be appropriate for adequate administration and operation of the fund.
(i) Enter into an agreement with, and accept matching funds from, a public water system. A public water system that seeks to enter into an agreement with the department and provide matching funds pursuant to this subdivision shall provide to the department evidence of the availability of those funds in the form of a written resolution, or equivalent document, from the public water system before it requests a preliminary loan commitment.
(j) Charge public water systems that elect to provide matching funds a fee to cover the actual cost of obtaining the federal funds pursuant to Section 1452(e) of the federal act (42 U.S.C. Sec. 300j-12) and to process the loan application. The fee shall be waived by the department if sufficient funds to cover those costs are available from other sources.
(k) Use money returned to the fund under Section 116761.85 and any other source of matching funds, if not prohibited by statute, as matching funds for the federal administrative allowance under Section 1452(g) of the federal act (42 U.S.C. Sec. 300j-12).

(l) Establish separate accounts or subaccounts as required or allowed in the federal act and related guidance, for funds to be used for administration of the fund and other purposes. Within the fund the department shall establish the following accounts, including, but not limited to:
(1) A fund administration account for state expenses related to administration of the fund pursuant to Section 1452(g)(2) of the federal act.
(2) A water system reliability account for department expenses pursuant to Section 1452(g)(2)(A), (B), (C), or (D) of the federal act.
(3) A source protection account for state expenses pursuant to Section 1452(k) of the federal act.
(4) A small system technical assistance account for department expenses pursuant to Section 1452(g)(2) of the federal act.
(5) A state revolving loan account pursuant to Section 1452(a)(2) of the federal act.
(6) A wellhead protection account established pursuant to Section 1452(a)(2) of the federal act.
(m) Deposit federal funds for administration and other purposes into separate accounts or subaccounts as allowed by the federal act.
(n) Determine, on behalf of the state, whether sufficient progress is being made toward compliance with the enforceable deadlines, goals, and requirements of the federal act and the California Safe Drinking Water Act, Chapter 4 (commencing with Section 116270).
(o) To the extent permitted under federal law, including, but not limited to, Section 1452(a)(2) and (f)(4) of the federal Safe Drinking Water Act (42 U.S.C. Sec. 300j-12(a)(2) and (f)(4)), use any and all amounts deposited in the fund, including, but not limited to, loan repayments and interest earned on the loans, as a source of reserve and security for the payment of principal and interest on revenue bonds, the proceeds of which are deposited in the fund.
(p) Request the Infrastructure and Economic Development Bank (I-Bank), established under Chapter 2 (commencing with Section 63021) of Division 1 of Title 6.7 of the Government Code, to issue revenue bonds, enter into agreements with the I-Bank, and take all other actions necessary or convenient for the issuance and sale of revenue bonds pursuant to Article 6.3 (commencing with Section 63048.55) of Chapter 2 of Division 1 of Title 6.7 of the Government Code. The purpose of the bonds is to augment the fund.
(q) For any financing made pursuant to this chapter the department may assess an annual charge to be deposited in the Emergency Clean Water Grant Fund, established in Health and Safety Code Section 116475, in lieu of interest that would otherwise be charged. The charge authorized by this subdivision may be applied at any time during the term of the financing, and once applied, shall remain unchanged unless it is determined by the Department that the Emergency Fund is adequately funded, at which point it shall terminate and be replaced by an identical interest rate. The charge shall not increase the financing repayment amount as set forth in the terms and conditions imposed pursuant to this chapter.

3. Flexibility in DAC project and applicant requirements[8]

[8] *This concept is intended primarily to clarify that the applicant does not necessarily have to be the party with contaminated drinking water to achieve priority status and relaxing 'legal entity' requirements. These changes are designed to (1) encourage applicants to apply for projects that serve DACs through consolidation, service*

Section 116760.50 of the Health and Safety Code is amended to read:

116760.50.
The department shall establish criteria that shall be met for projects to be eligible for consideration for funding under this chapter. The criteria shall include all of the following:
(a) All preliminary design work for a defined project that will enable the applicant <u>or another public water system</u> to supply water that meets safe drinking water standards, including a cost estimate for the project, shall be completed.

(b) <u>Only when the Department is considering eligibility for construction funding,</u> a legal entity shall exist that has the authority to enter into contracts and incur debt on behalf of the community to be served and owns the public water system or has the right to operate the public water system under a lease with a term of at least 20 years, unless otherwise authorized by the department. <u>The applicant need not be the legal entity.</u> If the proposed project is funded by a loan under this chapter, the department may require the applicant <u>or another legal entity</u> to secure a lease for the full term of the loan if the loan exceeds 20 years.

(c) The applicant shall hold all necessary water rights.

(d) The applicant shall have completed any review required pursuant to the California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) and the guidelines adopted pursuant thereto, and have included plans for compliance with that act in its preliminary plans for the project.

(e) The applicant has assembled sufficient financial data to establish its ability to complete the proposed project and to establish the amount of debt financing it can undertake.

Section 116760.70 of the Health and Safety Code is amended to read:

---

extension or other types of shared services / facilities, (2) facilitate approval and funding of projects that serve DACs, and in particular communities that are not served by a public water system, through consolidation, service extension or other shared services /facilities.
Additionally, the Intended Use Plan should try to facilitate the following specific circumstances:

1. *Applicant A, even if it's in compliance with drinking water standards can be deemed to be in a priority category if its proposed project provides safe drinking water for a disadvantaged community that is in a priority category*

2. *Allow for any other public agency with an agreement from the community to receive funding for a feasibility study and planning purposes when a disadvantaged community is not served by a public water system.*

3.

116760.70.
(a) The department, after public notice and hearing, shall, from time to time, establish a priority list of proposed projects to be considered for funding under this chapter. In doing so, the department shall determine if improvement or rehabilitation of the public water system is necessary to provide pure, wholesome, and potable water in adequate quantity and at sufficient pressure for health, cleanliness, and other domestic purposes. The department shall establish criteria for placing public water systems on the priority list for funding that shall include criteria for priority list categories. Priority shall be given to projects that meet all of the following requirements:

(1) Address the most serious risk to human health.

(2) Are necessary to ensure compliance with requirements of Chapter 4 (commencing with Section 116270) including requirements for filtration.

(3) Assist systems most in need on a per household basis according to affordability criteria.

(b) The department may, in establishing a new priority list, merge those proposed projects from the existing priority list into the new priority list.

(c) In establishing the priority list, the department shall consider the system's implementation of an ongoing source water protection program or wellhead protection program.

(d) In establishing the priority list categories and the priority for funding projects, the department shall carry out the intent of the Legislature pursuant to subdivisions (e) to (h), inclusive, of Section 116760.10 and do all of the following:

(1) Give priority to upgrade an existing system to meet drinking water standards. <u>This includes an upgrade to an existing system to meet drinking water standards in a Disadvantaged Community distinct from the applicant agency.</u>

(2) After giving priority pursuant to paragraph (1), consider whether the applicant has sought other funds when providing funding for a project to upgrade an existing system and to accommodate a reasonable amount of growth.

(e) Consideration of an applicant's eligibility for funding shall initially be based on the priority list in effect at the time the application is received and the project's ability to proceed. If a new priority list is established during the time the application is under consideration, but before the applicant receives a letter of commitment, the department may consider the applicant's eligibility for funding based on either the old or new priority list.

(f) The department may change the ranking of a specific project on the priority lists at any time following the publication of the list if information, that was not available at the time of the publication of the list, is provided that justifies the change in the ranking of the project.

(g) The department shall provide one or more public hearings on the Intended Use Plan, the priority list, and the criteria for placing public water systems on the priority list. The department shall provide notice of the Intended Use Plan, criteria, and priority list not less than 30 days before the public hearing. The Intended Use Plan, criteria, and priority list shall not be subject to the requirements of Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of

Title 2 of the Government Code. The department shall conduct duly noticed public hearings and workshops around the state to encourage the involvement and active input of public and affected parties, including, but not limited to, water utilities, local government, public interest, environmental, and consumer groups, public health groups, land conservation interests, health care providers, groups representing vulnerable populations, groups representing business and agricultural interests, and members of the general public, in the development and periodic updating of the Intended Use Plan and the priority list.

(h) The requirements of this section do not constitute an adjudicatory proceeding as defined in Section 11405.20 of the Government Code and Section 11410.10 of the Government Code is not applicable.

Section 116760.90 of the Health and Safety Code is amended to read:

116760.90.

(a) The department shall not approve an application for funding unless the department determines that the proposed study or project is necessary to enable the applicant to meet safe drinking water standards, and is consistent with an adopted countywide plan, if any. The department may refuse to fund a study or project if it determines that the purposes of this chapter may more economically and efficiently be met by means other than the proposed study or project. The department shall not approve an application for funding a project with a primary purpose to supply or attract future growth. The department may limit funding to costs necessary to enable suppliers to meet primary drinking water standards, as defined in Chapter 4 (commencing with Section 116270).

(b) With respect to applications for funding of project design and construction, the department shall also determine all of the following:

(1) Upon completion of the project, the applicant and other beneficiaries of the project will be able to supply water that meets safe drinking water standards.

(2) The project is cost-effective.

(3) If the entire project is not to be funded under this chapter, the department shall specify which costs are eligible for funding.

(c) In considering an application for funding a project that meets all other requirements of this chapter and regulations, the department shall not be prejudiced by the applicant initiating the project prior to the department approving the application for funding. Preliminary project costs that are otherwise eligible for funding pursuant to the provisions of this chapter shall not be ineligible because the costs were incurred by the applicant prior to the department approving the application for funding. Construction costs that are otherwise eligible for funding pursuant to the provisions of this chapter shall not be ineligible because the costs were incurred after the approval of the application by the department but prior to the department entering into a contract with the applicant pursuant to Section 116761.50.

Appendix D: Water Boards' Regulatory and Permitting Programs Addressing Nitrate Summary

Appendix D: Existing Framework to Address Nitrate in Groundwater or Provide Safe Drinking Water

State Water Resources Control Board
Nonpoint Source (NPS) Pollution Control Program Developed to comply with Water Board WDRs, waivers of WDRs, or basin plan prohibitions. Implementation programs can be developed by the State Water Board or by a Regional Water Board, as well as for individual dischargers or coalitions of dischargers.
Recycled Water Policy (Resolution 2009-0011) Included in the Recycled Water Policy is the requirement for local water and wastewater entities, together with local salt and nutrient contributing stakeholders, to fund locally driven and controlled collaborative processes that will prepare salt and nutrient management plans (SNMP) for each groundwater basin/sub-basin in California, including compliance with CEQA and participation by Regional Water Board staff.
Anti-Degradation Policy (Resolution 68-16) Restricts degradation of surface and groundwater where existing quality is higher than what is necessary for the protection of beneficial uses. Any actions that can adversely affect water quality must: 1) Be consistent with the maximum benefit to the people of the State, 2) Not unreasonably affect present and anticipated beneficial use of the water, and, 3) Not result in water quality less than that prescribed in water quality plans and policies.
Sources of Drinking Water Policy (Resolution 88-63) Establishes that all groundwater should be considered suitable for municipal or domestic water supply, and should be so designated by the Regional Boards unless certain exceptions apply. The exceptions generally require that existing, natural groundwater quality exceed 3,000 mg/L total dissolved solids and is not reasonably expected to supply a public water system. The drinking water policy also exempts groundwater where contamination, either by natural processes or by human activity that is unrelated to a specific pollution incident) that cannot reasonably be treated for domestic use using either Best Management Practices or economically achievable treatment practices.
Groundwater Ambient Monitoring and Assessment (GAMA) Program California's comprehensive groundwater quality monitoring program. Includes Domestic Well Project (voluntary domestic well sampling for commonly detected chemicals), Priority Basin Project (assessment of state-wide basin groundwater quality), Special Studies Project (detailed studies including nitrate sources, fate, transport and management), and GeoTracker GAMA (online publically accessible groundwater quality database).
Enforcement Assists in protecting the beneficial uses of waters of the State. Enforcement ensures compliance with requirements in Water Board regulations, plans, policies, and orders. Enforcement actions can address violations of water quality objectives in groundwater, discharge of bio-solids to land, and WDRs.

Central Coast Regional Water Quality Control Board
Agricultural Regulatory Program Regulates discharges from irrigated agricultural lands in an effort to protect both surface water and groundwater, and is the cornerstone of the Central Coast Regional Board's nitrate pollution source control efforts. Requires groundwater monitoring in priority areas, and source reduction via improved nutrient application and irrigation efficiency. Nitrate impacts to groundwater that serves as a drinking water supply is the top priority of this program.
Permitting Waste Water Discharge Permits (WDRs) are issued to discharges that affect groundwater quality, and began including salt and nutrient management plans for wastewater discharges in 2004/2005. The Central Coast Water Board is also participating in development of regional salt and nutrient management plans as required by the State Water Board's Recycled Water Policy.

Appendix D: Existing Framework to Address Nitrate in Groundwater or Provide Safe Drinking Water (cont.)

Central Coast Regional Water Quality Control Board (cont.)
Funding Program Funding is key in the implementation of nutrient and irrigation efficiency projects. Since 2006, the board has funded millions of dollars for projects to test practices and techniques that help mitigate or treat discharges from irrigated lands, or to improve irrigation and nutrient management practices. Results are being used to educate other growers in the region.
Local Agency Outreach and Domestic Well Sampling Efforts include reaching out to local agencies (county health agencies, public health officials, boards of supervisors), urging the agencies to address populations that are most at-risk of unsafe levels of nitrate in their drinking water. The Board is also currently in the process of developing a domestic well outreach and sampling program, to help educate domestic well users. In three cases, the Board is developing enforcement cases which may require the provision of replacement water to individuals connected to nitrate-polluted wells or water systems.
Central Valley Regional Water Quality Control Board
Irrigated Lands Regulatory Program (ILRP) The goals of the this program are to restore and/or maintain the highest reasonable quality of state waters, considering all the demands placed on that water, to minimize waste discharge from irrigated agricultural lands that could degrade the quality of state waters, to maintain the economic viability of agriculture in the Central Valley, and to ensure that irrigated agricultural discharges do not impair access by Central Valley communities and residents to safe and reliable drinking water.
Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) CV-SALTS is a joint effort by stakeholders, the State Water Board, and the Central Valley Water Board to address salinity and nitrate problems in the Central Valley, with the ultimate goal of adopting long-term solutions that will lead to enhanced water quality and economic sustainability for the region. CV-SALTS is aimed at developing and implementing a comprehensive salinity and nitrate management program, the first phases of which are anticipated in 2014. In addition, CV-SALTS is developing a short-term nitrate action plan, which will use the collective expertise of stakeholders to assist economically disadvantaged communities with engineering assistance and/or grant writing projects with direct impacts on access to safe drinking water.

Groundwater Quality Protection Strategy The Central Valley Water Board began developing a groundwater quality protection strategy in 2008. The strategy, approved by the board in 2010, will provide a roadmap for future regulatory and control activities to be implemented within the next five to twenty years.
Dairy Program In 2007, the Central Valley Regional Board adopted a WDR General Order for Existing Milk Cow Dairies, with requirements that focus on control and abatement of nitrates in groundwater. Each dairy must implement a Waste management Plan by 2011, and must implement a Nutrient Management Plan by 2012. The Dairy General Order also included requirements for sampling of shallow groundwater wells (domestic, agricultural, and monitoring) located on dairy property.

Appendix E: European Union Nitrate Directorate Summary Fact Sheet

European Union Nitrates Directive Summary Sheet

In 1991, the European Union (EU) introduced the Nitrates Directive to help reduce water pollution by nitrates from agricultural sources. The Nitrate Directive classifies groundwater with nitrate concentrations above 50 milligrams per liter (mg/L) as polluted groundwater. There are currently 27 member nations. Member nations are required to develop and implement nitrate action programs that emphasize management of livestock manure and fertilizer application. Codes of good practice for farmers are implemented on a voluntary basis throughout a member nation's territory, and specific "action programs" are implemented on a mandatory basis by farmers located in nitrate-vulnerable zones. More information on the EU Nitrates Directive can be found at: http://ec.europa.eu/environment/pubs/pdf/factsheets/nitrates.pdf

Steps of implementation of the EU Nitrates Directive are summarized below.

1. Identification of polluted or threatened waters

- Groundwater concentrations above 50 mg/l (nitrate as NO_3).
- Surface water - elevated productivity (eutrophication) caused by excess nitrogen.

2. Designation of Nitrate Vulnerable Zones (NVZs)

- Areas of land which drain into polluted or threatened waters and which contribute to nitrate pollution.

3. Establishment of code(s) of good agricultural practice, implemented by farmers located outside of NVZs on a voluntary basis

- Measures limiting the time when fertilizers can be applied on land, in order to allow nitrate availability only when the crop needs nutrients.
- Measures limiting the conditions for fertilizer application (steeply sloping ground, frozen or snow covered ground, near water courses).
- Requirement for a minimum storage capacity for livestock manure.
- Crop rotations, soil winter cover, catch crops, in order to limit leaching during the wet seasons.
- Country-specific codes can also address irrigation efficiency.

4. Establishment Action Programs (mandatory agricultural practices), implemented by farmers within NVZs on a mandatory basis

- Measures included in the code(s) of good agricultural practice become mandatory.
- Other measures such as limitation of fertilizers taking into account crops needs, all nitrate inputs and soil supply.
- Maximum amount of animal manure to be applied corresponds to 170 kilograms of nitrogen (by weight) in manure per hectare per year – but can get an exemption if they can demonstrate that they can meet directive objectives by improving other measures and reducing nutrient loss in other ways.
- Some countries have developed standards for inorganic fertilizer application.

5. National monitoring and reporting every four years on:

- Nitrate concentrations in 31,000 groundwater monitoring locations.
- Eutrophication and nitrate concentrations in 27,000 surface water locations.
- Assessment of Action Programs impact .

Findings, as reported by the fact sheet referenced above, are summarized as follows:

Monitoring Results (as of 2011)

- All member states have submitted at least one action program.
- 66 percent of groundwater monitoring stations (well samples) remained stable or were improving (a reduction in nitrate concentration) between 2004 and 2007.
- 70 percent of surface water monitoring stations remained stable or were improving between 2004 and 2007.
- Nitrate loading has reduced from a high of over 15 million metric tons in 1990 to 12 million metric tons in 2011.

Enforcement

- Infringements (violations) are penalized with administrative orders and fines, in combination with legal procedures. There is a large variation in penalties between member states.
- Fines may be fixed amounts or may be related to an area, or a unit of nutrient above a threshold.
- In some cases, sanctions include a prohibition on the farming business, or a reimbursement of environmental damages caused.
- In 70% of cases, repeated fines are used until the measure is implemented correctly.

Challenges

- Nitrate Directive has been a challenge to implement properly.
- Implementation needs to be tailored to site specific conditions rather than regional models.

- The restriction of manure land application (170 kilograms of nitrogen (by weight) in manure per hectare per year) creates difficulties for member states with a high livestock density and not enough land for manure application.
- Since exemptions to the manure land application limit are tied to additional stringent requirements, many farmers do not use exemptions and instead dispose of their excessive manure offsite.

Attachment 12

Governor's Drinking Water Report

2012

GOVERNOR'S DRINKING WATER STAKEHOLDER GROUP

August 20, 2012

To: Martha Guzman- Aceves
Cliff Rechtschaffen

Cc: Drinking Water Stakeholder Group members
Tom Howard, Executive Officer, SWRCB

Subject: Report of the Drinking Water Stakeholder Group

On behalf of the Drinking Water Stakeholder Group, we are pleased to provide this *Report of Agreements and Recommendations* that will advance efforts to provide safe drinking water to disadvantaged communities in unincorporated areas impacted by nitrates in groundwater.

The Group reached consensus on six key agreements in principle and put forward for your consideration a number of recommended actions. In addition, the group developed three urgent legislative concepts for this legislative session, which we have already provided to your office in advance of this report and are attached here in the form that they were approved by the Group on August 1st.[1] Since that time, however, a number of significant revisions have been recommended on these concepts through continued review by state agencies and stakeholders. Several issues pertaining to these concepts continue to be refined and clarified through continued work with the stakeholder group, state agencies, and others through the legislative process.

It is our understanding that the CDPH has recommended that a number of pieces of these urgent legislative concepts would be best implemented administratively, outside of the legislative process, or need additional time to develop. Based on that agency's recommendations, we understand that two pieces of these legislative concepts, 1) the renewed source of funding for emergency projects through a fee in lieu of interest, and 2) the concepts to clarify and provide additional flexibility around disadvantaged community applicant and project eligibility, will be pursued separately from this year's legislative actions. It is our understanding that the first will be developed further for proposed legislative consideration this coming January, and that the second will be implemented administratively through the Intended Use Plan beginning in January 2013. We appreciate the Governor's commitment to the

[1] Because the legislative concept language attached here has been and continues to be significantly revised, please do not include this attachment in any final report. We are providing that attachment merely to document generally the three urgent legislative concepts that were unanimously agreed upon by the Stakeholder group.

urgent nature of these actions and look forward to supporting the implementation of all of these Recommended Actions both administratively and through the legislative process.

Considerable time was spent developing a shared understanding of existing funding sources and the challenges to accessing those sources for disadvantaged communities in unincorporated areas. The participating state agencies were extremely helpful and supportive throughout this process and we would not have been able to accomplish as much as we did without their considerable efforts. However, there were many more detailed ideas and concepts that were brainstormed through this process that we did not have time to fully develop and reach consensus due to the accelerated timeframe and diversity of the group. Therefore, we believe that the Group has the potential to contribute more than what is contained in this report.

Based on the significant success we had in developing consensus recommendations in the short-term, we believe there are considerable opportunities to further advance the development and implementation of these concepts through continued discussion. We would request that some resources be made available for a professional facilitator to support any continued process going forward, as that was absolutely essential to the success we were able to achieve thus far.

We both thank you for the opportunity to lead this diverse group of interests to the successes and opportunities described in this Report. We stand ready to assist you further in whatever capacity you deem appropriate to develop and implement safe drinking water solutions for these communities.

Sincerely,

David Orth & Laurel Firestone

Co-Chairs of the Drinking Water Stakeholder Group

GOVERNOR'S DRINKING WATER STAKEHOLDER GROUP

AGREEMENTS AND LEGISLATIVE RECOMMENDATIONS

DEFINING THE PROBLEM[1]:

Significant numbers of people lack access or are at risk of lacking access to safe drinking water because nitrates contaminate their groundwater in the Salinas Valley and the Tulare Lake Basin. State and Federal programs exist to attempt to solve the problem, but there are many barriers that prevent communities from making use of those programs, leaving those communities to pay for their unsafe water and the additional cost of purchasing bottled water. According to the UC Davis Nitrate Pilot Project Report, the majority of the nitrates contaminating drinking water are from the agricultural sector.
According to the communities and organizations that advocate on their behalf, and according to the State Water Plan Update, 2009 (page 15-15) two of the most pervasive problems are lack of funds to cover the cost of operations and maintenance and organizational challenges. Because the systems at the highest risk of being entirely without safe water tend to be small systems (serving between 15 and 3300 connections) they cannot achieve the economies of scale necessary to afford the operations and maintenance costs of currently available treatment technologies. If a community cannot demonstrate that they can afford operations and maintenance on their proposed system project they are not eligible to receive most of the available grant dollars from the State or Federal Governments.

Small systems face a number of organizational challenges. There are numerous efforts to address these challenges at the local level. Occasionally creative solutions are difficult to work through our state and federal funding programs, adding one more hurdle for these communities.

STAKEHOLDER GROUP CHARGE:

The Stakeholder Group was asked to:

1. Develop a shared understanding of the O&M challenges and the challenges encountered by creative solutions accessing state agency programs.
2. Identify promising solutions (which may focus on the Tulare and Salinas regions).
3. Develop a plan with a high likelihood of closing these two gaps.
4. Make a recommendation to the Governor's Office.

THE APPROACH[2]:

---

[1] As defined by the "Stakeholder Process on Drinking Water Contaminated by Nitrates" document prepared by the Governor's office and provided to the Drinking Water Group at the initial meeting on June 14.
[2] As defined by the Governor's Office in email dated May 29 inviting the Stakeholder group to the initial meeting of June 14.

SBX2 1 (Perata, 2008) directed the State Water Resources Control Board (Water Board) to study the relationship between nitrate contamination and access to safe drinking water in the Tulare Lake Basin and the Salinas Valley. SBX2 1 also directed the Water Board to provide a report and recommendations to the Legislature. The Water Board contracted with researchers at UC Davis to produce a scientific report that is being used to inform the Water Board's report to the Legislature.

The UC Davis report focused broadly on the nitrates issue and provided a range of promising actions. The Governor's Office convened this Drinking Water Stakeholder Group to identify specific, creative, viable solutions focused in two critical areas; covering the costs of operations and maintenance for small systems, while maintaining affordable water rates[3].; and state agency actions to make funding programs, regulations, and implementation more flexible and proactive in supporting creative solutions.

The Stakeholder Group was challenged with an aggressive timeline to coincide with the Water Board's development of their report and the remaining 2011-12 Legislative calendar. The Group was convened in mid-June and met regularly together and through workgroups on key issues (governance, navigation, legal/regulatory, legislation). With significant support from participating State agencies, the Group reviewed and discussed existing funding sources (summarized in Attachment A), the barriers from multiple perspectives to achieving sustainable drinking water solutions (Attachment B), as well as local and regional projects that are pursuing safe drinking water solutions for disadvantaged communities in unincorporated areas. Agreements in Principle, Recommended Actions and legislative concepts for this legislative session were discussed and agreed upon at the August 1, 2012 meeting of the full Stakeholder Group and are summarized in this Report.

DECISION-MAKING CRITERIA

From the June 27th meeting, the Stakeholders identified these criteria to help reach consensus:

- Solutions should be replicable, sustainable, scalable
  - ✓ "Both/and" solutions
  - ✓ *Options* for communities to consider vs. a 'prescription' for what to do
- Solutions should not harm other areas of the State
  - ✓ Solutions that might be used for more than one pollutant
  - ✓ Avoid creating 'winning' and 'losing communities.
- Leverage existing, available resources
- Creative solutions
- Move closer to safe drinking water for all Californians
- Accelerate what is working
- Solution-oriented
  - ✓ Interim solutions must be sustainable.

[3] As defined by the US EPA (*not reviewed or discussed by the Stakeholder Group)*

O&M FUNDING

The Stakeholder Group discussed methods to address and develop sustainable O&M funding, both in terms of creating additional revenue sources and reducing costs through efficiencies and economies of scale. The Group believes that, in general, in the long-term, systems should have the ability to cover operations and maintenance costs while maintaining affordable rates. However, the Group did not rule out the need for additional outside funding sources in the short-term, particularly for disadvantaged communities in unincorporated areas impacted by increased costs due to source contamination. In order to address this challenge, the Group developed recommendations particularly aimed at fostering locally and regionally viable "shared solutions" that allow for increased economies of scale, as well as reducing unnecessary costs for small systems. The Group recognized, however, that the best solution for each community will differ among a variety of options that are not limited to "shared solutions." While the Group discussed possible revenue sources to support interim O&M funding challenges, each of the identified options present significant legal and political challenges, and thus require additional discussion and effort for any to become viable.

AGREEMENTS IN PRINCIPLE

The Stakeholder Group developed the following Agreements in Principle to guide development of recommendations contained in this Report:

1. It is important to comprehensively and uniformly identify drinking water needs of disadvantaged communities and small systems between 2-14 connections to improve data collection and management.

2. There is a need to incentivize and promote sustainable safe drinking water solutions within disadvantaged communities in unincorporated areas.

3. It is essential to ensure that all disadvantaged communities in unincorporated areas have access to immediate, interim sources of safe drinking water.

4. It is critical to increase access to existing funding sources for disadvantaged communities in unincorporated areas for both long-term and interim safe drinking water solutions and to make it easier for communities to 'navigate' the agency/funding systems and requirements.

5. A key element in achieving sustainability is to reduce costs for disadvantaged communities in unincorporated areas to secure and sustain drinking water solutions.

6. There is a need for continued engagement between a diverse stakeholder group and appropriate State agencies (CDPH, SWRCB, DWR, CalEPA) to develop programs to support sustainable solutions to the drinking water challenges in disadvantaged communities in unincorporated areas of California.

AGREEMENTS WITH ADDITIONAL DETAIL AND RECOMMENDATIONS FOR ACTION

1. **It is important to comprehensively and uniformly identify drinking water needs of disadvantaged communities and small systems between 2-14 connections in unincorporated areas to improve data collection and management.**
   The scope and magnitude of the drinking water problems for disadvantaged communities and small systems in unincorporated areas is not fully understood, due to limits in or a lack of current and ongoing assessment of conditions. Additional efforts are necessary to collect and manage information to inform planning and implementation of solutions.

   Recommended Actions:

   A. Continue to establish, maintain, integrate, and improve data collection tools to help inform planning, prioritization and implementation of interim and long-term solutions.

2. **There is a need to incentivize and promote sustainable safe drinking water solutions within unincorporated disadvantaged communities.**
   Efforts are necessary to actively foster more sustainable, effective, and affordable drinking water solutions and decrease drinking water system vulnerability for very small disadvantaged communities in unincorporated areas lacking sufficient resources or scale to "stand alone," through a variety of locally-driven solutions, including (but not limited to) efficient, effective shared services and facilities, technical support and outreach and education. The exact model will be different for different communities, but may include a wide variety of technical and/or management/institutional options. (For the purposes of this Report, the term "shared services" is used to describe solutions/strategies between and across communities that facilitate increased economies of scale.)

   Recommended Actions:

   A. Identify water supply needs and potential opportunities for promoting and incentivizing sustainable local drinking water solutions for disadvantaged communities in unincorporated areas

   B. Directly target funding for IRWMs (or other entity where appropriate) to develop an inventory of need and a plan for local solutions (including shared solutions) for disadvantaged communities in unincorporated areas in each hydrologic region of the state as is being used in the Tulare Lake Basin Disadvantaged Community Water Study (SBX2 1 (Perata, 2008)).

      i. Begin with the Salinas Valley.

ii. Coordinate these efforts with local health departments, local NGOs, academic institutions and local agencies.

C. Support and fund project planning to foster local, sustainable solutions (including, but not limited to, shared solutions, inter-community planning facilitation, engineering, legal, financial or managerial analysis, environmental documentation, and other project development activities).

i. Directly augment funding to regional planning agencies (e.g. IRWMPs or other appropriate entity) to develop community-driven shared solutions where practical for unincorporated disadvantaged communities. (Model this after work begun in IRWM DAC pilots)

ii. Drinking water regulatory agencies at local and State levels should more actively identify and address technical, managerial, and financial (TMF) capacity issues.

D. Improve accessibility of funding pathways for shared services/facilities projects in communities with highest public health priority as identified by regulatory agencies, including but not limited to:

i. Carve out a set-aside of existing drinking water funding.

ii. Provide strong incentives for shared solutions among local systems and provide funding for NGOs/local agencies/universities for increased outreach and education.

iii. Promote and incentivize more robust investigation of shared solutions as part of feasibility or planning studies.

3. **It is essential to ensure that all disadvantaged communities in unincorporated areas have access to immediate, interim sources of safe drinking water.** *Currently many of California's poorest small disadvantaged communities in unincorporated areas are left without access to safe drinking water for years as they wait to secure financing to develop a long-term safe drinking water source. These communities are often left paying twice for water, as they continue to pay for unsafe water service and have to buy alternative water sources on top of those costs. It is vital that communities have an affordable option to access safe drinking water in their community through an interim source as they are developing a sustainable long-term solution.*

Recommended Actions:

A. Direct rapid, easily accessible funding to support immediate, interim sources of safe drinking water for disadvantaged communities in unincorporated areas.

B. Create a renewable funding source for immediate interim solution funding.

C. Clarify types of solutions eligible for funding including (but not limited to): point of use treatment, point of entry treatment, central high-volume vending machine point, water hauling, etc. Once projects are deemed eligible, develop integrated permitting process to allow for expedited project permitting.

4. Increase access to existing funding sources for disadvantaged communities in unincorporated areas for both long-term and interim safe drinking water solutions.

CDPH, SWRCB and DWR each administer funds to support, develop, and/or implement drinking water solutions. Limits and restrictions, in state and federal law, regulation and guidelines, affect the availability and access to these funds. Processes to access these funds can be difficult and cumbersome, demanding resources and expertise lacking at the local disadvantaged community level. Simplified and expedited processes and additional technical support can increase access to safe drinking water solutions.

Attention to disadvantaged communities in unincorporated areas without a public water system (less than 15 connections) to improve their access to safe drinking water is required. Many disadvantaged communities in unincorporated areas are not served by a public water system but rely on contaminated private wells or unregulated very small systems. In many cases, these communities lack sufficient information on drinking water quality, and wells are often more vulnerable to contamination due to shallow depth and/or construction. However, most existing funding sources are not available for improvements for private wells or infrastructure that is not part of a public water system.

Recommended Actions:

A. Help small disadvantaged communities in unincorporated areas better navigate funding opportunities across agencies

i. Create an interagency 'team' (or "one-stop shop") of existing staff from all State agencies with a role in the funding, regulation, and/or planning of safe drinking water systems in disadvantaged communities in unincorporated areas. This 'one stop' center for DACs will provide technical assistance, professional services, and general guidance to small communities trying to navigate the maze of State agencies and funding/application requirements.

ii. Create a single point of entry for communities needing assistance.

B. Create expedited requirements for funding applications for small disadvantaged communities in unincorporated areas.

C. Improve, support and add access to technical assistance programs, including but not limited to: an ombudsmen program housed in a state agency or the Governor's Office; technical assistance from UCs/ CSUs; local government assistance.

D. Create fund specifically for project planning for disadvantaged communities in unincorporated areas that is easily accessible and less restricted in who must be actual legal applicant.

   i. Utilize local set aside in SRF for local planning and grant directly to IRWMPs to develop solutions for disadvantaged communities without safe drinking water within their boundaries.

E. Utilize existing technical assistance and set-aside programs to fund non-profits or public agencies to do low-income assistance programs. (e.g. Self Help Enterprises well rehabilitation funding program)

F. Expand eligibility for funding and assistance programs for disadvantaged communities in unincorporated areas without a public water system (less than 15 connections).

G. Fund non-profit or county programs that support monitoring, planning, maintenance, and improvements for low-income private well owners or systems less than 15 connections in unincorporated areas.

5. Reduce costs for disadvantaged communities in unincorporated areas to secure and sustain affordable drinking water solutions.

The high cost of specific elements of operation and maintenance and other ongoing costs (e.g., financing costs, the cost of administrative requirements, financial audits, and certain regulatory requirements) impact the ability to achieve sustainable and affordable solutions in certain communities.

Recommended Actions:

A. Reduce high-cost regulatory and administrative requirements for small systems.

   i. Ease burdens of data reporting and streamline application submission process.

   ii. Reduce level of audit requirements for small systems

B. Address cash flow problems for small systems (for example, advancing electronic reimbursements or advance payments).

C. Address reserve fund burden by creating or supporting a pooled reserve fund for small disadvantaged communities in unincorporated areas.

6. **There is a need for continued engagement between a diverse stakeholder group and appropriate State agencies (CDPH, SWRCB, DWR, CalEPA) to develop programs to support sustainable solutions to the drinking water challenges in disadvantaged communities in unincorporated areas of California.** *Development and implementation of solutions will require ongoing and coordinated effort between local stakeholders and appropriate state agencies. Additional discussion to expand concepts contained in this report is warranted.*

   Recommended Actions:

   A. Support the continuation of this Stakeholder Group as the forum to continue this work, resolve 'open' issues and work to advance the interests of all stakeholders.

ATTACHMENTS
1) Existing Funding Matrix
2) Legislative concept recommendations for current legislative session

GOVERNOR'S DRINKING WATER STAKEHOLDER GROUP

August 13, 2013

To: Martha Guzman- Aceves
Cliff Rechtschaffen

From: Drinking Water Stakeholder Group members

Subject: Report of the Drinking Water Stakeholder Group on New and Expanded Funding Sources

The Drinking Water Stakeholder Group (DWSG) is pleased to provide this report which summarizes the process and discussion regarding New and Expanded Funding Sources to address the needs of disadvantaged communities in unincorporated areas that do not have safe drinking water.

Over the past year, the DWSG has worked to examine components of O&M and the existing and new funding sources that could be considered. This particular Report focuses on exploring opportunities and actions to maximize solutions by creating efficiencies, and building institutional capacity to address operations and maintenance and other sustainability and affordability challenges through shared solutions.

The Report examines a number of new funding sources, including those identified in the February, 2013 SWRCB Report to the Legislature, *Recommendations Addressing Nitrate in Groundwater,* and discusses points of agreement as well as issues and concerns for each.

The Report also offers two Promising Options/Actions that could advance drinking water solutions – (1) implementation of a Transitional Funding Program; and (2) Coordination of Disadvantaged Community Representation.

The participating state agencies continue to be extremely helpful and supportive throughout this process and we would not have been able to accomplish as much as we did without their considerable efforts.

We thank you for the opportunity to be involved in this significant and diverse group of interests working towards preparing the opportunities described in this Report. We stand ready to assist you further in whatever capacity you deem appropriate to develop and implement safe drinking water solutions for these communities.

Sincerely,

Laurel Firestone
David Orth

Report on New and Expanded Funding Sources

to address the needs of disadvantaged communities in unincorporated areas that do not have safe drinking water

Governor's Drinking Water Stakeholder Group

August 13, 2013

GOVERNOR'S DRINKING WATER STAKEHOLDER GROUP

REPORT ON NEW AND EXPANDED FUNDING SOURCES

to address the needs of disadvantaged communities in unincorporated areas
that do not have safe drinking water

INTRODUCTION

Background

The Governor's Drinking Water Stakeholder Group (the 'DWSG') was formed in June, 2012 to develop a shared understanding of the operations and maintenance (O&M) challenges and the challenges encountered by creative solutions accessing state agency programs; identify promising solutions; and develop a plan and recommendations for the Governor's office. The DWSG issued a Report in August, 2012 which led to numerous actions by the Administration and Legislature. Specific to the issue of O&M Funding, the Report states:

> *"The Stakeholder Group (DWSG) discussed methods to address and develop sustainable O&M funding, both in terms of creating additional revenue sources and reducing costs through efficiencies and economies of scale. The Group believes that, in general, in the long-term, systems should have the ability to cover operations and maintenance costs while maintaining affordable rates. However, the Group did not rule out the need for additional outside funding sources in the short-term, particularly for disadvantaged communities in unincorporated areas impacted by increased costs due to source contamination. In order to address this challenge, the Group developed recommendations particularly aimed at fostering locally and regionally viable "shared solutions" that allow for economies of scale, as well as reducing unnecessary costs for small systems. The Group recognized, however, that the best solution for each community will differ among a variety of options that are not limited to "shared solutions." While the Group discussed possible revenue sources to support interim O&M funding challenges, each of the identified options present significant legal and political challenges, and thus require additional discussion and effort for any to become viable."*

The DWSG presented a 2013 Work Plan to the Governor's office in November 2012, which focused on (1) monitoring and advancing recommendations in the August 2012 Report, including those related to existing funding programs; (2) advancing the discussion on new and expanding funding sources for O&M; and (3) developing recommendations regarding data collection and management for small systems and private wells.

This Report summarizes the process and discussion regarding New and Expanded Funding Sources and advances promising options, particularly as they related to increasing economies of scale and maximizing opportunities through "shared solutions." The DWSG acknowledges that the best solution for each community will differ among a variety of options that are not limited to "shared solutions". For example, there will be areas where individualized and non-scalable solutions will be necessary. This particular Report focuses on exploring opportunities and actions to maximize solutions by creating efficiencies and building institutional capacity to address O&M and other sustainability and affordability challenges through shared solutions.

Definition of Shared Solutions

The DWSG believes it is appropriate to consider the definition of "Shared Solutions" to be broad and expansive, and not prescriptive or limited to full or physical consolidation of drinking water treatment and delivery systems. The term "shared solutions" refers to any solution that allows a system or systems to achieve technical, managerial, or financial efficiencies and/or water supply or delivery efficiencies by partnering with another system(s). Shared solutions can range in options and can include the following:

- Informal arrangements (e.g., sharing of equipment);
- Formal arrangements (e.g., sharing of technical, managerial and financial resources or joint management between neighboring or various systems, including isolated systems);
- More complex arrangements that may lead to structural changes (e.g. physical sharing of water sources or treatment facilities and even full systems consolidation).

Objective & Scope

The objective of this Report is to examine potential new and expanded funding sources to address the needs of disadvantaged communities in unincorporated areas that do not have safe drinking water, particularly those impacted by nitrate and located in the Salinas Valley and Tulare Lake Basin Hydrologic Region (the "Target Area").[1]

The Target Area covers 5.7 million acres and is home to approximately 2.65 million people, almost all of whom rely on groundwater as a source of drinking water. The Target Area includes four of the most productive agricultural counties in the nation and more than half of California's dairy herd. These areas are also some of California's poorest communities; a number of these communities are categorized as "severely disadvantaged" (less than 60% of the state's median household income), and a number of the remaining communities are considered "disadvantaged" (less than 80% of the state's median household income). These communities have little economic means and technical capacity to maintain safe public drinking water systems.[2]

[1] The DWSG recognizes that other pollutants in water supplies, such as naturally-occurring arsenic, present a challenge for disadvantaged communities.

[2] *Addressing Nitrate in California's Drinking Water*, January 2012 Center for Watershed Sciences, UC Davis

Summary of Issues Covered by this Report

The DWSG discussed methods to address and develop sustainable O&M funding, including: creating additional revenue sources, implementing "shared solutions", increasing the number of eligible projects, and reducing costs through efficiencies and economies of scale. In general, over the long-term, drinking water systems should have the ability to cover O&M costs while maintaining affordable rates. However, the Group identified funding needs in the immediate-term to enable disadvantaged communities to transition to systems that are economically sustainable. In addition, there is a need to reduce short-term costs due to source contamination, particularly for disadvantaged communities in unincorporated areas. As further detailed below, the DWSG discussed possible revenue sources to support O&M and other funding challenges; each of the identified options presents significant legal and political challenges, and thus will require additional discussion and effort for any to become viable.

Process Used to Identify Issues/Challenges/Opportunities

In order to develop a clearer understanding of new or expanded funding needs, the DWSG developed the attached background matrix. The matrix identifies the types of funding needs, and then for each, lists 1) the approximate funding requirements, 2) existing funding sources and availability, and 3) the new or expanded funding sources discussed by the DWSG, with notes on important considerations for each. All members of the DWSG were asked to contribute ideas and input that were included in the matrix to focus and clarify our discussion and development of recommendations on new or expanded funding sources.

The DWSG formed five working groups from DWSG members and representatives to monitor, develop and advance concepts included in both the August 2012 report and this Report. These working groups covered Legislative, Government Structure, Capacity & Technical Assistance, Utilizing Existing Funding Sources, and Data/Monitoring. Attached to this Report are summaries of working group activities, except for the Data/Monitoring working group which will complete its tasks later this year. The DWSG intends to file a final report on Data/Monitoring by November, 2013.

GUIDING PRINCIPALS

The DWSG agreed to the following guiding principles regarding new and expanded funding sources:

1) No single source of revenue is appropriate – ideally, a portfolio of funding sources will be available to address solution components.
2) There is a need to develop economically sustainable solutions at the local/regional level that can cover O&M costs over long-term.

3) Significant, targeted resources are necessary to address the costs of transitioning systems to economically sustainable solutions, particularly to foster "shared solutions" that take advantage of economies of scale and address factors that may make these systems economically sustainable.

FUNDING NEEDS AND GAPS

The DWSG identified the following categories of vital funding needs, and key gaps in existing and limited funding sources:

- **Disadvantaged communities without an existing public water system –** The funding needs of communities with private wells and state smalls (systems under 15 connections) are often ineligible for funding from existing sources.[3] Funding needs include appropriate testing of individual wells, facilitation of community meetings to understand the problem and evaluate and choose an affordable and sustainable solution, all the pre-planning and planning analysis and documentation described above, construction of new infrastructure, legal entity formation and Local Agency Formation Commission (LAFCO) processes, on-going technical, managerial and financial capacity development and leadership training, as well as O&M costs and interim solutions. Furthermore, a number of these communities are not adequately identified or mapped by local and state planning agencies, and also may lack any form of organized governance structure, making development of solutions and funding even more challenging.

  Existing state bonds and federal Safe Drinking Water State Revolving Fund (SRF) funding are restrictive and limited for areas without an existing public water system. Significant funding will be needed to address the needs of communities without regulated drinking water systems, and more comprehensive and targeted mapping, water testing and other data collection (such as median household income (MHI) surveys), technical assistance, community outreach and facilitation efforts are needed to adequately estimate this need and develop solutions.
- **Disadvantaged communities served by privately owned public water systems –** Disadvantaged communities reliant on small, privately-owned public water systems (such as those serving mobile home parks and labor camps) experience similar challenges. Funding for privately-owned systems through existing funding programs is more restrictive than for publicly-owned systems, and is primarily loan-based. As a result, pre-planning and construction loan repayment costs are generally passed to the tenants through increased water rates. Residents in these systems have similar affordability challenges.

[3] The Safe Drinking Water State Revolving Fund and past state grant programs restrict funding eligibility to public water systems. Federal as well as state statute defines a public water system as "a system for the provision of water for human consumption through pipes or other constructed conveyances that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year."

- **Project Pre-planning & Planning –** Existing funding sources for this work are often very restricted. Funding opportunities are often spread over a number of different agencies and programs making them difficult to access for disadvantaged communities. Furthermore, other than a few pilot projects,[4] these funds are often only available in piecemeal and communities need to apply individually for each step in their planning process. A more comprehensive, coordinated and targeted effort is needed, to provide required funding for all of the pre-planning, planning and technical assistance components listed above. The funds should be available for all types of disadvantaged communities in unincorporated areas that do not have safe drinking water regardless of whether they are served by an existing public water system or lack a regulated water system, and regardless of whether the water system is a privately-owned or publicly-owned entity.

  Project planning and pre-planning were among the primary funding gaps and needs identified. Specifically, this category includes the need to more comprehensively identify community needs, help communities evaluate and determine the best solution that can provide sustainability and affordability over the long-term (including evaluating new operations or new or improved governance structures that create more economies of scale), and develop the project plans and documentation necessary to implement the solution. This includes:

    - Technical assistance
    - Outreach
    - Data collection (such as well testing, income surveys, etc.)
    - Facilitation of joint project development
    - Feasibility studies
    - Governance structure analysis
    - Legal assistance and entity formation
    - Engineering
    - Project design
    - Development of plans and specifications
    - Environmental analysis

- **Technical Assistance –** Technical Assistance is vital to enable disadvantaged communities to develop projects and access funding. The funding needs listed above as "pre-planning" or "planning" needs often require technical assistance to develop robust plans. These efforts may be funded directly through technical assistance providers in some existing agency programs. Specific technical assistance needs include:

[4] In the regions of focus, there have been two pilot projects that have begun to spearhead a more comprehensive planning process focused on fostering shared solutions – the Tulare Lake Basin Disadvantaged Community Water and Wastewater Study, and the Upper Kings Basin Water Authority Disadvantaged Community Pilot Project. Both were funded through special appropriations within DWR's Integrated Regional Water Management funding program.

- Project development and management
- Responding to requests for proposals and completing full applications
- Community outreach and meeting facilitation, data collection support – including MHI surveys
- Technical, managerial and financial capacity development
- Leadership training

Some funding sources currently provide technical assistance to disadvantaged communities to access existing funding programs. However many of these programs are extremely limited, can be difficult to access and are restricted in the programs or services that can be funded. A more comprehensive, coordinated and targeted effort is needed, including providing required funding for all of the pre-planning, planning and technical assistance components listed above. The funding should be available regardless of whether the community is served by an existing public water system or lacks a regulated water system, and regardless of whether the water system is a privately-owned or publicly-owned entity.

- **Construction and Capital Costs –** Most existing funding is for capital improvement projects. However, there is almost no funding available for capital costs for communities without a public water system. In addition, the overall needs associated with drinking water infrastructure in the state far exceed existing resources. Without significant, targeted efforts to provide the planning and technical assistance funding needed to develop "shovel ready" long-term, sustainable and affordable solution projects, the existing construction funding will not flow to disadvantaged communities.

- **Ongoing O&M –** Water systems are facing higher and higher O&M costs due to increasing source water contamination (including nitrates), and increasing regulatory standards (including requirements that cause water providers to have to hire more staff, contract for certified professional services, and meet new and stricter water quality levels). Typical O&M costs include, but are not limited to, staff (management, administrative, and operations, etc.), financial services (bookkeeping, billing, accounting, audit and financial reporting), professional services (certified operator, engineer, attorney), water quality monitoring, permit fees, insurance, annual equipment and infrastructure repair and replacement, energy costs, chemical or other water quality treatment materials, wholesale water purchases. Rates and charges can also include components for loan repayment, and creation of capital reserves.

  The only existing funding source for O&M is local rate payers. Proposition 218 requirements are a factor relative to rate setting. There are currently no federal, state-wide or regional funding sources to supplement these costs for local water providers.

As a result, many disadvantaged communities are often unable to raise enough funding through rates alone to provide for even the basic costs of running a water system. At the same time rates become increasingly unaffordable for low-income residents, who face water shut-offs if they cannot pay their full bill, and often have to pay for alternative water sources when the system is unable to provide safe drinking water. Often the first area of costs that are under-funded are the capital reserves for future infrastructure repairs and replacements for infrastructure.

As discussed in our August 2012 Report, efforts must be made to reduce O&M costs as much as possible, as well as create more economies of scale. Although the DWSG agreed that the developed solutions need to be self-sustaining, there was also agreement that significant investment and targeted efforts to create new systems that allow for more economies of scale was needed to achieve this outcome, and initially there may need to be interim support for O&M cost.

More investigation and discussion is needed regarding the development of funding options that allow for water providers to ensure an affordable rate for basic water needs for disadvantaged communities in unincorporated areas.

- **Interim Solutions** – Interim solutions are needed to ensure that disadvantaged communities in unincorporated areas can have immediate access to safe drinking water while developing and implementing sustainable and affordable long-term solutions. Creating well-planned new or modified governance structures and infrastructure projects can take years, and many disadvantaged communities lack access to safe drinking water now. Interim solutions, such as providing bottled or vended or hauled water, or installing small-scale (such as point-of-use/entry) treatment systems to disadvantaged communities, ensures that residents are able to access safe and affordable drinking water while long-term solutions are being developed and implemented.

  Currently only a one-time allocation of $4 million statewide has been made available to fill this need through state funding sources. While useful, the source of the funding limits the flexibility of the program to provide the most cost-effective interim solutions, and the one-time nature of the fund limits the amount of funding available per community, regardless of need.

  Some private funding sources have initiated efforts to support these kinds of funding needs, including local Rotary Clubs, and private foundations such as The California Endowment. Additionally, individual growers have provided bottled water to some neighboring communities (i.e. areas in the Santa Maria and Salinas Valley). The State Water Resources Control Board (STWCB) and the regional water quality control boards have initiated some efforts to develop additional orders for dischargers to provide replacement water to neighboring communities. However, there is no ongoing, reliable source of funding for this need.

- **Mitigation of Pollution Impacts –** When drinking water sources are contaminated by natural and/or anthropogenic sources of pollution, many of the costs listed above are needed to mitigate that pollution. The needs are particularly acute in disadvantaged communities in unincorporated areas that often only have one or two wells as the sole source of drinking water. Funding for planning, technical assistance, capital costs, increased O&M and interim solutions are often needed to develop a new source or treat an existing source of drinking water.

  Currently the only available funding for these costs is either through local ratepayers, limited state or federal programs, or, for some anthropogenic sources of pollution, through complex individual enforcement or liability actions (which are even more complex and challenging in the case of non-point pollution).

- **Wastewater Infrastructure –** The DWSG is focused on safe drinking water solutions. As a point of information, the DWSG notes that often communities without safe drinking water may also lack adequate wastewater services and infrastructure. This can lead to further contamination of drinking water sources and public health impacts. Many of the same funding needs identified for disadvantaged community drinking water solutions, including preplanning and planning, technical assistance, capital costs, and O&M are needed for wastewater as well.

  Currently the amount of grant funding needed in the state for wastewater projects far exceeds the amount available through existing funding sources. Planning and construction funding is generally available (almost always as loans), but funding for ongoing operations and maintenance is restricted and therefore in greater need. Furthermore, even with extra points or priority for disadvantaged communities, without significant, targeted efforts to provide the planning and technical assistance funding needed (as outlined above) to develop "shovel ready" long-term, sustainable and affordable solution projects, the existing construction funding will not be able to adequately address disadvantaged community needs.

- **Data Gathering and Management –** Existing public drinking water systems (with 15 connections or more) are required to monitor water quality and report data from certified labs to the regulatory agency (California Department of Public Health (CDPH) or Local Primacy Agencies (LPAs), such as County Environmental Health programs), and CDPH has an existing data management system for that data. However there is no central system for gathering or managing data on water quality for areas outside of existing public drinking water systems. As a result, there is extremely limited data on water quality and water needs for disadvantaged communities that are on private wells or state smalls (less than 15 connections).

  CDPH's existing data collection and management system is funded by public water systems that pay for the monitoring directly, and pay for the data collection and management costs through their permit fees. There are very limited funding mechanisms and funding sources available for data collection or management for areas on private wells or state smalls (<15 connections). Even the existing funding sources have been insufficient to uniformly fund a complete and adequate database for small public water systems (15-1000 connections) resulting in the lack of considerable information required to plan for the water related needs of these communities. Furthermore, access to this data is limited for various reasons. This creates local data availability problems for communities seeking cost-effective solutions, because information on the construction, depth and screening level of nearby wells is not always available, forcing communities to dig unnecessary test wells. Given the limited availability of planning funds, a solution to this dilemma should be explored.

Estimating the Amount of Need

General estimates of the amount of funding needed to address drinking water quality challenges were included in the UC Davis Report on Nitrates in Drinking Water, and recent needs assessment updates from USEPA. The attached matrix provides estimates on different types of needs, to the extent available through a variety of sources, as well as a brief description of the source and/or assumptions underlying those estimates. The DWSG was not able to further refine estimates of the total dollar amount needed for some of these topics, in part because there has not been a comprehensive needs assessment. As noted above, the DWSG believes ongoing needs assessments are required to fully comprehend the scope and magnitude of this problem, and to target funding and refine future funding requests. However, the DWSG agreed that the lack of an estimate on the total amount needed for some of the topics listed above does not mean that the type of need is any less real or urgent.[5] To the contrary, in many cases it is an indication that it is a gap in existing funding and should be a focus of new and additional or expanded funding efforts. Where such gaps exist, one option for reducing delays and providing immediate assistance is to design pilot programs that fund a limited number of projects. This has the benefit of providing information and guidance for future program development, while at the same time providing urgently needed assistance without delay.

TYPES OF NEW AND EXPANDED FUNDING ALTERNATIVES CONSIDERED/DISCUSSED

The DWSG identified and considered new and expanded funding alternatives, including but not limited to those included in the SWRCB Report to the Legislature.

Water Bond

The DWSG reached consensus that some portion of the solution was appropriate to be funded by general obligation bonds. There was also consensus that a modified version of the 2014 water bond should have significant, targeted funding to address this problem. There was recognition

[5] The UC Davis Report on Nitrates in Drinking Water demonstrated a significant overall need and quantified that need at a very course level.

that funding from a modified version of the 2014 bond is not guaranteed because it has to pass by a two-thirds vote of the Legislature and then be approved by the voters. Funding would also take significant time to become available even with a successful bond due to the legislative appropriations process and the development by agencies of funding guidelines and criteria.

While bonds are generally not used to fund O&M costs, it was suggested that under special circumstances a bond could fund a limited amount of O&M and start-up costs if written into the bond as a transition to implement regional solutions that will ultimately be self-sustaining. This concept requires further legal and financial analysis.

Regional Financing

The DWSG agreed **in concept** that regional or county contributions may be an appropriate part of the funding solution. There was an acknowledgement, however, that obstacles to implementation include local economies (many of the regions that have the largest problems are also the poorest regions), local politics, existing jurisdictional boundaries and authorities, and Proposition 218 processes.

Specifically, the group discussed a county-wide or regional special tax that could be added to sales tax collections on goods at the local level. Special taxes have been authorized by local agencies and then passed by local voters to pay for various programs or specified projects. Many counties have established such taxes for county-wide transportation purposes. A majority vote of the legislature authorizing such use would be required followed by local authorization and a two thirds majority of local voters. Funds raised could be dedicated to local safe drinking water projects, although any regional sales tax would be a regressive tax. The group noted that passage of any such a measure would require significant campaign investment to be successful, and would require an existing county or a new or existing regional entity to administer the funds and any related debt issuances.

Nitrogen Fee/Fertilizer Tax

Agricultural representatives believe it is premature to discuss the appropriateness of a nitrogen fee or fertilizer tax while other available funds have not been fully utilized and regulatory efforts are still being realized, as not all nitrate contamination in disadvantaged communities is a result of farming practices. Additionally, not all farming areas in the state have nitrate issues in drinking water.

However, agricultural landowners and growers recognize there is a shared responsibility for and interest in maintaining acceptable water quality. They recognize that past fertilizer inputs, as well as other historical land use practices, may have contributed to groundwater quality problems, and are focused on finding solutions to address the contribution that may be coming from existing agricultural practices.

Farmers and ranchers within the Central Valley and the Central Coast regions currently pay significant mandatory regional water board regulatory program monitoring and reporting costs, which the agricultural industry estimates to average about $37 million a year. Additionally, farmers and ranchers have significant costs to implement new beneficial management practices and infrastructure upgrades to comply with the surface and groundwater elements of the Irrigated Lands Regulatory Program and the Dairy Regulatory Program. The grower-funded cooperative groundwater program approved by the Central Coast Regional Water Board will locate and sample domestic supply wells and characterize groundwater aquifers with a focus on the quality of shallow groundwater. Agricultural industry representatives estimate this program will cost growers about $13 per acre.

Agricultural representatives noted that agriculture has also been proactive in addressing groundwater problems locally by partnering with local agencies, including recently, the community of San Lucas. We anticipate this practice will continue as monitoring results are analyzed.

Environmental justice representatives stated that some contribution from agriculture is necessary to fund part of the costs of solutions and mitigation of nitrate impacts on groundwater quality degradation.

Water User Charge (Fee/Tax)

Like the proposed fertilizer fee/tax, the proposal for a statewide water user fee/tax (also known as a public goods charge) generated opposition from a specific group of stakeholders, water agencies. Water agencies stated that 1) such a charge would be a tax because the payers in most areas of the state would not receive a benefit from their payment, and they would not have contributed to the water contamination problem; 2) as a tax it would require a two-thirds vote of the Legislature to enact; 3) the tax would be a regressive tax; and 4) the State Water Resources Control Board's (SWRCB) February 2013 Nitrate Report recommendations noted that this type of charge may be viewed as a burden on low-income residents.

Environmental justice representatives stated that a public goods charge is regularly brought up as a way to fund statewide priorities, and that the development of long-term sustainable solutions for communities without safe water should be given the same statewide priority.

Point of Sale Fee/Tax on Agricultural Commodities

A point of sale fee or tax on agricultural commodities at the retail level has also been discussed and was one of the recommendations made by the SWRCB in their report to the Legislature. Such a fee or tax applied to food items would be regressive and precedential in nature given the tax-exempt status of food items currently. Agricultural representatives also feel such a fee is too narrow and wrongly assumes that all drinking water contamination is agricultural based. The constitutionality of charging a fee or tax on the out-of-state agricultural commodities is also a concern.

Environmental justice advocates are concerned that a fee or tax would further disproportionately impact low-income communities and especially those already dealing with contaminated drinking water.

Federal Funding - Farm Bill

DWSG members have initiated discussions at the national level to create a pilot project within the Rural Utility Service program (funded by the Farm Bill) for grants and technical assistance for disadvantaged communities in rural areas and in cities and towns with a population of less than 10,000 where drinking water is impaired by nitrate contamination.

PROMISING OPTIONS / ACTIONS

Transitional Funding Program

At the state level there is a need for a targeted and coordinated funding program with the clear goal of transitioning small disadvantaged communities in unincorporated areas without safe drinking water (including those communities with and without existing public water systems) to achieve, self-sustaining, affordable drinking water systems. Such an effort would need to include targeting significant amounts of existing funding sources, and will need new and additional funding sources to adequately address the needs and gaps identified above. The modified Water Bond should include significant funding for this effort.

This newly targeted program should specifically include funding for the following:

- Community outreach and data collection and analysis of community needs, particularly for communities without public water systems
- Facilitation of stakeholder-driven development of shared solutions, and on-going communication, outreach, and organization of community participation
- Engineering and governance feasibility studies and pre-planning
- Project planning, design and environmental review
- Funding for implementation of shared solutions, including construction, implementation of new or modified governance structures and other one-time costs associated with setting up a new entity
- Technical Assistance for both 1) project application and project operation and management (currently eligible under CDPH funding but not DWR IRWM funding), and 2) leadership and capacity training

- A pooled capital reserve fund, which can cover both short-term financing costs and help lower O&M costs.[6]
- Some O&M subsidies for an initial period of time until long-term solutions are implemented and self-sustaining[7]

As a "transitional" program, the associated funding should be limited to supporting the transition of existing disadvantaged communities (including those that have a public water system as well as those that currently lack a regulated water system) into self-sustaining systems that can achieve compliance with the applicable regulatory requirements and ensure affordable rates. The program should not be a long-term, on-going financial support mechanism. As such, a disadvantaged community's participation in a transitional funding program should have conditions and incentives to ensure it is meeting certain objectives and milestones in a timely manner. What types of conditions and incentives and what is an appropriate timeframe are issues that need discussion.

Consolidating Disadvantaged Communities Representation

The Need

Many disadvantage communities (DACs) lack sufficient organization and representation required to develop, implement and maintain drinking water solutions. In areas with high concentrations of disadvantaged communities, the number of issues and diversity of interests are difficult to address given the limited scope and resources of local entities (water districts, counties, neighboring communities, Integrated Regional Water Management or IRWMs, and Non-Governmental Organizations (NGOs)) and the various State agencies as each and every DAC require specific analysis and support.[8] While counties and other existing water agencies are able to support some of these functions, there is a need in some areas for a new entity that will have the focused mandate, capacity and in some cases, political will to fill the needed planning function and facilitation of solutions for DACs.

In order to effectively and efficiently implement solutions in areas with a large number of disadvantaged communities in unincorporated areas without safe drinking water, including the Tulare Lake Basin and Salinas Valley, consideration should be given to how representation of DACs can be coordinated and in some instances consolidated. Without this kind of coordination, disadvantaged communities in unincorporated areas will likely remain isolated, disjointed, and often unorganized without structural capacity and an ability to implement cost effective drinking water solutions.

[6] Further review/analysis by bond counsel is required to determine limits and restrictions under tax law if this is funded from bond funds.

[7] IBID

[8] systems serving DACs are An additional complicating factor is the fact that many small community water private entities (e.g. mutual water companies, mobile home parks, labor camps, etc.). These entities are generally governed as corporations not subject to governmental agency requirements such as open meetings or public records laws, and are often restricted in their ability to obtain full grant funding through state and federal water funding programs.

Attributes Needed from a DAC Representative Organization or Entity

In concept, the mission of any organization or entity formed for DAC representation should be focused on disadvantaged community water needs and 1) provide the organization, structure, and capacity needed to support development and funding of sustainable and affordable shared solutions, 2) represent and integrate disadvantaged communities into local and regional planning processes, including IRWMPs, and 3) provide direct management and operations of DAC water systems when needed or not being implemented by other interested parties.

Specific objectives and outcomes for a DAC representative organization or entity could include:

1. Develop, collect, and update inventory of DAC water needs.
2. Provide outreach, communication, and capacity development with local disadvantaged communities in unincorporated areas (including those served by public water systems and districts, as well as those without regulated water systems).
3. Facilitate and support locally-developed, voluntary consolidation and regional planning efforts by providing expertise for studies or analysis, stakeholder facilitation, as well as legal and LAFCO processes, with the goal of advancing the most sustainable and affordable solutions.
4. Serve as receiver and/or operator for individual systems, as needed or requested, with the objective of ensuring affordable rates and increased sustainability.[9]
5. Represent and integrate DAC water needs within IRWMs and other planning efforts.
6. Provide financing/fundraising/grant writing/fiscal management for local and regional drinking water projects for disadvantaged communities in unincorporated areas without safe drinking water, as needed or requested (regardless of whether they are served by an existing public water system or lack a regulated water system, and regardless of whether the water system is a privately-owned or publicly-owned entity).

Considerations for Potential Forms and Structures of DAC Representative Entities

The DWSG discussed the various structural forms within California law to develop regional DAC representation. In some areas, for example, a county may be appropriate to coordinate DAC representation. However, while counties are perhaps most closely aligned with these objectives, some of them lack sufficient resources, focused mandates, and DAC expertise to apply proper priorities to DAC water needs. One option for a solution is to provide the needed resources and training to counties to conduct this work. Joint power authorities may also be a feasible alternative for local interested parties to address drinking water issues.

[9] The entity should be able to operate these systems as one larger system to spread costs and create more economies of scale and increase affordability.

The DWSG had discussions about the potential for creating one or more new regional entities as another option that could provide DAC representation that communities or systems could participate in on a voluntary basis in regions with a large number of disadvantaged communities in unincorporated areas without safe drinking water. The jurisdictional lines of the entities could be watershed based, starting with just the Tulare Lake Basin and Salinas Valley. Other jurisdictional lines (e.g., smaller than watersheds) might be practical as well.

Such an entity or organization could be housed in an existing agency or local government or be a new independent entity. Future development of this concept should include input from LAFCOs on their involvement and discussions on how to avoid conflict with other water suppliers.

More discussion and work is needed to evaluate the related issues and develop a full proposal for the structure and role of any such entity or organization. However, considerations should include the following:

- The entity should not just become another layer of bureaucracy or costs for small DACs, but instead create efficiencies, additional capacities, and reduced overhead.
- The entity should have sufficient expertise in the technical, managerial and financial needs of DAC communities, as well as a clear and focused mandate.
- In developing the entity, consideration should be given to what legal authority and financial capacity is needed to serve the functions outlined above; this could include planning, fundraising and financial management, and direct operation of systems as needed.
- The entity should be complementary, rather than duplicative or directly competitive, with existing IRWMs, local water agencies or other local or regional jurisdictions.
- The structure should allow for the entity or organization to authentically and independently represent the DACs within its area of coverage.
- The size/scale of any entity should be appropriate (for example, it should be sufficient to achieve needed economies of scale and provide representation for DACs in processes such as IRWMPs and local, regional and state efforts. However, the scale must be small enough to make the entity and its operation accessible to its DAC membership).

Background Discussion Matrix for Funding Discussion

Governor's Drinking Water Stakeholder Group (DWSG)

August 13, 2013

This discussion matrix tool is not a consensus document and is only meant to serve as a background discussion tool to help focus and clarify DWSG discussion and development of recommendations around new/ additional funding sources. Further discussion of funding sources is contained in the DWSG Report on New and Expanded Funding Sources dated August 13, 2013.

SCOPE: The focus of this discussion is disadvantaged communities in unincorporated areas that do not have safe drinking water. The DWSG particularly focused on those impacted by nitrate and those in the Salinas Valley and Tulare Lake Basin. Whenever possible commenters provided information tailored and focused on that scope, although they also provided broader information as well to help provide some context for the need and amounts. In all cases, commenters did their best to clarify the scope being described.

Type of Funding need	**Approximate amount needed (indicate if annual or total)**	**Existing Funding Amounts used (indicate approx. amount annually or total)**	**Existing Funding sources potentially available**	**Potential new funding sources being looked at**	**Comments/ Notes**
Project Planning					
Pre-planning and Planning funding to develop regional or shared solutions					
	Approx. $15K for planning and another $15K-20K for engineering per project; $1M for the Central Valley alone.[1]		CDPH: New CDPH SRF pre-planning grants (approx. $1.3M for this year once new work plan for funds in place and approved)	May expand amount available for pre-planning grants in next year IUP for DWSRF.	Funding might be most effective if rolled into existing planning funds.

[1] Based on estimates from Self-Help Enterprises (technical assistance provider).

Type of Funding need	Approximate amount needed (indicate if annual or total)	Existing Funding Amounts used (indicate approx. amount annually or total)	Existing Funding sources potentially available	Potential new funding sources being looked at	Comments/ Notes
Planning funding to develop regional or shared solutions (*continued*)					
		DWR: IRWM pilot projects – • Provided $2.75M to seven IRWM regions, including Upper Kings DAC pilot ($500K), to foster DAC participation in IRWM planning efforts, and • $2M Tulare Lake Basin DAC wastewater/water quality treatment plan.	No additional funding sources. All IRWM planning grant funds have been awarded.	AB403 and AB1 would have allocated a one-time amount from State Board penalty fund ($2M) to comprehensive DAC pilot project in Salinas Valley. Clean-up and Abatement Fund may provide opportunity. New Water Bond	AB403 or AB1 failed to pass in 2013 There are limitations on how Water Bond Funding may be used for planning.
		Strategic Growth Council (Prop 84) Department of Conservation: Funded two consolidation planning projects for drinking water and wastewater this past year in Tulare County. ($939,861)	Third round of Prop 84 Strategic Growth Council (SGC) planning grants available in November 2013. ($13M)	Future grant rounds may be funded by cap-and-trade revenues.	Competitive Statewide Draft guidelines review process under way for funds available November 2013. Cap and trade investment plan finalized through budget.

Type of Funding need	**Approximate amount needed (indicate if annual or total)**	**Existing Funding Amounts used (indicate approx. amount annually or total)**	**Existing Funding sources potentially available**	**Potential new funding sources being looked at**	**Comments/ Notes**
Individual community project planning grants					
		CDPH: Prop 84 planning grants [fully allocated], SRF planning grants.	CDPH DWSRF Planning funds for existing water systems.		
		California Department of Housing and Community Development – CD Allocation Program. Has been used to fund projects like connecting home laterals to new distribution systems.			Each year, generally in January, the CDBG program releases one combined Notice of Funding Availability (NOFA) for both the Community Development and Economic Development Allocations.

Type of Funding need	Approximate amount needed (indicate if annual or total)	Existing Funding Amounts used (indicate approx. amount annually or total)	Existing Funding sources potentially available	Potential new funding sources being looked at[2]	Comments/ Notes
O&M					
Base Operation and Maintenance Costs					
		Entirely funded by rate payers.	No current state funding available for such costs.	New Water Bond	Legal review is needed to determine where and how Water Bond funding may be used for O&M. Agricultural representatives note that not all farming areas in the state have nitrate issues in drinking water.
				Fertilizer Fee/Tax	As a tax it would require a 2/3 vote of the Legislature to enact. Agricultural representatives note that not all farming areas in the state have nitrate issues in drinking water. Farmers and ranchers within the Central Valley and the Central Coast regions currently pay significant mandatory regional water board regulatory program monitoring and reporting costs, which the agricultural industry estimates to average about $37M a year. Environmental justice representatives believe that some contribution from agriculture is necessary to fund part of the costs of solutions and mitigation of nitrate impacts on groundwater quality degradation.
				Water User Fee/Tax	Water agencies stated that 1) such a charge would be a tax because the payers in most areas of the state would not receive a benefit from their payment, and they would not have contributed to the water contamination problem; 2) as a tax it would require a 2/3

[2] Refer to DWSG Report on New and Expanded Funding Sources dated August 13, 2013 for further discussion of the potential funding sources.

Type of Funding need	Approximate amount needed (indicate if annual or total)	Existing Funding Amounts used (indicate approx. amount annually or total)	Existing Funding sources potentially available	Potential new funding sources being looked at[3]	Comments/ Notes
O&M					
Base Operation and Maintenance Costs				(continued)	(continued)
				Water User Fee/Tax (continued)	vote of the Legislature to enact; 3) the tax would be a regressive tax; and 4) the State Water Board's February 2013 Nitrate Report recommendations noted that this type of charge may be viewed as a burden on low-income residents. Environmental justice representatives stated that a public goods charge is regularly brought up as a way to fund statewide priorities, and that the development of long-term sustainable solutions for communities without safe water should be given the same statewide priority.
				Point of Sale Fee/Tax on Ag Commodities	Would require 2/3 vote of the Legislature to enact. Such a fee or tax applied to food items would be regressive and precedential in nature given the tax-exempt status of food items currently. Agricultural representatives also feel such a fee is also too narrow and wrongly assumes that all drinking water contamination is agricultural based. The constitutionality of charging a fee or tax on the out-of-state agricultural commodities is also a concern. Environmental justice advocates are concerned that a fee or tax would further disproportionately impact low-income communities and especially those already dealing with contaminated drinking water.
				Carbon Tax[3]	

[3] Refer to DWSG Report on New and Expanded Funding Sources dated August 13, 2013 for further discussion of the potential funding sources.

Type of Funding need	Approximate amount needed (indicate if annual or total)	Existing Funding Amounts used (indicate approx. amount annually or total)	Existing Funding sources potentially available	Potential new funding sources being looked at[4]	Comments/ Notes
Increased treatment costs due to contamination of source water – *Anthropogenic sources*					
	\$13M/ year for nitrate in Salinas and Tulare only.[5]	Currently entirely funded by rate payers, although if there are clear polluter**s**, after years of litigation, public water systems have been successful in recovering treatment costs from polluters or manufacturers of polluting chemicals.	Water Board: Cleanup and Abatement Account (although current uncommitted fund balance is not less than \$8M the available amount varies significantly and unpredictably over time, since it is dependent on penalties collected)	New Water Bond	See comment on page 4
				Fertilizer Fee/Tax	See comment on page 4
				Water User Fee/Tax	See comment on page 4
				Point of Sale Fee/Tax on Ag Commodities	See comment on page 5

[4] Refer to DWSG Report on New and Expanded Funding Sources dated August 13, 2013 for further discussion of the potential funding sources.
[5] See Endnotes for more detail on this estimate and underlying assumptions.

Type of Funding need	**Approximate amount needed (indicate if annual or total)**	**Existing Funding Amounts used (indicate approx. amount annually or total)**	**Existing Funding sources potentially available**	**Potential new funding sources being looked at**	**Comments/ Notes**
Increased treatment costs due to contamination of source water – *Natural Sources*					
Increased treatment costs due to new/revised primary or secondary MCLs (Maximum Contaminant Levels) for natural sources		Currently entirely funded by rate payers. Often a reason systems seek new sources of water (e.g., consolidation, new well, treatment, etc.)		Fertilizer Fee/tax	See comment on page 4
				Water User fee/tax	See comment on page 4
				Point of Sale fee/tax on Ag Commodities	See comment on page 5

Type of Funding need	Approximate amount needed (indicate if annual or total)	Existing Funding Amounts used (indicate approx. amount annually or total)	Existing Funding sources potentially available	Potential new funding sources being looked at	Comments/ Notes
Capital / infrastructure projects					
Public water system improvements or new sources					
	DWSRF shows a total of $9.5B on the PPL, $650M is just to address inability to meet primary drinking water contaminants (category A-G). $23M/year for just nitrate for Salinas and Tulare only.[6]	CDPH: • DWSRF • Prop 84 is over allocated already but should solve some of this need. • Prop 84 Emergency Funding for capital improvements (approx. $2-4M of original $10M has been used)	CDPH: • DWSRF • Prop 84 Emergency Funding for capital improvements (approx. $4-6M of original $10M still available) Water Board: Supplemental Environmental Projects (SEPs). Amount available is variable, but has averaged approx. $3M/year for all SEP projects. SEPs may potentially be available for other funding needs included in this matrix (e.g. project planning, studies, monitoring programs, etc.), but there must be a nexus between the violation addressed and the SEP.	New Water Bond AB21 (Alejo) will create a renewable source for capital costs for emergency projects from Fee in Lieu of interest on SRF.	Note that Prop 84 Emergency Funding listed here does not include funding for interim solutions, only capital projects, such as new pumps, interconnections, collapsed well replacement, etc. SEPS are funded by dischargers in lieu of paying a portion of a Water Board-assessed penalty. Would need to develop SEP projects to solicit this type of funding.

[6] See Endnote for more details on this estimate and underlying assumptions.

Type of Funding need	Approximate amount needed (indicate if annual or total)	Existing Funding Amounts used (indicate approx. amount annually or total)	Existing Funding sources potentially available	Potential new funding sources being looked at	Comments/ Notes
Public water system improvements or new sources (continued)					
		DWR: IRWM: Round 1 provided $21.3M to critical water supply/water quality projects (35% water quality / 65% water supply) and an additional $43.5M in “non-critical” DAC funding.	DWR: **IRWM implementation grants**: Available balances for the Tulare and Salinas funding areas – (after Round 2 planning awards) Central Coast = $27.3M and Tulare/Kern = $33M. **Prop 50 Desalination** = $4.5M total available, includes brackish groundwater; pilots, feasibility, demo, and construction. **Prop 50:** $5M per grant; total funding $34M for the following programs: 1) **Pilots & Demonstrations for Contaminant Removal Technologies:** Pilot and demonstration projects for the following contaminants: Petroleum products, Nitrosodimethylamine, Perchlorate, Radionuclides, Pesticides, Herbicides, Pharmaceuticals, Heavy Metals, Endocrine disrupters 2) **UV/Ozone disinfection byproducts:** Systems that have MCL compliance violation, surface water treatment microbial requirements, or disinfection requirements by CDPH or local primacy agency. **Prop 81:** Grants or loans to investigate alternatives for system improvements. $25K/investigation project; $400K/ construction project. Total available 5.1M.	2009 Water Bond bill proposed $50M for Interregional funds and lists meeting the needs of DACs or economically distressed areas, including technical assistance and grant writing assistance, as one of six expressly named actions.	

Type of Funding need	Approximate amount needed (indicate if annual or total)	Existing Funding Amounts used (indicate approx. amount annually or total)	Existing Funding sources potentially available	Potential new funding sources being looked at	Comments/ Notes
Short-term financing during construction					
		Rural Community Assistance Corporation provides bridge loans. CDPH will reimburse interest costs on bridge loans for SRF projects. California Endowment may have some funds.			

Type of Funding need	Approximate amount needed (indicate if annual or total)	Existing Funding Amounts used (indicate approx. amount annually or total)	Existing Funding sources potentially available	Potential new funding sources being looked at	Comments/ Notes
State Smalls and Private Wells					
Planning funding to develop solutions for state smalls and private wells					
			CDPH: New: CDPH SRF pre-planning grants, for areas with at least 15 residences ($1.3M available this year once work plan developed and approved)	Future years of DWSRF IUP may have more money in the new pre-planning grant fund.	
		USDA : Loan/ Grant Program for Private Wells ($189K)		2013 Farm Bill	DWSG members are pursuing a Rural Utility Service pilot project - $10M to address nitrate contamination in drinking water. Still in negotiation.
Education and outreach funding to identify and involve affected systems and do leadership development in the state small DACs					
	Low to mid six figures.	None Apparent	Not clear if applicable state funds.	Private Foundations	Ag participation important, as many of the State Smalls are on farms.

Type of Funding need	Approximate amount needed (indicate if annual or total)	Existing Funding Amounts used (indicate approx. amount annually or total)	Existing Funding sources potentially available	Potential new funding sources being looked at	Comments/ Notes
Domestic Well rehabilitation, repairs or new water source infrastructure for state smalls					
		VERY small amount through USDA revolving fund administered through third party providers through competitive national grant program.		New Water Bond	
Technical Assistance					
		CDPH: Third party technical assistance contracts funded through Capacity Building Program of DWSRF.	DWR: DWR does not have a technical assistance program, similar to DPH or SWRCB. There may be limited remaining capacity on existing facilitation and technical services contracts.	Creation of volunteer "retiree" / annuitants' technical assistance program.	CDPH potentially interested in funding some costs of volunteer program.
		CalEPA E J Grant: 20K			Awarded to Community Water Center to provide ongoing technical assistance and support in at least five southern S J Valley communities.
Training for Board Members, Staff, and Operators					
		CDPH: Funds Free Drinking Water Workshops series, which are classroom and online courses provided throughout year.			Courses targeted to board members are ONLY provided online and English-language; not accessible for many DACs

Type of Funding need	Approximate amount needed (indicate if annual or total)	Existing Funding Amounts used (indicate approx. amount annually or total)	Existing Funding sources potentially available	Potential new funding sources being looked at	Comments/ Notes
Median Household Income (MHI) Surveys					
		CDPH: Has contract with RCAC (Rural Community Assistant Corporation) for 15 MHI surveys.		Using CDPH guidelines other entities, such as non-profits and university student groups (include AWWA University chapters), can perform surveys as volunteers, or if funding secured or if it meets service learning project requirements.	Needed to show eligibility for most grant funding programs.

Type of Funding need	Approximate amount needed (indicate if annual or total)	Existing Funding Amounts used (indicate approx. amount annually or total)	Existing Funding sources potentially available	Potential new funding sources being looked at	Comments/ Notes
Waste Water Systems Upgrade Funding to Prevent Pollution to Drinking Water Sources					
	$887M (Based on SWB small communities' project waiting list. Only 165 of 321 communities have cost estimates. Amount could be well over $1.5B)	Water Board: $13M (one time) Small System Waste Water Program (Funds approved by SWB on February 2013)	Water Board: CWSRF funding can be used to address wastewater degradation of groundwater supplies (e.g., septic to sewer projects). Small Communities Waste Water Program funded through Fee in Lieu of interest in CWSRF.	New Water Bond	AB30 would eliminate sunset and cap for Small Communities Waste Water Program.
		USDA Waste Water Revolving Fund $487K	USDA Waste Water Revolving Fund: Need more info - Tens of millions potentially available.	Farm Bill -2013	USDA Waste Water Revolving Fund

Type of Funding need	Approximate amount needed (indicate if annual or total)	Existing Funding Amounts used (indicate approx. amount annually or total)	Existing Funding sources potentially available	Potential new funding sources being looked at	Comments/ Notes
Data gathering and management					
Monitoring state smalls					
			Water Board: Cleanup and Abatement Account (current uncommitted fund balance is not less than $8M)		
Monitoring private wells					
			Water Board: Cleanup and Abatement Account (current uncommitted fund balance is not less than $8M)		
Collecting, Reporting and Managing Drinking Water Data for public water systems and state smalls and private wells.					
		CDPH has a comprehensive system for collecting data for public water systems (>/= 15 connections)			

Estimated Least Cost Long-term Funding Needed to Address Nitrate in Drinking Water in Tulare Basin and Salinas Valley

*Estimates based on UC Davis Report for the SWRCB SBX2 1 Report to the Legislature, estimates represent least cost long-term solutions. See below for details on estimates and underlying assumptions. **Further analysis required to determine statewide needs.**[7]

Option	Annual Capital Costs	Annual O&M Costs	Total Annual Costs
	Community Public and State Small Systems[1,2]		
Pipeline to a Nearby System (10,000+ system)	$5,592,000	--	$5,592,000
Groundwater Treatment Facility	$1,903,000	$4,441,000	$ 6,344,000
Surface Water Treatment Facility	$14,426,000	$7,106,000	$21,532,000
Subtotal (Community Public and State Small Systems)	$21,921,000	$11,547,000	$ 33,468,000
	Self-supplied households and local small water systems[3]		
Installation of Point of Use RO Systems	$1,000,000	$1,500,000	$2,500,000
TOTALS	**$22,921,000**	**$13,047,000**	**$35,968,000**

[1] O&M [1] Costs from UC Davis Technical Report 7, Table 45, page 100; 44, page 99

[2] Total costs from UC Davis Technical Report 7, Table 44, page 99

[3] All cost information from UC Davis Technical Report 7, page 101

[7] Refer to DWSG Report on New and Expanded Funding Sources, dated August 13, 2013

Data Collection and Management for Local and State Small Water Systems January 2014

Scope of this Report

A Working Group was tasked by the Governor's Drinking Water Stakeholder Group (Stakeholder Group) to identify what data the state has regarding nitrate contamination of small water systems (2-14 connections), particularly in the Tulare Basin and Salinas Valley, and to recommend actions that would improve nitrate data collection and management practices. The Stakeholder Group previously recommended that the state "continue to establish, maintain, integrate, and improve data collection tools to help inform planning, prioritization and implementation of interim and long-term solutions" to nitrate contamination.[1] This report expands that recommendation and is organized under the following headings:

- Summary of Findings
- Issues Statement
- Background
- Existing Data Collection and Management Mechanisms
- Data Gaps
- Conclusions
- Recommendations
- Implementation Challenges
- Non-consensus issues

In addition, the report includes the following attachments, which provide more detailed references used to develop our conclusions and recommendations:

- Attachment A – Water System Definitions,
- Attachment B – Small Systems (2-14 Connections) Nitrate Testing in the Salinas Valley and Tulare Lake Basin.

Summary of Findings

The Stakeholder Group has concluded that there is no uniform, statewide system for testing small water systems for nitrate contamination. The State Water Resources Control Board (State Water Board) has sampled private domestic wells through its Groundwater Ambient Monitoring and Assessment (GAMA) Program and some regional water boards require testing of domestic wells located on farms. However, there is no state program for testing state and local small water systems (2-14 connections) and the state thus has limited data on these systems.

[1] Governor's Drinking Water Stakeholder Group Final Report to the Governor's Office, August, 20, 2012.

To the degree data is collected on small water systems, it is being done almost entirely at the county level. The five counties in the Tulare Basin and Salinas Valley have adopted very different nitrate testing requirements; the Stakeholder Group assumes this same pattern exists statewide. For state small water systems (5-14 connections), nitrate testing may occur only upon the initial permitting of a water system well (Kern), annually (Fresno, Tulare), or on a different schedule based on nitrate concentration levels (Monterey, Kings). For local small water systems (2-4 connections), several counties do not require testing (Tulare, Fresno, Kings), although some require testing upon the initial permitting of the well (Kern, Monterey) or at a frequency based on concentration levels in initial and follow-up testing (Monterey). These data are not linked to well completion reports (WCRs), which are reports that contain details of well construction such as location and screening depth. County data are sometimes forwarded to the state but are often not maintained in a format that can be used in various state databases.

The nitrate data collection and management practices of the state and the counties in the Tulare Basin and Salinas Valley are summarized in matrix form in Attachment B.

Issue Statement

As the Stakeholder Group reported to the Governor in August 2012, "the scope and magnitude of the drinking water problems for disadvantaged communities and small water systems in unincorporated areas is not fully understood, due to limits in or a lack of current and ongoing assessment of conditions. Additional efforts are necessary to collect and manage information to inform planning and implementation of solutions."[2] Water users, especially those near or within rural agricultural areas are at risk of drinking water containing nitrate at concentrations in excess of health standards and may not know it.

Regular and systematic collection and reporting of nitrate data from state small and local small water systems will help identify the locations and needs of populations at risk of being served water that exceeds drinking water standards. According to the California Department of Public Health (CDPH), an estimated 95% of Californians are served by public water systems[3] subject to rigorous drinking water quality testing and reporting requirements. However, drinking water quality oversight for water systems below the public water system threshold of 15 service connections is either less stringent or nonexistent. Moreover, what limited data are collected at the county level for domestic wells and these small water systems is often maintained in disparate non-electronic formats – this includes both water quality and well location data.

---

[2] Ibid.

[3] See the State Water Resources Control Board's *AB2222 Report*, available at http://www.waterboards.ca.gov/water_issues/programs/gama/ab2222/docs/ab2222.pdf

Background

The following discussion provides background information regarding current state and county level drinking water program regulatory oversight for water systems below the "public water system" service connection threshold with respect to data collection and management.

Water System Terminology

Attachment A to this report provides excerpted water system definitions from applicable drinking water statutes and regulations. Water system terminology is very important given applicable state drinking water statutes and regulations can be confusing with respect to the use of similar terminology with different legal definitions depending the source and context of the applicable statute or regulation. For consistency within this report, the Stakeholder Group will be using the definitions of state small water systems for 5-14 connection systems, local small water systems for 2-4 connection systems, and private domestic wells for single connection systems. As the matrix in Attachment B reveals, state agencies and county agencies have adopted different definitions for under-15 connection systems, which may generate confusion; *we recommend that the "state small" and "local small" definitions be standardized, as indicated above.* In addition, although applicable statutes and regulations define "small water systems" as varying subsets of public/community water systems[4], the use of the term "small water systems" within this report refers to water systems/wells below the public water system threshold of 15 service connections.

State Small Water Systems

Title 22 of the California Code of Regulations and the Health and Safety Code currently only addresses state small water systems via minimal sampling and consumer reporting requirements. The Health and Safety Code (§116275(n)) defines a "state small water system" as "a system for the provision of piped water to the public for human consumption that serves at least five, but not more than 14, service connections and does not regularly serve drinking water to more than an average of 25 individuals daily for more than 60 days out of the year." Regulations currently require state small water systems to conduct quarterly bacteriological sampling within the distribution system and one time sampling at the point of initial water system/well permitting, prior to any treatment, for various minerals (fluoride, iron, manganese, chlorides and total dissolved solids) and inorganic chemicals, including nitrate, with Maximum Contaminant Levels MCLs) listed within Table 64431-A, section 64431(a) of Title 22 of the California Code of

[4] There are numerous types of water systems that are referred to using a variation of the term "small water system," which may confuse the lay reader. For example, depending on context or the legal text at issue:

- "***State*** small water system" refers to a system with 5-14 connections;
- "Small ***community*** water system" refers to a community water system with 15-3,300 connections; and
- "Small ***public*** water system" refers to a system with 5 to 200 connections.

Attachment A provides an overview of and citations for the different water system definitions used in the state.

Regulations (CCR). (See 22 CFR §64211 through §64213.) No additional or follow-up sampling is specifically required unless ordered by the local health officer. Current regulations delegate decisions about additional testing to the local health officer, although statute allows CDPH to promulgate more stringent regulations. (Health and Safety Code §116340) For systems/wells with initial sampling results above the MCL, the local oversight agency requires either an alternative source of supply or treatment with verification of MCL compliance, but typically does not require follow-up sampling to verify the system continues to comply with drinking water standards. Our survey of county practices, summarized in Attachment B, found that Kern county requires nitrate testing upon the initial permitting of a well (the regulatory minimum), Fresno and Tulare require annual testing, and that Monterey and Kings require a nitrate testing schedule based on nitrate concentration levels found during previous tests.

Local Small Water Systems

Neither Title 22 nor the Health and Safety Code currently define or address water systems below the state small water system threshold of five service connections. Consequently, there are no statewide requirements for systems with less than five service connections unless otherwise required by an individual county; county level drinking water programs typically do not regulate these systems/wells beyond the initial point of permit application and the level of initial sampling requirements vary from county to county. The California Department of Public Health (CDPH) and various county public/environmental health agencies (i.e., county level drinking water programs) throughout the state generally define private domestic wells as wells serving up to four (4) service connections (i.e., individual residences). However, some local health agencies define a private domestic well as serving an individual residence (single connection) and "local small (or shared) water systems" as having 2 to 4 service connections. This report adopts the definition of local small water systems as one with 2-4 connections.

Our survey of county practices, summarized in Attachment B, found that Tulare, Fresno, and Kings counties do not require testing of local smalls (although Tulare and Fresno offer voluntary, one-time testing), that Kern requires one-time testing upon well permitting, and that Monterey requires repeat testing once every three years at a minimum with increased sampling frequencies based on nitrate concentration levels.

Private Domestic Wells

Adopting the State Water Board's approach, the Work Group defines private domestic wells as those serving a single connection. Although private domestic wells were not within the scope of the project study, the Work Group found that several county (Fresno, Tulare) and state programs (State Water Board, Central Coast Regional Board, Central Valley Regional Board) offer voluntary nitrate testing of private domestic wells. Some counties (Monterey, Kern, Tulare) require one-time nitrate testing of newly installed private domestic wells, and some regional boards (Central Coast Regional Board, Central Valley Regional Board) require ongoing testing of private domestic located on some farms or dairies.

Local Agency Oversight Programs

Health and Safety Code section 116340 dictates that state small water system requirements be enforced by the local health officer or a local health agency designated by the local health officer. As such, local county public health or environmental health departments are typically the oversight agency for state small water systems, local small water systems, and private domestic wells (for drinking water quality and sometimes well permitting). An evaluation of county level drinking water programs within the Central Coast and Central Valley regions indicates that local health officers/programs are implementing varying requirements for water systems below the public water system threshold, as detailed above. These requirements range from the minimum state regulations to more protective requirements that include tiered sampling frequencies based on drinking water pollutant concentration ranges and sampling of water systems/wells below the state small water system threshold of five service connections (required sampling frequencies and analyses vary).

There are currently no requirements governing the management of data generated by state small water systems or smaller entities or for reporting data beyond the county level. Each county manages its data differently, often only in a hard copy format or in a non-searchable electronic format.

Existing Data Collection and Management Mechanisms

Existing Data Collection Programs for 2-14 connections

The Working Group surveyed agencies responsible for collecting and/or storing groundwater quality data for systems with fewer than 15 connections. The results are organized in the accompanying matrix in Attachment B.

Public Water System Data Management

Drinking water quality data associated with public water systems is currently reported to and managed through CDPH's Water Quality Management database. These data are submitted to CDPH by private and commercial laboratories that are approved by CDPH's Environmental Laboratory Accreditation Program. These laboratories are required to electronically transmit the public water system water quality data, often through a Laboratory Management Information System (LIMS) utilized by larger commercial laboratories or through a program provided by CDPH for use by the smaller and county agency laboratories. The CDPH water quality data are also regularly integrated to the State Water Board's GeoTracker GAMA information system.

GeoTracker GAMA additionally integrates available groundwater water quality data from Water Board regulatory programs (e.g., UST program, etc.) and projects (i.e., GAMA Priority Basin Project, GAMA Domestic Well Project, and GAMA Special Studies). Regulatory data are predominantly uploaded by responsible party representatives (environmental consultants and laboratories) using the GeoTracker ESI tool. Other datasets are also shared with the State Water Board and are integrated into GeoTracker GAMA using other methods.

Analytical data associated with existing regulatory programs that are currently not uploaded to the GeoTracker GAMA information system, data collected voluntarily, or data collected as part of a county monitoring plan from domestic wells and unregulated water systems could potentially be integrated into either the CDPH Water Quality Management database or GeoTracker GAMA if provided in the appropriate format.

Local Public/Environmental Health Agency Data Management

Many county public/environmental health agencies manage water quality data at the local level collected from state small and local small water systems by utilizing third-party software (e.g. Decade Software-Envision Connect), a Microsoft-Access based database, or a Microsoft-Excel spreadsheet, which may have the ability to query the information, if requested. Even though a majority of the counties statewide uses third-party software for small water system drinking water quality data management, this not the case for all counties. Some counties may not track this information electronically and the water quality analyses may be retained in the individual water system files as hard copies. Currently, if water quality data are available electronically at the local level, they are not integrated into either the CDPH Water Quality Management or GeoTracker GAMA databases.

Data Gaps

Local Small Water Systems

Currently, Title 22 requirements for county level monitoring and reporting only address state small water systems, to the exclusion of systems with fewer than five connections. In its AB 2222 Report to the Legislature, the State Water Board concluded that "[w]ater quality data from [local and state small systems] do not exist or are not easily available in a centralized database." [5] Our survey of county practices confirmed this finding; many counties imposed no testing requirements on local smalls, and any data that is collected at the local level is not being reported to the state. This is significant because, in certain counties, there are a large number of local smalls. Using Monterey County as an example, which requires ongoing monitoring of systems with as few as two (2) connections, it is clear that these systems are at no lower risk than state small water systems. Monterey County has a much greater number of local small water systems than state small (694 to 276), and water quality monitoring of these systems indicates that local small water systems are exposed to greater levels of nitrate contamination.[6]

[5] AB 2222 Report, p. 22, available at, http://www.waterboards.ca.gov/gama/ab2222/docs/ab2222.pdf
[6] Based on Environmental Justice Coalition for Water analysis of 2010 Monterey County state and local small monitoring data.

Identification of Disadvantaged Communities (DAC) and/or Individuals

The Stakeholder Group has already identified the lack of information about DACs and their water quality as a major data gap and recommended the allocation of resources to address that gap. An issue identified by the Working Group is the difficulty of using census block or tract[7] data to map out DACs and SDACs[8]. The scale of these data, particularly in rural areas, may not be of a sufficiently fine scale to identify very small DACs or individuals served by small water systems, or even public water systems. For example, California Rural Legal Assistance recently completed a Median Household Income (MHI) survey for Alpine Court Labor Camp, a 19-household farmworker community in the Salinas Valley. The census tract which includes Alpine Court stretches 16 miles north to south and covers half the town of Gonzales. While census income data did indicate the community was a DAC at $42,300, the MHI survey revealed that Alpine Court has a much smaller MHI at $24,000, well below the SDAC MHI threshold. It takes only a few affluent households within a block or tract, depending on the number of households with them (the population within census blocks can vary greatly), to drive the MHI above the DAC MHI thresholds. Subsequently, an even more localized evaluation scale supported by grass-roots efforts is likely needed to adequately identify DACs and DAC drinking water needs within rural areas. In addition, new DAC vocabulary and criteria needs to be developed that addresses small groups or individuals living below the MHI that are not part of a specific community or are not sufficiently represented by census block data.

Access to Well Completion Reports

Well completion reports (WCRs), which provide information including well location, depth, and screening level are maintained by the Department of Water Resources (DWR). California Water Code Section 13752 provides that the reports "shall not be made available for inspection by the public, but shall be made available to governmental agencies for use in making studies, or to any person who obtains a written authorization from the owner of the well." DWR has scanned several hundred thousand hard copy well reports into TIFF or pdf format so that they may be stored electronically. However, the files are not searchable and are not linked to individual water system well locations or other information such as water quality data, making it difficult for authorized agencies and representatives to find needed information.

[7] A census block is the smallest geographic unit used by the United States Census Bureau for tabulation of 100-percent data (data collected from all houses, rather than a sample of houses). Several blocks make up block groups, which themselves are aggregated to make up census tracts.

[8] California Water Code Section 79505.5 defines a disadvantaged community as one with a median household income that is less than 80% of the state median household income. California Health and Safety Code Section 116760.2(n) defines a severely disadvantaged community as one with a median household incomes that is less than 60% of the state median household income.

Conclusions

Monitoring and Reporting

- Testing of local small water systems is inconsistent; little regular testing of these wells for nitrate contamination occurs;
- State small system nitrate sampling varies greatly by county; some require testing only upon submission of a permit application (the minimum requirement), some require annual testing, and some require testing based upon initial nitrate concentration levels;
- Sampling is done by county officials or by well operators self-reporting, which may create inconsistent sampling methods;
- Counties do not report the nitrate testing data to the state.

Data Management

- At the county level there is often a lack of fully electronic and searchable records;
- There is no comprehensive statewide database of voluntary or county-collected nitrate sampling data;
- Water quality data are not linked to Well Completion Reports (WCRs);
- Agency and/or public access to critical information in WCRs is severely limited or nonexistent;
- Available data are not in consistent formats or compatible with GIS applications;
- Most local data are often only accessible through PRA request;
- The State does not have a comprehensive accounting of state small and local small water systems and associated wells.

Recommendations

		Implementation steps	Resource needs
Monitoring and Reporting	Increased County-level monitoring and reporting for state small and local small water systems: 1. CDPH should consider expanding current regulations to require nitrate sampling of local small and state small water systems/wells. Sampling could be conducted at different frequencies based upon historic water quality information. CDPH regulations already direct the local health officer to require testing of state small system for constituents of concern as determined by local health officer (in consultation with CDPH and State Water Board).	CDPH should inventory counties to determine their current testing requirements and use this to inform a regulatory update or other appropriate actions.	Additional funding will be needed to support additional sampling, analysis and reporting. Insufficient data are available to determine what additional local or state resources might be needed. Recommend that resource needs - for the counties and the systems they regulate - be included as part of the CDPH inventory CDPH will need funding to conduct this comprehensive inventory and to develop regulations, if needed. This could be incorporated into their Drinking Water Plan, which is in development now and is supposed to be updated every five years.

Recommendations

		Implementation steps	Resource needs
Monitoring and Reporting	Consumer Reporting for state small water systems: 2. Currently required customer notifications, which are delivered annually or continuously posted at a central location, should additionally include (a) contact information for local public/environmental health agency program who oversees state small water systems and (b) provide translation where needed.	Update regulations; provide translation of basic notice in most common languages.	CDPH resources for regulatory update translation services.
	3. Similar reporting should be required for local small water systems.	Update regulations to include local small water systems.	Local resources would be needed as new systems would need to be advised of notification requirements.

Recommendations

		Implementation steps	Resource needs
Data Management	One Stop Shop or Common Portal for Water Quality Data: 4. All county-level water quality data associated with water systems/wells would need to be reported (in a format compatible) to the California Department of Public Health (CDPH) Water Quality Management database. (Most certified labs should already have the capability to do this.)	CDPH would provide notices to certified labs with a requirement to provide data in an appropriate format. CDPH should include this requirement as part of the lab certification process. CDPH should consider including these changes within Environmental Laboratory Accreditation Program (ELAP) regulatory revisions that are currently under development. Counties and systems doing sampling would need to provide the same direction to their labs.	Resources may be needed for any regulatory update required. Laboratories may have a potential need for new or updated software that could result in costs being passed on to counties and systems using their services.

Recommendations

		Implementation steps	Resources needs
Data Management	Well Completion Reports (WCRs): 5. Require that future WCRs be reported/uploaded electronically into a robust searchable online database system, maintained by DWR that can be linked with water quality data in GeoTracker, with access to that data consistent with existing statute.	DWR, in coordination with the State Water Board, should develop database software and secure website for drillers to generate electronic WCRs and make data available to appropriate county and state level agencies (investigate other states that already do this).	Costs for new or revised data systems.

Implementation Challenges for Recommendations

Expansion of County Monitoring and Reporting Requirements

At the county level a local drinking water program agency is tasked with fulfilling the Health Officer's regulatory obligations for state small water systems. New or expanded regulations to require more water quality analyses at greater frequencies and expanding those requirements to local small water systems will present cost and resource challenges on two basic levels. First, state and local small water systems, with a small and often disadvantaged rate-payer base, may find it difficult to absorb the increased expense of additional testing. Certified analytical labs can submit sample results to the CDPH database in the standard format so that expense is not borne by the state small water system. If reporting to the customers or local Health Officer is required that cost will be borne by the system and can vary. Typically the state small water system conducts operations with volunteer labor.

A second level of cost and resource challenges is at the local public/environmental health agency which presently regulates state small water systems. New water quality monitoring, reporting and data management may require increased staff time and related expenses.

Data Management and Access Issues/Concerns

Concerns with identification and sampling of currently unregulated water systems/wells include well location confidentiality (i.e., public safety), decreased property values associated with poor water quality, and potential third party liability associated with the sources of pollution.

Identifying Disadvantaged Communities

This report is concerned with identifying the needs of disadvantaged communities.[9] However, identifying disadvantaged or severely disadvantaged[10] communities can be difficult. The difficulty of identifying communities using census data is compounded by the fact that the 2010 long-form census survey did not include income as a question. The annual (and smaller) American Communities Survey is used as a substitute, but has an even greater margin of error for small communities than prior census information. Currently NGOs and service providers conduct income surveys of communities that are trying to qualify for funding. Trying to distinguish disadvantaged communities from the rest of the population for the purposes of this report would not be a good use of resources. However, because these surveys must be done before an application for funding is submitted there is a need to ensure that funding is available to conduct what is often an expensive and time consuming process.

[9] Ibid
[10] Ibid

Non-Consensus Issues

Private Domestic Wells Serving DACs

Although private domestic wells were not included in the workgroup's charge, several members expressed concern that a significant number of DACs rely on private domestic wells as a drinking water source.[11] Groundwater quality data collected from private domestic wells serving a DAC will help identify potential drinking water threats to nearby DACs. To address disadvantaged community drinking water needs and ensure all communities have access to safe drinking water, there must be a better mechanism to identify the water quality of DACs that rely on private domestic wells.

There is no statewide regulatory requirement for testing groundwater quality from private domestic wells, whether serving a DAC or not. Of the five counties surveyed for this report, four require testing or provide voluntary water testing at the time that a well permit is obtained. Follow-up testing is not required in any of the counties surveyed. Data generated by any testing are maintained in a variety of formats, none of which are submitted to the state, and which are only made publicly available through a Public Records Act request. As the State Water Board reported in its AB 2222 Report, there is no "comprehensive database for these groundwater sources."[12]

Several efforts, most conducted by the State Water Board's GAMA program[13], have tested the water quality of private domestic wells in these counties. The results indicate that nitrate contamination in private domestic wells is significant, ranging from 11% of wells tested (Monterey County, 2011) to 41% (Tulare County, 2006).

---

[11] The number of DACs relying on private domestic wells in the Tulare Lake Basin and Salinas Valley regions alone is likely in excess of 200 communities (with a total population of over 100,000), based on the preliminary inventory of communities under development for the Tulare Lake Basin Disadvantaged Community Water Study (TLB Study) and The UC Davis Nitrate Report, 2012. The TLB Study, which is still finalizing its database of unincorporated communities in the Tulare Lake Basin, is funded by the Department of Water Resources and administered by Tulare County. Thus far, the database includes nearly 200 unincorporated communities that rely at least in part on private domestic wells in the Tulare Lake Basin alone. A final report with final number estimates is due in late 2014. More information is available at http://www.tularecounty.ca.gov/cao/index.cfm/tulare-lake-basin-disadvantaged-community-water-study/. According to *Addressing Nitrate in California's Drinking Water* (UC Davis Nitrate Report, 2012), approximately 245,000 people rely on about 74,000 domestic wells within the Tulare Lake Basin and Salinas Valley. There are an estimated 20,000 private domestic wells in Tulare County alone.

[12] AB 2222 Report, p. 31 (http://www.waterboards.ca.gov/gama/ab2222/docs/ab2222.pdf).

[13] The State Board's GAMA Program has sampled private domestic wells in five county focus areas since 2002, including Tulare and Monterey Counties. Through its continuing collaboration with the USGS, GAMA is also testing private domestic wells as part of its Priority Basin Project (called Shallow Aquifer Assessment). In addition, the Central Coast Water Board is implementing domestic well projects as part of its Central Coast Ambient Monitoring Program – Groundwater Assessment and Protection (CCAMP-GAP)

While not a consensus, some members of the group recommended:

1. Sampling and reporting requirements for local small water systems should be extended to private domestic wells serving known DACs.
2. State and county agencies should expand efforts to educate private domestic well owners about the need to regularly test their well water, and provide resources to disadvantaged communities to assist in testing efforts. Data collected by a voluntary well sampling program should be included in the GeoTracker GAMA groundwater information system. As part of these voluntary programs, private domestic well owners must be clearly informed that the water quality results will be made public and that precise well locations and ownership information will remain confidential.[14]

Well Completion Reports

The Stakeholder Group held divergent opinions on the need for public availability of information contained in WCRs. Current state law[15] limits access to the information in these reports to governmental agencies for use in making studies. This makes California unique among the western states.

Some stakeholders believe that this information – particularly information about well location and screening depth – is critical for homeowners and/or communities investigating the potential for a new well. The alternative practice of drilling a test well is cost prohibitive for many disadvantaged communities and is often only accessible after a water system has received funding for planning and/or feasibility studies. Access to location and screening depth information in relation to local water quality would provide these communities a preliminary evaluation of local conditions and better inform the process for selecting a new water source. Moreover, disclosure of such information would help empower communities relying on private domestic wells to take the appropriate precautionary measures if and when they find themselves at risk of water contamination, whether it be seeking out water quality sampling or consolidating with neighbors and/or a local water provider to secure a new drinking water source.

Other stakeholders believe the current practice of making this information available to public water systems, state agencies, or consultants working for public agencies is sufficient to generate needed information. Others thought that the law could be amended to allow access to a broader list of experts, including academia, under certain conditions.

[14] Currently GeoTracker GAMA keeps well owner and precise well location information confidential, except for environmental monitoring wells associated with groundwater cleanup sites.
[15] California Water Code Section 13752.

Attachment A – Water System Definitions

Private domestic wells and local small water systems

Neither the California Health and Safety Code or Title 22 of the California Health and Safety Code define private domestic wells or water systems with 2-4 service connections. The California Department of Public Health (CDPH) and various county environmental health agencies throughout the state acting as the drinking water program primacy agency for "state small water systems" or "small public water systems" generally define private domestic wells as wells serving up to four (4) service connections. However, some local health agencies define a domestic well as serving an individual residence (single connection) and "local small (or shared) waster systems" as having 2 to 4 service connections.

Water system type legal definitions

The following water system definitions are taken directly from the California Health and Safety Code and Title 22 of the California Code of Regulations as noted. The hyperlinks preceding the excerpted definitions are to CDPH's compilation documents for drinking water related statutes and regulations:

http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Lawbook/DWstatutes-2012-01-01a.pdf

HEALTH AND SAFETY CODE

DIVISION 104. ENVIRONMENTAL HEALTH
PART 12. DRINKING WATER
CHAPTER 4. CALIFORNIA SAFE DRINKING WATER ACT

Article 1. Pure and Safe Drinking Water

§116275. Definitions.[16]
(h) "**Public water system**" means a system for the provision of water for human consumption through pipes or other constructed conveyances that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year. A public water system includes the following:

(1) Any collection, treatment, storage, and distribution facilities under control of the operator of the system that are used primarily in connection with the system.

[16] Note: the Title 22 definitions of a "public water system" and "community water system" are consistent with the Federal Safe Drinking Water Act definition of a public water system; http://water.epa.gov/infrastructure/drinkingwater/pws/pwsdef2.cfm

(2) Any collection or pretreatment storage facilities not under the control of the operator that are used primarily in connection with the system.
(3) Any water system that treats water on behalf of one or more public water systems for the purpose of rendering it safe for human consumption.

(i) “**Community water system**” means a public water system which serves at least 15 service connections used by yearlong residents or regularly serves at least 25 yearlong residents.

(n) “**State small water system**” means a system for the provision of piped water to the public for human consumption that serves at least five, but not more than 14, service connections and does not regularly serve drinking water to more than an average of 25 individuals daily for more than 60 days out of the year.

(j) “**Noncommunity water system**” means a public water system that is not a community water system.

(k) “**Nontransient noncommunity water system**” means a public water system that is not a community water system and that regularly serves at least 25 of the same persons over six months per year.

(o) “**Transient noncommunity water system**” means a noncommunity water system that does not regularly serve at least 25 of the same persons over six months per year.

(aa) “**Small community water system**” means a community water system that serves no more than 3,300 service connections or a yearlong population of no more than 10,000 persons.

§116395. County evaluation of small public water systems.
(b) For purposes of this section, "**small public water system**" means a system with 200 connections or less, and is one of the following:
(1) A community water system that serves at least 15 service connections used by yearlong residents or regularly serves at least 25 yearlong residents.
(2) A state small water system.
(3) A noncommunity water system such as a school, labor camp, institution, or place of employment, as designated by the department.

Article 3. Operations
§116350. Department responsibilities.
(c) The department may conduct studies and investigations as it deems necessary to assess the quality of private domestic water wells.

http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Lawbook/dwregulations-2012-06-21c.pdf

TITLE 22 CODE OF REGULATIONS
DIVISION 4. ENVIRONMENTAL HEALTH
Chapter 14. Water Permits

Article 3. State Small Water Systems

§64214. Service Connection Limitation.
No state small water system shall add additional service connections to the system such that the total number of service connections served by the system exceeds 14 before the water system has applied for and received a permit to operate as a public water system from the Department.

Article 4. Local Primacy Delegation

§64251. Definitions.
(a) For the purpose of this Article the following definitions shall apply:

(1) "**Small Water System**" means a community water system except those serving 200 or more service connections, or any noncommunity or nontransient noncommunity water system.

CHAPTER 15. DOMESTIC WATER QUALITY AND MONITORING REGULATIONS

Article1. Definitions

§64400.10. Community Water System.
"Community water system" means a public water system which serves at least 15 service connections used by yearlong residents or regularly serves at least 25 yearlong residents.

§64400.80. Nontransient-noncommunity Water System.
"Nontransient-noncommunity water system" means a public water system that is not a community water system and that regularly serves at least the same 25 persons over 6 months per year.

§64401.85. Transient-noncommunity Water System.
"Transient-noncommunity water system" means a public water system that is not a community water system or a nontransient-noncommunity water system.

CHAPTER 17.5. LEAD AND COPPER
Article 1. General Requirements and Definitions
§64671.70. Small Water System.
"Small water system", for the purpose of this chapter only, means a water system that serves 3,300 persons or fewer.

Attachment B

Small Systems (2-14 Connections) Nitrate Testing in the Salinas Valley and Tulare Lake Basin

Data Source	Number of Wells Tested (2000-present)	Testing Requirements & Frequency	Data linked to Well Completion Reports (WCRs)?	Data Format & Public Accessibility	How does the agency use the data?	Data shared with CDPH or the SWRCB?	Funding
California Department of Public Health (CDPH) – *Drinking Water Program – Water Quality Management Database* (Data Source: locally-reported data)	Domestic wells (1-4), statewide: 619 wells tested • ***Fresno***: 5 • ***Kern***: 42 • ***Kings***: 3 • ***Monterey***: 15 • ***Tulare***: 4 State Smalls (5-14) statewide: 894 wells tested • ***Fresno***: 19 • ***Kern***: 20 • ***Kings***: 6 • ***Monterey***: 155 • ***Tulare***: 2 *May be some overlap with county data. Data may include inactive wells.*	• Counties voluntarily report this data to CDPH. • ***Local regulations*** determine the testing frequency and whether testing is voluntary or mandatory.	No.	• Data is stored in the Water Quality Management Database (PC Focus), which is not publicly available. • Data is provided online in zipped .dbf files. Searchable via Access (or compatible program). • Well location information (GPS coordinates) is in the database, but is not publicly available.	CDPH archives the data for informational purposes.	• SWRCB: This data is integrated into GeoTracker GAMA information system. CDPH forwards location coordinates with an approved non-disclosure agreement.	No funding associated with this; data is uploaded as part of current operations.

State Water Resources Control Board (SWRCB) - *Groundwater Ambient Monitoring and Assessment (GAMA) Program, Domestic Well Project.* (Data Source: SWRCB staff, as close to the wellhead as possible)	Statewide: 1,146 private domestic wells (1) tested • ***Monterey***: 79 • ***Tulare***: 181	2002-peresent: ***Voluntary, one-time*** well sampling on a county focus area basis.	SWRCB requests well details, information, and WCRs from the owner. Well information (which occasionally includes WCRs) was provided for 18 of the 79 wells in Monterey and 141 of the 181 wells in Tulare. Well test information is not directly linked to WCRs.	• Data is stored in the GeoTracker GAMA information system. GeoTracker has an agency portal and a public portal. • GeoTracker data can be displayed in tables or on maps, and is exportable into excel. • Data summary reports are available to the public on the GAMA website. • Well ownership information and exact well location is not publicly available.	• Test results are provided to well owners. • Data is used for research and for the preparation of reports to assess the groundwater zones used for private domestic water supply. • Data is used by the public and interest groups to learn more about groundwater resources.	• SWRCB: This data is integrated into GeoTracker GAMA information system.	Funding comes from the Waste Discharge Permit Fund (WDPF).

State Water Resources Control Board - *GAMA Program, Priority Basins Project* (Data Source: USGS, as close to the wellhead as possible)	Statewide: 417private domestic wells (1) tested. • ***Monterey***: 183 • ***Tulare***: 2 • ***Kern***: 20 • ***Fresno****: 77 (*expected in 2014)	2004-present: ***Voluntary, one-time*** well sampling with ***trend sampling*** for a subset of wells. Sampling occurs on a Study Unit (typically a group of groundwater basins) basis. Currently, trend sampling has occurred on 20 private domestic wells in the Monterey Bay/Salinas Valley area.	USGS collects available WCRs from the DWR database. Well test information is not directly linked to WCRs.	Same as above (GeoTracker). Priority Basins Project also includes Assessment Reports and associated fact sheets.	• The USGS publishes data summary reports, assessment reports, and factsheets. • This information is used by the SWRCB GAMA program for information and research purposes. • Data is used by the public and interest groups to learn more about groundwater resources.	Same as above (GeoTracker GAMA).	In 2003, Proposition 50 funding allowed for $45 million in contracts over a 10 year period for statewide, comprehensive GAMA Priority Basins sampling. This funding source will soon expire so a stable funding source is needed to continue sampling after 2014.
Central Coast Regional Water Quality Control Board – *Central Coast Ambient Monitoring Program – Groundwater Assessment and Protection (CCAMP-GAP)* (Data Source:	Pajaro and Salinas Valleys: 70 domestic wells (1) tested (data pending USGS). • ***Monterey***: 52	Winter/Spring 2013: ***Voluntary, one-time*** well sampling.	Expected: CC RWQCB intends to link available WCRs to testing data.	Expected: USGS will • Upload the data to the GeoTracker GAMA information system. GeoTracker has an agency portal and a public portal. • GeoTracker data is can be displayed in tables or on maps,	• Test results are provided to well owners by direct mail. • The data assists the CC RWQCB in making informed decisions on source control and outreach.	• SWRCB: This data is integrated into GeoTracker GAMA information system.	CCAMP-GAP funding of $50K along with 40% Federal Matching Funds of $20K. (Note: CC RWQCB is pursuing $450k in Cleanup and

USGS, likely from a hose bib or sink tap)				and is exportable into excel. •The data will also be available in excel worksheets with location information • Well ownership information and exact well location is not publicly available.			Abatement (CAA) funding for a region-wide sampling program of 2,000 domestic wells.)
Central Coast Regional Water Quality Control Board - *Agriculture Order Compliance Monitoring* (Data Source: Well-owner self-reports, test could be at the well or downstream)	<u>CC region-wide</u>: 292 domestic wells (1) tested • ***Monterey***: 31 ***Note***: Because this data is self-reported, it could include tests from local smalls (2-4) that are incorrectly designated as domestic wells.	<u>Since 2012</u>: ***Mandatory, semi-annual*** well sampling (for growers opting for individual monitoring). The Ag Order may be expanded to require sampling of all on-farm wells, including those in cooperative monitoring programs.	WCRs may be available on file, but are not linked to tested wells.	• Data is stored in the GeoTracker GAMA information system. GeoTracker has an agency portal and a public portal. • GeoTracker data can be displayed in tables or on maps, and is exportable into excel. • Data summary reports are available to the public on the GAMA website. • Well ownership information and exact well location is not publicly available.	• For wells that exceed MCL standards, CC RWQCB sends out notices to the farmers and recommends corrective measures to protect public health. • Data used to prioritize implementation of the Ag. Order and to provide information to well-owners.	Same as above (GeoTracker).	Since this is compliance monitoring the farmers cover the cost of testing. CC RWQCB provided $10k to assist limited resource farmers in conducting testing; this fund is exhausted.

Central Valley Regional Water Quality Control Board – *Dairy General Order* (Data Source: well-owner self-reports, tested at the wellhead or the tap nearest the well head)	CV region-wide: 1,411 domestic wells (1-4)* tested • ***Fresno***: 185 • ***Tulare***: 726 • ***Kings:*** 409 • ***Kern:*** 91 *Note: Dairies self-report this data as being for domestic wells, but some of this information may relate to agriculture wells or wells supplying milk barns. A few wells may even be state smalls. Wells are tested at the well head, unless there is a pressure tank, in which case the nearest tap is tested.	2007-present: ***Mandatory, annual*** well sampling.	WCRs are not asked for and are not linked to tested wells.	• Data submitted in paper form by dairies, scanned into PDF. • The data is translated into excel spreadsheets. Since 2012 the data includes lat. & long. coordinates for the dairy (not the well). • The public can review the file at CCRVWQ offices. Test results data (electronic or hard copy) is also publicly available through a PRA request.	• This data enables CV RWQC to survey groundwater quality and changes over time as management practices improve. • When inspectors go out they may review the file. • Data was also used for the UC Davis Nitrate Report.	Test data is not shared with other state agencies.	Dairy owner/ operator pays for testing.

Central Valley Regional Water Quality Control Board – *Seville Area Special Study* (Data Source: Regional Board staff, tested at the wellhead or the tap nearest the well head)	Tulare: 7 domestic wells (1) tested	June 2011: ***Voluntary, one-time*** well sampling.	WCRs are on file for these wells, but are not linked to test data.	• Data is kept in non-searchable PDF format (scanned forms). • The public can review the file at CCRVWQ offices. Test results data (electronic or hard copy) is also publicly available through a PRA request.	• Test results provided to well owners and to Tulare County. • This project was to assist disadvantaged communities in Seville in addressing Nitrate contamination problems.	Same as above (not shared).	Done within normal funding operations.
Dept. of Pesticide Regulation – *Groundwater Protection Program*. (Data Source: DPR collects from a port as close to the well head as possible)	Tulare & Fresno: 75 (now 68) domestic wells (1) tested as part of an ongoing well network study. • ***Fresno:*** 47 • ***Tulare:*** 21	• 2001-2002: ***Voluntary, semi-annual*** well sampling in spring and fall. • 2003+: ***Voluntary, annual*** well sampling in spring.	DPR has WCRs for 32 wells, but they are not linked to the test results.	• Data is kept on Excel worksheets with associated well numbers. • Test results data (hard copy or electronic) is publicly available through a PRA request. • Exact well location and well owner information is kept confidential.	• Well owners receive letters that detail the pesticide and nitrate sampling results. • DPR maintains ***pesticide*** sampling data in a database for program and public use. ***Nitrate*** data is only collected as part of the well network study in Fresno and Tulare, representing a very small portion of all sampling conducted by DPR, as a favor to participating well-owners.	Test data is not submitted to other state agencies.	The DPR Fund provides ongoing support for the Ground Water Protection Program. Sampling for nitrate as part of the well network study costs about $1,500 per year.

Fresno County Dep. Of Pub. Health – *Water Program, Consumer Protection.* (Data Source: Domestic wells: tested by county at the well head, where possible. State smalls: well-owner self-reports.)	Fresno • ***Domestic wells*** (1-4): 5,137 wells permitted, approximately 40% of which were tested.* • ***State small*** (5-14): 17 systems tested * ***Note:*** This is a rough estimate. The database does not separate out the number of private domestic wells or well tests.	• Domestic wells: ***Voluntary, one-time*** well sampling of new domestic wells (1-4); best estimate is about half accept.* • State smalls: ***Mandatory, annual*** testing; best estimate is about half of the state small systems half have been tested at least twice.* * ***Note:*** This is a rough estimate. The database does not track this information.	• Domestic wells: WCRs are digitized (non-searchable PDF) but are not linked to well tests; best estimate is that about 80% have WCRs on file.* • State smalls: 10 of 17 have WCRs on file; other 7 have inspection reports with limited construction data. Data is not linked to test results. ****Note:*** This information is not tracked.	• Data is stored in the Envision Database (not publicly accessible). • Some of the data is database searchable; some data is stored in the form of non-searchable, scanned PDFs. • Test results data (hard copy or electronic) is publicly available through a PRA request. • Well ownership information might be kept confidential.	• Domestic wells: well-owners are notified of their test results. • State smalls: If nitrate levels are exceeded, notice must be given to consumers. Data is collected pursuant to state law.	Test data is not regularly submitted to state agencies.	• Single-family domestic wells: Testing for new water wells is covered by well permit fees ($605 one-time). • State smalls: Water systems are required to perform the tests at their cost. ***Note:*** Lab costs for a nitrate test is $8 + staff processing cost (~$98 /hr).

Tulare County Environmental Health Dept. -- *Private Water Sampling Program* (Data Source: Domestic wells: tested by county at the well head, where possible. State smalls: well-owner self-reports.)	Tulare: • ***Private Domestic wells*** (1): 528 wells • ***Public domestic wells*** (2-4) : 47 wells • ***State smalls*** (5-14) : 39 wells	• Private & Public Domestic wells (1-4): ***Voluntary, one-time*** well sampling (since 2008). From 2005-2008, testing was mandatory. • State smalls: ***Mandatory, annual*** well sampling; 22 wells have been tested more than once.	•WCRs on file for domestic wells; unknown for state smalls (rough estimate is 50%). • Data is not linked to the tests, but could be through the APN #.	• Data is stored in the Envision Database (not publicly accessible). •Data can be exported to excel. • Test results data (hard copy or electronic) is publicly available through a PRA request.	• Letter mailed to well-owner indicating if they meet standards or not. • If exceeds an MCL, CDPH health statements are provided.	Test data is not submitted to state agencies.	Paid for by owner. Lab fees are around $120 for valley wells (includes water collection fee and tests for nitrate and other contaminants).
Monterey Environmental Health Bureau (Data Source: Single-connection well-owners self-report; 2-14 connection wells county officials test, usually a tap at the home.)	Monterey: •***Domestic Wells*** (1 connection): ~35 wells drilled in 2012, test results pending. •***Local smalls*** (2-4): 694 systems* tested •***State Smalls*** (5-14): 276 systems* tested *The database is	•Domestic wells: ▶***Pre-2012***: Sporadic testing for water quality sometimes included nitrate ▶***2012+: Mandatory, one-time*** well sampling for new wells or wells for buildings converted to residential use. No new test for well repairs.	All wells: Newer wells generally have WCRs. WCR records are more spotty for older wells (sometime other data is available). WCR is in paper files or non-searchable PDFs, and is not linked to testing data.	• Data is stored in the EnvisionConnect Database (not publicly available). • Data is available in Excel. • Location information is available for most water systems (not wells). Some location information is available for wells. • Summary test result data for every	The data is used to order corrective action, where appropriate.	Test data is not submitted to state agencies. (Note: CDPH system is not equipped to receive EnvisionConnect data.)	Single domestic well connections pay for these tests themselves. Water Well Permit Fees and Annual Water System Permit Fees pay for 2-14 connection systems testing. $185 -

	not set up to indicate how many wells tested; tests are conducted on the distribution system, not well.	• <u>Local and State Smalls</u>: ***Mandatory, repeat testing.*** Internal policy, at the director's discretion, is to test based on nitrate concentration: ▶ ***<5 ppm*** - every 3 years ▶ ***5-22 ppm*** – every 2 years ▶ ***23-45ppm*** – annually (but up to quarterly for state smalls between 35-45 ppm) ▶ ***45+ ppm*** – annually or, if nitrate levels are consistently over 45ppm, every three years. ▶***Nitrate treatment:*** If system has nitrate treatment, collect with every coliform sample.	<u>Local and state smalls:</u> For 2-14 connection systems, water system parcel locations and certain well information (including well depth, and well seal depth) has been inputted into a spreadsheet which includes nitrate test results.	well in the County is publicly available online at the County website (data is currently 4+ year old, though soon to be updated). • Test results data (electronic or hard copy) is also publicly available through a PRA request.			$736

Kern County Public Health Services Department (Data Source: well-owner self-report, generally at the sample tap installed at the well)	Kern: •***Sole connection*** (1): 1,082 wells tested •***Non-public*** (2-4): 226 wells tested •***State Smalls*** (5-14): 17 wells tested	All wells: Since 1970, ***mandatory one-time well sampling*** has been required as part of the Title 22 test at the initial permitting stage or (for old, untested wells) at point of parcel development. New testing is required only if a well is deepened.	Hard copy of the WCR is kept in the same physical file as the testing results. From 2006 on, the electronic database indicates that a WCR has been submitted (but is not linked to it).	• Data is stored in the Envision and SearchExpress databases (not publicly available) • Scanned hard copies of recent water testing for wells are in the database. • From 2006+, wells that exceed nitrate MCL levels are manually uploaded into the software program file in a searchable format. •From 2006+, wells are tagged with location information. •Test results data (electronic or hard copy) is publicly available through a PRA request.	All wells: are required to submit a Title 22 analysis to be certified for occupancy. Wells found exceeding MCLs get a nitrate advisory and have those constituents recorded on the property deed. State Smalls: If exceed MCLs must notify all consumers annually. The County encourages treatment. All wells exceeding nitrate levels are tracked in a database.	Test data is not submitted to state agencies.	Owner pays for the sample.

Kings County Health Department (Data Source: well-owner self-reports)	Kings: • ***State smalls*** (5-14): 6 water systems tested ***Note:*** Kings does not test domestic wells.	State smalls: • ***Mandatory, one-time*** well sampling when the well is first goes into production. • ***Mandatory, repeat*** well sampling if the initial test reveals nitrate levels at: ▶ ***23-45ppm*** – annually ▶ ***45+ ppm*** – quartlery • If nitrate levels are below 23ppm, testing is voluntary; two systems are ***voluntarily testing annually***.	WCRs are on file for 5 of 6 water systems.	• Data is stored in the EnvisionConnect database (not publicly accessible) • Paper records of testing data is kept in paper files • Test results data (hard copy) is publicly available through a PRA request.	If the initial well test exceeds MCLs, additional testing would be required.	Test data is not submitted to state agencies.	Testing is done at operator expense.

Other agencies consulted: Cal. Department of Food and Agriculture (no nitrate data for under-15 connection systems), Cal. Department of Water Resources (same), and the U.S. Geological Survey (all nitrate data for under-15 connection systems provided to the Water Boards).

September 2013

Attachment 13

CDFA Nitrates Tracking

2013

CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

Nitrogen Tracking and Reporting Task Force

FINAL REPORT

December, 2013

Table of Contents

Acknowledgements

This report is the result of the efforts of a Task Force convened by Secretary Karen Ross, California Department of Food and Agriculture (CDFA), to identify an appropriate nitrogen tracking and reporting system. The objective of the Task Force was to provide meaningful and high quality data to help CDFA, the State Water Resources Control Board (State Water Board hereinafter) and the Regional Water Quality Control Boards address groundwater quality in nitrate high-risk areas in California. The Task Force included stakeholders and experts from agricultural organizations, academia, regulating agencies, and the environmental advocacy community (Appendix A – List of Members).

Task Force members invested a significant amount of time and energy to produce this final report, which has been through several iterations based on their comments and suggestions. The members were uniformly courteous, industrious, extremely professional and dedicated to completing the charge of the Task Force. Particular thanks must be given to several of the Task Force members and other participants who took the responsibility for making presentations on various existing models (see Appendix B – List of Presenters and Systems Considered).

A deep sense of appreciation and gratitude is extended to Marcelle (Marci) DuPraw, California State University Sacramento, Center for Collaborative Policy, for facilitating the Nitrogen Tracking and Reporting Task Force meetings and assisting in drafting the final report; and CDFA acknowledges the efforts of CDFA staff Edward Hard, Erika Lewis, Maria Hicks, Dr. Amrith Gunasekara, and Dr. Asif Maan for their assistance with Task Force activities and drafting the final report.

Executive Summary

Agriculture in California is highly diverse in terms of food production, crop management, ecosystems, and climate. Nitrogen fertilizer is essential for crop food production. Nitrogen fertilizer use over several decades in California has led to nitrates in groundwater. Recognizing that nitrates from agricultural nitrogen fertilizing materials have entered some California groundwater systems used for drinking water, CDFA convened the Nitrogen Tracking and Reporting Task Force in 2013 as part of a multi-pronged administration effort to address nutrient management and water quality.

This Task Force was charged with implementing Recommendation 11 of several recommendations made to the Legislature by the State Water Board: “CDFA, in coordination with the Water Boards, should convene a Task Force to identify intended outcomes and expected benefits of a nitrogen mass balance tracking system in nitrate high-risk areas. The Task Force should identify appropriate nitrogen tracking and reporting systems, and potential alternatives, that would provide meaningful and high quality data to help better protect groundwater quality.” (See Appendix C – Fact Sheet on State Water Resources Control Board Recommendations.) This charge was achieved through several measures including, among others, understanding and discussing the pros and cons of existing nitrogen tracking and reporting systems, identifying desirable components or elements of existing systems and evaluating the variability and complexity of California agriculture in relation to where existing systems have been implemented.

Through several meetings, presentations by subject matter experts and discussion, the Task Force members came to general agreement on several components of an effective nitrogen tracking and reporting system. The recommended system addresses eight key topics including: (1) System Structure; (2) Data Elements; (3) Roles, Responsibilities and Data Accessibility; (4) Benefits of Participation; (5) Verifiability; (6) Societal Benefits of the Recommended System; (7) Limitations and (8) System Phase-in. This report presents the Task Force’s discussions and recommendations including intended outcome and anticipated benefits of such a tracking and reporting system for nitrogen use.

The Task Force’s recommendations on a reporting system, and any resulting information from the implementation of such a system, will be utilized by CDFA and the Water Boards to further their efforts in protecting water quality and improving the efficiency of on-farm nitrogen management. The Task Force’s recommendations will also be presented to a panel of experts convened by the State Water Board, in coordination with CDFA, following Recommendation 14 of the State Water Board’s Legislative report. The expert panel will assess existing agricultural nitrate control programs and may propose new measures for consideration by the Water Boards for their on-going regulatory and non-regulatory efforts.

I. Introduction

Agriculture in California is highly diverse in terms of food production, crop management, ecosystems, and climate. California has a Mediterranean growing climate and five different biomes with their own sub- and micro-climates, different soil types, weather patterns and water quality that allow the state to produce more than 400 commodities, many of which are produced only in California. These traits allow for agricultural crop production that is vastly different from other U.S. states and affords a year-round diverse, reliable, and safe food supply.

Nitrogen is an essential plant nutrient required to ensure food production and essential building block (e.g., proteins and DNA) for humans. Nitrogen application and associated management varies among the diversity of crops grown in California, soil type, irrigation method, cost, and cultural practices. Nitrogen fertilizer use over several decades in California can and has led to nitrates in groundwater. It is widely acknowledged that the nitrogen cycle is complex and therefore nitrogen management in agricultural systems offers numerous challenges in a state with such high crop and environmental diversity.

Recognizing that nitrates from agricultural nitrogen fertilizing materials have entered some California groundwater systems used for drinking water, CDFA convened the Nitrogen Tracking and Reporting Task Force in 2013 as part of a multi-pronged administration effort to address nutrient management and water quality. This Task Force was charged with implementing a particular recommendation that had been made by the State Water Board in its “Recommendations Addressing Nitrate in Groundwater” report to the Legislature. Recommendation 11 calls for identifying the intended outcomes and expected benefits of a nitrogen mass balance tracking and reporting system for nitrate high-risk areas: “CDFA, in coordination with the Water Boards, should convene a Task Force to identify intended outcomes and expected benefits of a nitrogen mass balance tracking system in nitrate high-risk areas. The Task Force should identify appropriate nitrogen tracking and reporting systems, and potential alternatives, that would provide meaningful and high quality data to help better protect groundwater quality.” This report presents the Task Force’s discussions and recommendations.

The Task Force membership was diverse with 28 representatives from several different sectors; agricultural sector, environmental community, environmental justice community, government entities at local, regional, and state levels, and both of California’s university systems (the University of California and California State University). Efforts were made to ensure that Central Valley and Central Coast interests were well-represented based on the fact that those regions are at the forefront of currently addressing nitrates in groundwater.

This diverse Task Force was successful in reaching general agreement on a set of recommendations in a relatively short amount of time (two months). Their recommendation, detailed in Section IV of this report, identifies the intended outcome of their recommended nitrogen tracking and reporting system. The system addresses eight key topics including: (1) System Structure; (2) Data Elements; (3) Roles, Responsibilities and Data Accessibility; (4) Benefits of Participation; (5) Verifiability; (6) Societal Benefits of the Recommended System; (7) Limitations; and (8) System Phase-in.

There are several other detailed factors that must be considered in addressing nitrates from agricultural nitrogen use, but these are not the focus of this report. These factors include details related to database development, data gathering by aggregators, data transmittal, the definition and designation of high-risk areas, and groundwater quality monitoring and reporting. These factors offer numerous complexities and are all essential components to a broader comprehensive administration strategy. In recognition of this complexity, the Task Force acknowledges that nitrogen tracking and reporting will lead to an iterative process with growers and regulators. The proposed approach is for growers to track and report nitrogen management data. Interpretation and results of those data will be used to provide guidance as to how to improve nitrogen management and, ultimately, to improve protection of groundwater. The result, along with scientific and technological advances, will be a cycle of continual improvement over time with the objective of improving groundwater quality for its many beneficial uses including as a drinking water source.

II. Background

The Challenge

CDFA and the State Water Board recognize that nitrates from agricultural nitrogen fertilizing materials, both synthetic and organic, have migrated into some California groundwater systems. Because some of the aquifers are also used for drinking water, nitrate contamination presents a public health concern to several communities in the state. The State Water Board took steps to address this issue, beginning with the "SBX2 1" report to the Legislature on the extent of the problem and how to address it. Recommendation 11 in the SBX2 1 report called for the identification of intended outcomes and expected benefits of a nitrogen mass balance tracking and reporting system for nitrate high-risk areas.

The challenge that has been identified is based on two important points, both equally important. First, nitrogen fertilizer amendments are necessary and required for plant growth and are critical for food production. Second, the SBX2 1 report to the Legislature concluded that the majority of nitrates in groundwater in the Tulare and Salinas regions were from agricultural nitrogen use over many decades.

The Charge to the CDFA Nitrogen Tracking and Reporting Task Force

CDFA (in coordination with the State Water Board) convened the Task Force in the summer of 2013. As detailed in the Task Force charter, CDFA charged the Task Force members with identifying appropriate nitrogen tracking and reporting systems in consideration of the crop diversity and agronomic conditions in the state and with identifying potential alternatives that would provide meaningful and high quality data to help better protect groundwater quality in nitrate high-risk areas. (The task of defining "nitrate high-risk areas" is the responsibility of the State Water Board.) CDFA led this effort because it is the locus of several programs associated with nitrogen fertilizing materials. For example, CDFA manages the Fertilizing Materials Inspection Program, the Fertilizer Research and Education Program (FREP) and the Organic Input Materials Label Review and Registration Program. Program staff members have significant expertise and experience related to the efficient and effective management of nitrogen fertilizing materials, agronomic expertise and an understanding of environmental issues at the interface of agriculture.

III. Process

The Task Force convened on July 29, August 28 and 29, and September 12, 2013. CDFA staff and facilitator Marci DuPraw from the Center for Collaborative Policy at the California State University, Sacramento, supported the Task Force and members in reviewing existing nitrogen tracking and reporting systems and related decision support tools, identifying elements to include in a recommended system, and building consensus on a recommended system. Facilitation was particularly helpful in this situation, given the short period of time in which the Task Force needed to complete its work and the importance of the issue to numerous stakeholders from diverse sectors. The Task Force pursued their charge through a series of four intensive, facilitated meetings. Members listened to presentations by subject matter experts on existing tracking and reporting systems. They discussed the pros and cons of existing nitrogen tracking and reporting systems, and identified desirable elements of these systems. They also took into consideration the variability and complexity of California agriculture in relation to a nitrogen tracking and reporting system. See below for a more detailed description of the approach used to support the Task Force's deliberations.

Meeting 1

At the Task Force's inaugural meeting, executive leaders from CDFA and the State Water Board provided context for the Task Force's assignment – to recommend a nitrogen tracking and reporting system capable of addressing the underlying policy concerns. The leaders stressed the critical importance of protecting drinking water quality and urged the Task Force to develop clear and practical recommendations that ideally would be useful to growers as well as decision-makers. Moreover, they underscored the importance of taking diverse perspectives into account, while drawing upon the best available technical expertise and emerging technologies. It is anticipated that information generated by the system would enable farmers and ranchers to reduce costs and increase yields by helping them better target nitrogen applications for plant needs.

Members began discussions by agreeing upon two important building blocks. These two important building blocks included five driving questions and fifteen ideal characteristics of a nitrogen tracking and reporting system. Since the charge was to develop recommendations for a nitrogen tracking and reporting system that would generate information useful to decision-makers, they first discussed and agreed upon the key questions facing decision-makers. They identified these as being:

- How much nitrogen is being applied?
- At what scale (where) is nitrogen being applied?
- How much nitrogen is being taken up by the plant?
- How much nitrogen is being lost as emissions to the groundwater?
- What is the impact on groundwater quality?

Thus, Task Force members focused on recommending a nitrogen tracking and reporting system or potential alternatives that would contribute to decision-makers' ability to answer the above questions. (Some of these questions were addressed through the scientific SBX2 1 report to the Legislature.) The members discussed and reached general agreement on 15 ideal characteristics of the nitrogen tracking and reporting system. These included the following characteristics:

- Has geographic information system (GIS) tracking capability
- Based on verifiable methodologies
- User-friendly interface with information security provisions to ensure protection of confidential business information
- Establishes the trust of agricultural producers
- Affordable
- Equitable (e.g., shared costs by beneficiaries)
- Strives to balance feasibility, accuracy, and practicality
- Produces information to address policy questions
- Balances certainty (or consistency, as in a uniform system state-wide) and adaptability
- Leverages existing knowledge and lessons learned to maximize effectiveness and efficiency
- Provides benefits to the reporting community
- Data available to local groundwater management agencies, local and regional planning agencies, and regulatory community
- Affords tiering and phasing-in timelines for manageability
- Generates information on the fate of nitrogen over time (e.g., annually)
- Includes a spatial component that is compatible with existing groundwater quality monitoring systems

These characteristics would serve as key points of reference during subsequent discussions. Members provided CDFA staff with suggestions about existing nitrogen tracking and reporting systems and related decision support tools that might be relevant to the Task Force charge. Members also made suggestions about the elements of these systems and tools about which they wished to learn more (see below).

Meeting 2

In Meeting 2, CDFA leadership reminded the Task Force members to focus on Recommendation 11 of the SBX 2 1 report to the Legislature and that there were other groups responsible for addressing the other recommendations (e.g., Recommendations 6 and 14). The Task Force was urged to focus on identifying types of data that would be most useful to decision makers and provide real-time information while being practical to collect.

State Water Board leadership addressed Task Force questions about recent decisions pertaining to the Central Coast Draft Agricultural Order and how the decisions impact the charge of the Task Force. State Water Board leadership informed the Task Force that the State Water Board decision was a draft decision that is part of an evolving regulatory framework and therefore should not limit the work of the Task Force. It was the desire of the State Water Board leadership that the CDFA Task Force should operate as a "no constraints" process that affords members to think creatively about a range of possible approaches.

CDFA staff organized a series of presentations along with several subject matter experts to inform the members about existing systems. The presentations covered 13 nitrogen tracking and reporting systems and related decision support tools (See Appendix B). The purpose of these presentations was to give the Task Force material from which to draw in developing their own recommended system (or alternative).

Presenters and subject matter experts were asked to address the following topics with respect to the system or tool that was the focus of their respective presentations:

1. Purpose
2. Expected outcome
3. Data elements
4. Reporting mechanism (e.g., paper, electronic, voluntary, regulatory, third party)
5. Scale (e.g., field, farm, township and range, regional, state-wide etc.)
6. Cooperative nature
7. Economic costs/impact
8. Measures of success
9. Benefits and challenges

Task Force members identified five of the systems as being relevant to their charge. These included the East San Joaquin Water Quality Coalition efforts, Nebraska Groundwater Management Plan, Maryland Nutrient Reporting Program, California statewide Dairy Order, and Central Coast Ag Order. The Task Force jointly identified the qualities that were compelling about each of these systems, as well as areas that might be strengthened.

Meeting 3

Task Force members developed agreement on an initial list of the data elements that a nitrogen tracking and reporting system would need to "track" and to "report." To support the members in this task, staff provided Task Force members with a list of the data elements tracked and reported by their five preferred systems from the Meeting 2 presentations. This list was intended to stimulate further discussion. Data elements <u>tracked</u> by one or more of these five systems included:

- All forms and sources of nitrogen
- Where nitrogen is applied
- All data needed to track mass balance which will include yield and nitrogen removed
- Crop type

- Soil type (acquired by USDA NRCS)
- Responsible party
- Age of perennial crop
- Nitrogen application amount
- Nitrogen and irrigation management practices

Data elements included in the initial discussion of elements that a grower would report under one or more of those five systems included:

- All forms and sources of nitrogen
- Where applied
- All data needed to generate mass balance
- Mass balance calculated using nitrogen inputs and outputs
- Data needed to identify water quality impacts below the root zone

Three subgroups (with members assigned to subgroups by staff to achieve diverse, cross-sector representation in each subgroup) were established at this meeting. Each subgroup was requested to outline a potential approach to a nitrogen tracking and reporting system that would be appropriate for California's nitrate high-risk areas (or offer an alternative to such a system that would generate the high quality data needed by decision makers to protect groundwater quality). Subgroup members were encouraged to consider the following questions:

- Data requirements and availability
- Who / how data is generated and collected/managed?
- Who does data get submitted to and used by?
- Cost of development and compliance?
- Challenges?
- How well does the system meet "ideal characteristics" and provide needed data to protect groundwater and incentivize reduced use of nitrogen fertilizing material?

Members then identified together the numerous commonalities in the three system concepts developed during the subgroup discussions. Commonalities included:

- Use of third party as data-aggregator entity who pushes information "up" to the regulatory entity
- Need to understand farmers' current farm management practices
- Intended outcome of improved water quality
- Tracking all sources of nitrogen and amount by crop type
- Scale - township aggregation as for reporting to regulators with caveats (e.g., Is this scale adequate to reflect differences in cropping patterns, geology, and hydrology? Is watershed level appropriate? Appropriate in all locations to serve needed purpose?)

- Electronic reporting system (from third party to regulators)
- Responses to data received that focus on problem-solving research and outreach efforts
- Phased-in approach to tracking and reporting
- Annual reporting (with an indication if crop has not yet been harvested)
- On-farm, event-based record keeping as the foundation of nitrogen tracking and reporting

The Task Force requested that CDFA staff and the facilitation team develop a “straw” recommendation that reflected the common themes and tracking and reporting concepts identified through the subgroups for discussion at the fourth meeting. Task Force members also identified differences that suggested areas to which the Task Force might need to devote further attention.

- Preference for grower submitting electronic reporting, but recognition of need for paper reporting option
- Definitions, limitations, and implications of “net” mass balance estimates submitted to Regional Board
- The influence of irrigation management on the fate of nitrogen
- Clarify what is tracked versus what is reported to arrive at an annual calculation of nitrogen mass balance
- Data quality and verification

Meeting 4

This meeting began with an overview of nitrogen mass balance concepts presented by Dr. Mikkelsen from the International Plant Nutrition Institute. This was an effort to ensure that the Task Force had a shared understanding of nitrogen mass balance.

Task Force members focused on refining the “straw” recommendation document, reaching general agreement on it by the end of their fourth meeting. The resulting recommendations contain eight key elements:

1. System Structure;
2. Data Elements;
3. Roles, Responsibilities and Data Accessibility;
4. Benefits to participate in the Nitrogen Tracking and Reporting System;
5. Verifiability;
6. Benefits of the Recommended System;
7. Limitations;
8. System Phase-in

Members reviewed and established general agreement on the outline and structure of the Task Force final report. The staff and facilitation team revised the original “straw” recommendation to reflect the changes agreed upon by the Task Force members during this meeting. Additional review and comments on the recommendation and final report were completed electronically (e.g., electronic mail correspondence).

It is important to note that the State Water Board will be convening a panel of experts (Expert Panel, hereinafter) to assess current nitrogen control programs, such as the Irrigated Lands Regulatory Program, and develop recommendations by the end of Summer 2014; it is anticipated that a final report will be completed by Fall 2014. The outcome of the Task Force is expected to be used in the Expert Panel discussions. All of these efforts are the result of the State Water Board SBX2 1 recommendations to the Legislature designed to address nitrates in groundwater.

IV. Recommendation

CDFA and the State Water Board recognize that nitrates from both synthetic and organic nitrogen fertilizing materials used in agriculture have, over several decades, moved to some groundwater systems in California. Many communities in California rely on those same groundwater systems for drinking water. Thus, some drinking water supplies contaminated by nitrates from nitrogen fertilizing materials pose a public health concern to several communities in California. The State Water Board addressed this issue in its SBX2 1 report to the Legislature; this report contained a series of recommendations, one of which (Recommendation 11) is to identify intended outcomes and expected benefits of a nitrogen mass balance tracking and reporting system in nitrate high risk areas. To implement Recommendation 11, CDFA (in coordination with the State Water Board) convened a Task Force in summer of 2013 to identify appropriate nitrogen tracking and reporting systems, and potential alternatives that would provide meaningful and high quality data to help better protect groundwater quality.

This document characterizes the recommendations formulated through consensus-building to reach general agreement by the Task Force as of the conclusion of its fourth and final meeting. Given more time, Task Force members would have liked to continue refining and strengthening their recommendation. General agreement in this context should be understood to mean that Task Force members viewed the recommendation contained herein as a potentially viable way of establishing a nitrogen tracking and reporting system for nitrate high- risk areas. As described in this document, there are many related scientific and methodological uncertainties. The Task Force also emphasized the importance of further scientific research to strengthen available methods of quantifying nitrogen entering groundwater under various agronomic and environmental conditions.

The Task Force was charged in part with identifying the intended outcome of establishing a nitrogen tracking and reporting system; they identified that outcome as contributing to improved groundwater quality. The Task Force affirmed the importance of nitrogen tracking and reporting in nitrate high-risk areas.[1] The information provided by a nitrogen reporting and tracking system is an essential element in improving our understanding of the fate and transport of nitrogen. At the same time, the Task Force notes that a tracking and reporting system cannot, in and of itself, improve groundwater quality; it can only be expected to provide a portion of the information and understanding necessary to guide future decision making in this area.

An effective nitrogen tracking and reporting system must be broadly applied to produce data that are comparable across the geographic area in which they are used. However, at the same time, it must recognize and accommodate regional differences, such as in

[1] The task of defining nitrate high-risk areas was assigned to the State Water Board. At the time of this final report's release, the State Water Board had initiated work on this task but has yet to start its public process.

agricultural production and hydrogeology. It also must be flexible over time to accommodate changes as we learn more about nitrogen's movement in the environment. The Task Force recognized that the application of scientific knowledge to quantitatively estimate the magnitude of field scale movement of nitrogen past the crop root zone and the amount of nitrogen that is entering groundwater from an individual field or farm is currently limited, with estimates available on a large-scale basis, but not available on a field-by-field basis (except qualitatively). This limitation is due to the extensive scientific resources and instrumentation otherwise necessary for detailed, accurate estimation of nitrogen fluxes out of the root zone and into groundwater. Application of such monitoring systems is currently non-economic for field-by-field estimation of nitrogen fluxes across entire groundwater basins.

The elements of the Task Force's recommended tracking and reporting system are described below. The Task Force acknowledged that this system reflects a significant change for growers. As discussed later in this report, it may be appropriate to implement it in phases, with periodic adjustments, while all concerned learn what works. Task Force members believe that the particular approach suggested offers a number of benefits, which are enumerated in Section 6. Highlights include the belief that such a system will contribute to a better understanding of nitrogen fertilizer application and movement throughout the hydrologic system, will focus technical assistance where it is most needed to mitigate future nitrogen loading to groundwater and improve groundwater quality, and will reassure the public that growers are using nitrogen fertilizer in a manner consistent with best management practices to produce a safe, reliable, and affordable food supply. In so doing, the Task Force believes that establishing such a system will help to sustain agricultural productivity and sustainability in California.

Moreover, while the Task Force's recommended approach uses the concept of nitrogen mass balance as a key point of reference, this concept is only "one piece of the puzzle" in determining excess nitrogen that could potentially reach groundwater and in preventing that from happening. The nitrogen mass balance should be used in the larger context of informing improved use and efficiency of nitrogen application. Its use should be reviewed as part of Recommendation 14 of the State Water Board's SBX2 1 report to the Legislature -- which calls upon the Water Boards to convene an expert panel to assess existing agricultural nitrate control programs and develop related recommendations to ensure that these programs are protecting groundwater quality. These steps must also be complemented by further research (e.g., to establish a reliable methodology by which to quantify the amount of nitrogen reaching groundwater under various cropping systems, soil types, and agricultural practices; methods of preventing excess nitrogen from reaching groundwater, etc.).

1. **System Structure:** As depicted in Figure 1, the nitrogen tracking and reporting system can be described as a pyramid with one layer for tracking and several layers of reporting. Growers collect a number of types of crop and field-specific information

on an event basis to enable calculation of nitrogen mass balance (the quantity of nitrogen applied minus the quantity of nitrogen removed). The difference represents nitrogen that is not currently accounted for, including but not limited to nitrogen available for leaching to groundwater.[2] Much of the tracking data are retained on farm; a subset is compiled by crop and field at the farm scale and annually reported upward to a data aggregator.

In turn, the data aggregator annually compiles and reports data submitted by numerous growers into a single combined report for a larger geographic area as designated by the relevant Regional Water Board.[3] The Regional Water Board provides to the State Water Board the information necessary to compile an annual report on "status and trends" with respect to management and the fate of nitrogen applied in irrigated agriculture. In accordance with current law, any information submitted to a State or Regional Water Board is available for public review, with the exception of information determined to be proprietary; this is also true in situations where a Regional Water Board serves the role of data aggregator.

Thus, the narrowing of the pyramid (Figure 1) reflects increasing consolidation of information and larger geographic units of analysis as the information moves upward through the system from grower to State Water Board. Such a system is designed to effectively maintain grower confidence in the reporting system, optimize limited state resources and ensure improvement of groundwater quality.

Data reporting by growers is electronic. However, aggregators should also provide the option for paper reporting where reporting electronically is a hardship, since some growers may not have ready access to electronic reporting. Resources should be available to help growers develop the capacity to report electronically, as necessary. Data aggregators should provide growers with written guidance to explain what to track, what to report, and acceptable methods for doing so; additionally, any guidance documents will define key terms, provide tracking and reporting templates, and identify the unit scale (e.g., field) for nitrogen tracking and reporting. The reporting system should be flexible enough to accommodate farm-level data management systems that may be used by growers as long as they meet the nitrogen reporting objectives.

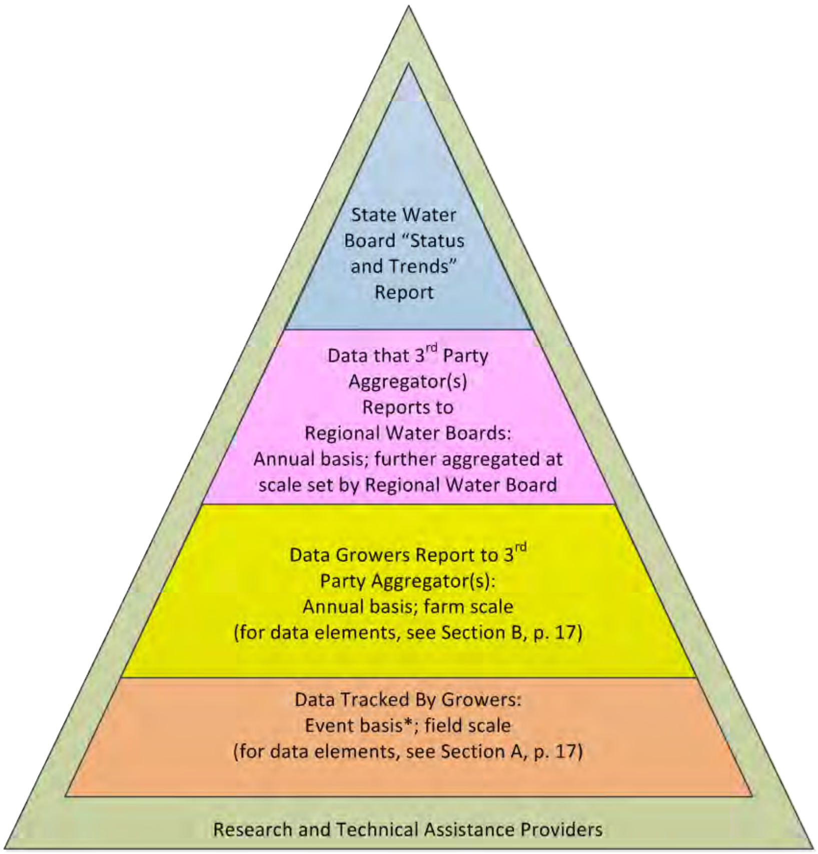
The data aggregators' reports, which include an analysis of the data collected, are submitted electronically to the Regional Water Boards. The scale of "reporting unit" -

[2] There are many dynamics (e.g., other losses, transformations and additions) associated with the nitrogen cycle in addition to leaching. These include: denitrification, volatilization, atmospheric deposition, mineralization, immobilization, plant uptake and removal, assimilation, etc.). These processes are highly dependent on a variety of conditions (e.g., farm management, crop type, irrigation and drainage management, soil type, environmental conditions, etc.), can vary widely, and in some cases are unknown.

[3] Task Force members noted that aggregation of data can compound errors if not done appropriately.

- e.g., watershed, township, section, or other appropriate unit – is set by each Regional Water Board in collaboration with the aggregators to best reflect regional

Figure 1
CDFA Nitrogen Tracking and Reporting Task Force
Nitrogen Tracking and Reporting System for Nitrate High Risk Areas in California: Structure, Roles, and Data Elements



Notes:
- Bottom of pyramid represents data tracked by grower.
- Moving toward top of pyramid corresponds with process of reporting data up to higher levels of decision-makers.
- Research and technical assistance providers support all aspects of tracking and reporting system.

**/ "Event" to be defined by Regional Water Board, in consultation with data aggregator(s); more frequent than annual.*

agricultural and aquifer characteristics. All regions should report data with reference to acres for consistency purposes, thus enabling comparisons across the geographic area in which this system is implemented.

2. **Data Elements:** The specific data elements recognized by the Task Force as elements to track and report are provided below in Sections A, B, C, D and E and

correspond to the different levels of the graphic in Figure 1, moving from the bottom to the top. The Task Force recognized that many of the data elements proposed are listed in templates under development as part of the Central Valley Regional Water Quality Control Boards Long Term Irrigated Lands Regulatory Program.

Section A. Data tracked by growers:

- Name of owner/manager
- Assessor Parcel Number (APN)
- Field identification number
- Crop type
- Crop age
- Total acres per crop
- Expected yield (Estimated. Documented as pounds of production per acre)
- Actual yield (Measured. Documented as pounds of production per acre)
- Nitrogen needed by crop (Measured or estimated. Documented in pounds of nitrogen per acre)
- Nitrogen removed (Measured or estimated. Documented as pounds of nitrogen harvested in the crop yield per acre; also includes material removed or harvested that is not the primary product, such as wheat straw bailed and removed after wheat is harvested, orchard prunings, almond hulls, etc.)
- Total nitrogen applied to field. Includes:
  - Foliar, conventional, and organic fertilizers (Measured. Documented as pounds per acre, dry and liquid combined);
  - Nitrogen in irrigation water (Measured. Documented as pounds per acre)
  - Nitrogen in organic amendments, including manure, biosolids, compost, and non-marketable plant biomass[4] -- e.g., crop residue (Measured. Documented as pounds of nitrogen applied per acre)
- Residual soil nitrogen credits (Measured. Documented as pounds of nitrogen per acre)
- Irrigation method

Section B. Data reported by grower to data aggregator(s):*/

- Management unit (e.g., Assessor Parcel Number, field number, or other suitable management unit decided by the Regional Water Board in consultation with the aggregator in the context of determining the reporting unit)

[4] Growers will need guidance on how to capture non-marketable plant biomass in calculations of “expected yield” and “nitrogen needs” of their crops.

- Crop year
- Grower identification number
- Crop type
- Crop age
- Total acres per crop
- Nitrogen removed (as defined in Section A above)
- Total nitrogen applied (as defined in Section A above).
- Residual soil nitrogen credits (as defined in Section A above)
- Annual nitrogen ratio (calculated by total nitrogen removed divided by total nitrogen inputs)

**/ Where there is no third party data aggregator approved by the Regional Board or where the Regional Board requires reporting by individual growers, growers submit their annual reports to the pertinent Regional Water Board directly.*

Section C. Data reported by aggregator(s) to Regional Water Board: Aggregated data referenced in section "B," at the "reporting unit" determined by the Regional Water Board and in coordination with growers/data aggregators. Data aggregation should be carried out by professionals familiar with California agricultural water quality regulations and with technical backgrounds in agronomy, GIS systems, statistical analysis, and other related disciplines.

Section D. Data reported by Regional Board to State Water Boards: Status and trends of nitrogen applied and harvested in nitrate high-risk areas within pertinent Regions, as well as potential loading to groundwater under various cropping systems, soil types, and agricultural practices.

Section E. Reported by State Water Board: Status and trends of nitrogen applied and harvested in State's nitrate high-risk areas, as well as potential loading to groundwater under various cropping systems, soil types, and agricultural practices.

3. Roles, Responsibilities, and Data Accessibility:

A. Grower: Responsible for data tracking and reporting (to aggregator). The field-level, event-specific[5] data tracked by grower stays on farm, accessible only to the grower, but is subject to the data aggregator and the Water Boards' review upon request.

[5] To be defined by the Regional Water Board in consultation with aggregator(s); more frequent than annual.

B. Aggregator: Responsible for data collection from growers and reporting to Regional Water Boards; quality control regarding accuracy of grower data via outreach, technical assistance, written guidance for growers on implementing tracking and reporting requirements; and education outreach efforts to bring identified “outliers” into compliance through improved management practices. The data aggregator normally has access to farm-level data reported by growers and the data that the aggregator synthesizes at the designated reporting unit scale to report to the Regional Water Board; if the Regional Water Boards request access to more fine-grained data for quality control or problem-solving purposes, the data aggregator can reach down to access grower’s original raw data at the field scale (where there is no third party data aggregator, the grower will indicate to the Regional Water Board what information, if any, in his/her annual report is confidential business information. The Water Boards will determine if this information is exempt from public access under the Public Records Act).

C. Regional Water Boards: Responsible for implementing and enforcing regulatory program and data reporting to the State Water Board and to the public on a regional scale. Aggregated reports submitted by a discharger of aggregator are maintained and used by the Regional Board for regulatory determinations and are available to the public; however, if access to more fine-grained data is needed for quality control or problem-solving purposes, the Water Boards can reach down to access growers’ original raw data at field scale.

D. State Water Board: Data analysis and trends in nitrogen mass-balance on a state-wide scale. Normally has access only to reports submitted by Regional Water Boards; however, if access to more fine-grained data is needed for quality control or problem-solving purposes, the Water Boards can reach down to access growers’ original raw data at field scale.

E. CDFA: Funds research (e.g., through Fertilizer Research and Education Program) and provides technical education (e.g., through Certified Crop Advisers’ Nitrogen Management Training Program) and outreach.

F. USDA: USDA ARS and USDA NIFA conduct research. USDA NRCS provides grower incentive funds competitively through Environmental Quality Incentive Program.

G. Institutions and Research Professionals: Research, technical education and development of grower tools for effective nitrogen crop uptake and management. Educational opportunities will be assessed and developed as appropriate to support grower education data collection needs and reporting.

H. Professional Advisers: Certified source of continuing education on nitrogen management and methods of improving nitrogen usage and crop results.

I. Public: The public has access to status and trends related to nitrogen mass-balance reported annually by the State Water Board, using a geographic scale deemed appropriate. The data reported to the Regional Water Boards and State Water Board is available to the public (unless it is confidential business information), and will typically be posted on their website.

4. **Benefits for Growers Who Participate in this Suggested Nitrogen Tracking and Reporting System:** Growers who participate will have:

   A. Effective documentation and increased public confidence that growers are making all reasonable effort to minimize nitrate loading to groundwater and maximize water quality protection so as to be in compliance with regulatory requirements.

   B. Opportunities to learn improved nitrogen management practices that may enable growers to increase the efficiency of their nitrogen fertilizer usage. Aggregators will provide follow-up on nitrogen management for conditions where the nitrogen ratio is considered an outlier in reported values.

   C. The opportunity to demonstrate effective nitrogen regulation and influence future regulations.

   D. Assistance from the data aggregator in meeting tracking and reporting requirements (e.g., technical assistance and training).

   E. Protection of confidential business information.

   F. Increased confidence that, in most instances, they will be able to retain field-specific information on-farm.

5. **Verifiability:** The nitrogen tracking and reporting system will include mechanisms enabling the data aggregator and the Regional Water Boards to verify the accuracy of the data that the system generates (consistent with available methods), including:

   A. Growers retain their field-level data (Section 2.A.) for the term required by existing laws and regulations, and make records available to the data aggregator and the Water Board upon request.

   B. The data aggregator is responsible for ensuring the accuracy of the data it reports, and to that end, investigates apparent exceptions in reporting patterns. The aggregator assists growers in implementing appropriate nitrogen management practices to improve water quality.

C. The Regional Water Boards are responsible for ensuring the accuracy of the data they receive and may consider developing an audit mechanism.

D. Technical assistance providers, such as Certified Crop Advisors and staff from the Resource Conservation Districts, can play a valuable role in assisting growers and data aggregators to implement the nitrogen tracking and reporting system effectively (e.g., through assistance in developing nitrogen management plans for growers).

6. **Societal Benefits of the Suggested System:** There was general agreement among Task Force members that the nitrogen tracking and reporting system described herein potentially offers numerous intended benefits. It will:

   A. Contribute to a better understanding of nitrogen fertilizer application and movement.

   B. Focus technical assistance where it is most needed to mitigate future nitrogen loading to groundwater and improve groundwater quality.

   C. Reduce methodological uncertainties and increase the precision of results over time.

   D. Reassure the public that growers are using nitrogen fertilizer in a manner consistent with best management practices to produce a safe, reliable, and affordable food supply.

   E. Help growers increase their efficiency by better managing nitrogen use where appropriate, with a potential for cost savings.

   F. Stimulate research and technological advancements to aid in increasingly effective and efficient use of nitrogen fertilizer.

   G. Better enable technical assistance providers, such as Certified Crop Advisers and Resource Conservation Districts, to help growers with well-informed recommendations.

   H. Potentially generate incentives that better align water and nitrogen usage.

   I. Encourage innovation in nitrogen fertilizer formulations and irrigation technology.

   J. Help to sustain agricultural productivity and sustainability in California.

   K. Offer a successful model for California that can also be adopted elsewhere.

7. **Limitations:** The above benefits of the recommended nitrogen tracking and reporting system are intended, but unproven. Limitations can also be anticipated. Primary among these is the fact that the scientific knowledge currently available for

understanding nitrogen's movement beyond the root zone for the many crops growing in California is limited and in some cases non-existent, particularly in terms of calculating exact amounts of nitrogen lost to air and groundwater. Additionally, it is recognized that the timing and amount of water applied can be critical to water/nitrogen moving below the root zone and is not tracked as part of these recommendations. Current and future technology adoption by growers will provide better knowledge and management in this area. There is a strong need for further scientific research to improve the existing data for nitrogen uptake and movement for California's many crops. It should also be emphasized that the Task Force was not charged with considering the costs of implementing a nitrogen tracking and reporting system, and did not consider cost in its deliberations. Clearly, costs will need to be factored into policy-makers' decisions concerning the path forward.

8. **System Phase-In**: The Task Force recognizes that implementing this system represents a significant request of growers, and that it will take time for them to adjust. All implementing parties will be learning about aspects of the proposed system that works and that need adjustment. Thus, the Task Force acknowledges that development of this program will need to proceed in phases, both to allow for ongoing, supporting scientific analysis and to help growers become accustomed to the program. The results of initial efforts should be periodically reviewed to inform subsequent phases with the system's design and implementing guidance modified adaptively as needed to ensure that it is effective in improving and protecting groundwater quality. Items discussed for possible inclusion in later phases included reporting the timing and volume of irrigation and the timing of fertilizer application. The "phase-in" approach should include a timeline and milestones to ensure consistent progress toward full implementation. The pace of implementation will be driven by trend analysis, research results, and best available science. The timeline will be structured to accommodate the collection and validation of the best available science. Over time, the Task Force envisions this system as reducing methodological uncertainties, increasing the precision of results, and establishing a successful system for tracking and reporting of nitrogen to help minimize nitrate loading and maximize protection of water quality.

Appendices

Appendix A: List of Task Force Members

CDFA wishes to thank the Nitrogen Tracking and Reporting Task Force Members for their time commitment, collective expertise, due diligence, thoughtful input and respect of divergent opinions. Their collective investment to seek general agreement to develop useful recommendations to help improve groundwater quality in the long-term has been instrumental in the Task Force success.

1. Allan Fulton, MSc., University of California Cooperative Extension
2. Danny Merkley, California Farm Bureau Federation
3. Darrin Polhemus, State Water Resources Control Board
4. Dave Duncan, California Department of Pesticide Regulation
5. Dave Orth, Kings River Conservation District
6. David Zoldoske, EdD., California State University, Fresno
7. Deanne Meyer, PhD, University of California, Davis
8. Donna Meyers, Santa Cruz Resource Conservation District
9. Gordon Burns, California Environmental Protection Agency
10. Hank Giclas, Western Growers Association
11. Jeanette Pantoja, California Rural Legal Assistance Inc.
12. J.P. Cativiela, Dairy CARES
13. Jennifer Clary, Clean Water Action
14. Joel Kimmelshue, PhD, Land IQ
15. Karen Ross, California Department of Food and Agriculture
16. Ken Harris, Central Coast Regional Water Quality Control Board
17. Luana Kiger, MSc, Natural Resources Conservation Service
18. Marc Los Huertos, PhD, California State University, Monterey Bay
19. Pamela Creedon, Central Valley Regional Water Quality Control Board
20. Parry Klassen, East San Joaquin Water Quality Coalition
21. Phoebe Seaton, California Leadership Council for Justice and Accountability
22. Rob Mikkelsen, PhD, International Plant Nutrition Institute
23. Sandra Schubert, California Department of Food and Agriculture
24. Sonja Brodt, PhD, University of California, Davis
25. Stacey Carlsen, California County Agricultural Commissioners and Sealers Association
26. Tess Dunham, Somach Simmons and Dunn
27. Thomas Harter, PhD / Minghua Zhang PhD, University of California, Davis
28. Tim Hartz, PhD, University of California, Davis

Appendices

Appendix B: List of Presenters and Systems Considered

CDFA thanks presenters, guest speakers and subject matter experts for their expertise and time sharing their valuable and unique experiences to help inform the process.

1. Doug Patteson, Central Valley Regional Water Quality Control Board
   -*Dairy Nutrient Planning*
2. Parry Klassen, East San Joaquin Water Quality Coalition
   -*Nitrogen Management Approach*
3. Angela Schroeter, Central Coast Regional Water Quality Control Board
   -*Data Management and Reporting*
4. Larry Wilhoit PhD, California Department of Pesticide Regulation
   -*Pesticide Use Reporting System*
5. Amadou Ba PhD, CDFA
   -*Fertilizing Materials Tonnage Reporting*
6. Krijn Poppe MSc, LEI Wageningen UR
   -*Dutch Mineral Accounting System Minus*
7. Thomas Harter PhD, University of California, Davis
   -*N Tracking Analysis to Estimate Groundwater Loading*
8. Doug Parker PhD, University of California Institute for Water Resources
   -*Nutrient Reporting In Maryland*
9. Edward J. Hard, CDFA / Richard Ferguson PhD, University of Nebraska, Lincoln
   -*Nebraska's Central Platte Valley Groundwater Management Program*
10. David Zoldoske EdD, California State University, Fresno
    -*Wateright Online Irrigation Scheduling*
11. Joel Kimmelshue PhD, Land IQ
    -*Consideration of a Nitrate Hazard Index for Reporting and Tracking*
12. Tim Hartz PhD, University of California, Davis
    -*CropManage Software for Irrigation and Nitrogen Management*
13. Hank Giclas, Western Growers Association
    -*Performance Metrics for Specialty Crops: A Common Yardstick*

Appendices

Appendix C

Water Boards

Fact Sheet

Report Recommendations to Address Impact of Nitrates Contamination in Groundwater Require Renewed Efforts

Overview
Groundwater contamination by nitrate is a major water quality issue and can pose health risks at concentrations above health standards. A State Water Resources Control Board (State Water Board) report on nitrates, which are principally a by-product of fertilizers, makes 15 recommendations to ensure clean drinking water is accessible to communities with groundwater contamination, calls for monitoring contamination for future remediation and identifying a funding source to pay for improvements and access to drinking water in at-risk communities.

Nitrate contamination is particularly significant in the Tulare Lake Basin and Salinas Valley areas. The report titled "*Recommendations Addressing Nitrate in Groundwater in the Tulare Lake Basin and Salinas Valley*" was released and sent to the Legislature for consideration per the mandate of Chapter 1 of the Second Extraordinary Session of 2008 (SBX2 1, Perata). The Legislation required the State Water Board to develop pilot projects focusing on nitrate in groundwater in the Tulare Lake Basin and Salinas Valley and to submit a report to the Legislature on the scope and findings of the pilot projects, including recommendations.

Nitrate a Public Health Concern
Nitrate pollution in groundwater is a widespread water quality problem that can pose serious health risks to pregnant women and infants if consumed in significant concentrations. Nitrate contaminated groundwater is a particularly significant problem in the Tulare Lake Basin and Salinas Valley areas, where approximately 2.6 million people rely on groundwater for their drinking water. Other areas of the State, however, also have nitrate contaminated groundwater that is used as a source of drinking water.

Significant Academic and Multi Agency Participation
In developing this report, the State Water Board relied significantly on information and findings from: 1) the State Water Board's contracted study with the University of California, Davis resulting in a 2012 report entitled *Addressing Nitrate in California's Drinking Water* http://www.waterboards.ca.gov/water_issues/programs/nitrate_project/index.shtml 2) the Governor's Drinking Water Stakeholder Group, which was comprised of representatives from state agencies, environmental justice advocates, and agricultural representatives; and 3) an Interagency Task Force, which included representatives from the California Department of Public Health, the Department of Food and Agriculture, the Department of Pesticide Regulation, the California Environmental Protection Agency and local environmental health agencies.

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
STATE WATER RESOURCES CONTROL BOARD
1001 I Street, Sacramento, CA 95814 • 916-341-5254 • Mailing Address: P.O. Box 100, Sacramento, CA 95812-0100 • www.waterboards.ca.gov

Water Boards

Fact Sheet

15 Specific Recommendations

The State Water Board makes 15 specific recommendations to address water quality issues associated with nitrate contaminated groundwater. These recommendations reflect a comprehensive strategy focused on the following four key areas:

- **Providing Safe Drinking Water.** Creating a reliable, stable funding source, integrated with institutional changes, to provide long-term safe drinking water infrastructure and interim solutions for the small disadvantaged communities impacted by nitrate contamination.

- **Monitoring, Assessment and Notification.** Developing and managing the data necessary to identify and effectively manage nitrate contaminated groundwater, with particular attention focused on (1) defining nitrate high-risk areas in order to prioritize regulatory oversight and assistance efforts in these areas, (2) notifying groundwater users in nitrate high-risk areas and (3) requiring property owners to sample their well as part of a property title transfer or purchase.

- **Nitrogen Application Reporting.** Developing and implementing a statewide nitrogen fertilizer application reporting system to effectively monitor nitrate application.

- **Protecting Groundwater.** Developing an effective statewide regulatory system for minimizing discharges of nitrates to groundwater, including (1) establishing a nutrient management certification program which recognizes the importance of water quality protection, (2) convening a task force of experts to identify and evaluate components of existing agricultural nitrate control programs for managing nitrate in groundwater, and (3) evaluating the effectiveness of existing permits for food processing and wastewater treatment facilities to address nitrate contamination in high-risk areas.

Ensuring Safe Drinking Water Requires New Funding Source

A majority of the report recommendations rely on identifying a funding source for successful implementation. The regulatory, monitoring, education and research recommendations can draw from existing programs with dedicated funding. The provision of safe drinking water for disadvantaged communities will require a new funding source. Existing funding available are the Safe Drinking Water State Revolving Fund (SRF), which is capitalized with federal grants, and state bond funds. Disadvantaged community demand outweighs limited existing funding through the SRF. There is a need to identify a new funding source, which can be used in combination with existing funding sources, to design, build, operate and maintain safe drinking water systems for disadvantaged communities. This report gives recommendations to the Legislature on the issue of funding.

Additional Resources

To see the report, please visit:
http://www.waterboards.ca.gov/water_issues/programs/nitrate_project/index.shtml
(This was updated February 20, 2013)

Appendices

Appendix D

ARS	Agricultural Research Service
CDFA	California Department of Food and Agriculture
DNA	Deoxyribonucleic acid
FREP	Fertilizer Research and Education Program
NIFA	National Institute of Food and Agriculture
NRCS	Natural Resources Conservation Service
SBX2 1	Chapter 1 of the Second Extraordinary Session of 2008
USDA	United States Department of Agriculture

Attachment 14

Review of SWRCB

Agricultural Expert Panel

2014

Humboldt BAYKEEPER
Klamath RIVERKEEPER
Russian RIVERKEEPER
San Francisco BAYKEEPER
Monterey COASTKEEPER
San Luis Obispo COASTKEEPER
Santa Barbara CHANNELKEEPER
Ventura COASTKEEPER
Los Angeles WATERKEEPER
Orange County COASTKEEPER
Inland Empire WATERKEEPER
San Diego COASTKEEPER

August 7, 2014

Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
1001 I Street, 24th Floor
Sacramento, CA 95814

Via email: commentletters@waterboards.ca.gov

Re: Agricultural Expert Panel Draft Report

Dear Expert Panel, State Board Members, and Staff:

Thank you for the opportunity to comment on the Expert Panel recommendations for solving the critical issues of agricultural water pollution and the nitrate contamination of our drinking water supplies. The following comments are made on behalf of The Otter Project, California Sportfishing Protection Alliance, California Rural Legal Assistance, Environmental Justice Coalition for Water, Santa Lucia Chapter of the Sierra Club, Santa Barbara Channelkeeper, California Coastkeeper Alliance and its 12 member Waterkeepers, and California Rural Legal Assistance Foundation. We agree these are complex and health threatening issues deserving immediate attention and action. In addition, California's recent codification of the Human Right to Water all the more emphasizes the need for regulatory agencies such as the State Water Board to implement practices and policies governing the agricultural community that ensure protection of our potable water sources and the environment.

The Harter Report (http://groundwaternitrate.ucdavis.edu/) and the Central Coast Water Quality Conditions Report (http://www.waterboards.ca.gov/centralcoast/water_issues/programs/ag_waivers/docs/12_09_2010_staffrpt/AgOrder_AppG.pdf) highlight the seriousness of the issue and the likelihood that agricultural pollution is impacting the health and pocketbooks of tens of thousands of California families.

This Agricultural Expert Panel is not the first of its kind. To date, the State has convened the following panels, experts, and stakeholder groups:

- The Central Coast Regional Board engaged a number of experts to help craft the February 1, 2010 Preliminary Draft Central Coast Agricultural Order (http://www.waterboards.ca.gov/centralcoast/water_issues/programs/ag_waivers/ag_order.shtml#feb1) ;
- An Inter-Agency Nitrates Task Force was created in August 2010 to study and offer recommendations(http://www.waterboards.ca.gov/water_issues/programs/nitrate_project/);
- The UC Davis Harter Report commissioned by the California Legislature was released March 13, 2012 and involved over two dozen experts to study the issues and recommend solutions (http://groundwaternitrate.ucdavis.edu/) that included two appendices of solutions;
- The Governor's Office convened a stakeholder group to offer recommendations (http://www.swrcb.ca.gov/water_issues/programs/groundwater/drinkingwater_stakeholders.shtml);
- The California Department of Food and Agriculture convened a Nitrates Tracking and Reporting Task Force which reported out in December of 2013 (http://www.cdfa.ca.gov/environmentalstewardship/PDFs/NTRSTFFinalReport122013.pdf);
- And finally this Agricultural Expert Panel's deliberations and products (http://www.itrc.org/001/swrcb.htm).

This Panel's recommendations are often at odds with panels and experts who have previously reported their recommendations. In general, the draft report emphasizes and focuses on what can't be done rather than identifying what can. We recognize that nitrate pollution in groundwater is a highly complex issue, however we are disappointed that the Panel's entire document emanates a tone of futility that fails to adequately rise to the challenge with which it was tasked: to identify and provide the State Board with real solution-oriented recommendations that address the State's critical agricultural pollution problems.

The Panel repeatedly identifies data gaps and quality issues that limit the usefulness of existing studies for policy making and management, however the Panel's recommendations consistently fail to produce outcomes that would help to ameliorate this problem in the short or long-term. Rather, the Panel's recommendations appear to support the status quo. The Panel stresses that monitoring and verification of nutrient management practices is a complex task, however it then ultimately concludes that it is not worth the time and effort to collect data that would allow us to do so and completely dismisses existing science-based solutions that have proven to be successful tools for dealing with groundwater remediation issues for other industries.

Instead of concentrating on science-based metrics and practices to monitor and verify effective nutrient management, the Panel has chosen to focus on farmer education as their preferred strategy. While we agree that grower and consultant education will – in the very long run – provide important dividends, the report does not recognize the language and cultural diversity, high rate of turn-over (especially in the Central Coast region) and other challenges a multi-level educational program present.

In an effort to offer positive solutions, The Otter Project has taken the step of engaging a highly credentialed, widely published, and respected consultant, Dr. Mark Kram, to review the "*Draft*

Conclusions of the Expert Agricultural Panel, Recommendations to the State Water Resources Control Board pertaining to the Irrigated Lands Regulatory Program." Dr. Kram's recommendations are science-based and offer benefits and efficiencies to regulators, the agricultural industry, environmental justice and conservation stakeholders, and the public-at-large. Dr. Kram's report is attached and is an integral part of this comment letter.

Our organizations endorse Dr. Kram's analysis and recommendations. We believe much needs to be done and much can be done in the short and longer terms to address California's pressing need for clean water for drinking, agriculture, and the environment.

Sincerely,

Steve Shimek
Executive Director
The Otter Project

Bill Jennings
Executive Director
California Sportfishing Protection Alliance

Pearl Kan
Attorney | Equal Justice Works Fellow
California Rural Legal Assistance

Colin Bailey
Executive Director
Environmental Justice Coalition for Water

Andrew Christie
Director
Santa Lucia Chapter of the Sierra Club

Kira Redmond
Executive Director
Santa Barbara Channelkeeper

Sara Aminzadeh
Executive Director
California Coastkeeper Alliance

Noe Paramo
Legislative Advocate
California Rural Legal Assistance Foundation

Attachment:

Review of "Draft Conclusions of the Expert Agricultural Panel, Recommendations to the State Water Resources Control Board Pertaining to the Irrigated Lands Regulatory Program" in Fulfilment of SBX2 1 of the California Legislature. Dr. Mark Kram. August 6, 2014.

Review of

"Draft Conclusions of the Expert Agricultural Panel, Recommendations to the State Water Resources Control Board Pertaining to the Irrigated Lands Regulatory Program"

In Fulfilment of SBX2 1 of the California Legislature

August 6, 2014

Mark L. Kram, Ph.D., CGWP #471

3905 State St., Suite 7-114

Santa Barbara, CA 93105

805-844-6854

Mark.kram@cox.net

www.markkram.net

Table of Contents:

Introduction

My name is Dr. Mark Kram, and I have been retained by the leaders of the Otter Project to review the document entitled "*Draft Conclusions of the Expert Agricultural Panel, Recommendations to the State Water Resources Control Board pertaining to the Irrigated Lands Regulatory Program*", which has been released for public comment in fulfilment of SBX2 1 of the California Legislature. As such, review comments have been organized and presented below as General Comments, Recommendations, Specific Comments, and Summary and Conclusions. I have also included references, a brief summary of my background and selected publications, and a list of selected technology vendors and contacts referenced in other parts of this document.

In response to recently observed elevated nitrate concentrations in groundwater resources near and adjacent to critical agricultural regions, the State Water Board developed recommendations in four key areas to promote the remediation of nitrate contaminated groundwater. These areas include:

1) Provide safe drinking water
2) Monitoring, notification, and assessment
3) Nitrogen tracking and reporting
4) Groundwater protection

In addition, the State Water Board recommended that the Legislature approve of the formation of an expert panel to assess existing agricultural nitrate control programs, and to develop recommendations for improvement, as needed, with a focus on protection of groundwater quality. The State Water Board then contracted to a panel of experts, each retained based on key areas of expertise that include familiarity with agricultural practices and understanding of fate and transport of pollutants in soil and water media.

Key objectives of this review report include identifying areas of common ground between the agricultural communities and other stakeholders, evaluating the panel's recommendations as described in their report, and to introduce and propose new technologies that can effectively and efficiently meet key drinking water quality and regulatory objectives with minimal burden to the grower community. Fortunately, the complex nitrate management issue has many features in common with the relatively mature environmental assessment and remediation industry focused on groundwater and soil restoration at hazardous waste release sites. As such, where possible, recommendations will be proposed for leveraging mature and innovative approaches, technologies and policies developed for such endeavors.

General Comments

1) A well-functioning and environmentally sustainable agricultural community is critical for reasons related to societal benefits associated with economic, security, drinking water supply, energy and long-term environmental considerations.

2) Since agricultural practices in California have been granted exemption or leniency regarding addressing the potential nitrate contaminant issues for so long, and a comprehensive nitrate management policy has not yet been developed or implemented by the regulatory community, it is critical to understand that contamination emanating from legacy activities will need to be considered when addressing relationships between cause-and-effect for current and future agricultural practices. In addition, loading studies seem to conclude that legacy sources alone do not account for the nitrates found in the groundwater or vadose zone. As such, implementation of compliance programs will need to be flexible and account for temporal, spatial, and site-specific characteristics, as a one-size-fits-all or even an aggregated (e.g., by crop, region, or common field characteristics) approach may not be appropriate.
3) Any solution proposed will require substantial financial resources for development of policies, integration of new practices, monitoring, education, and implementation of private sector and government programs.
4) It is in the best interest of all parties to derive a balanced approach towards managing agricultural practices that weighs public benefits against the interests of individuals or aggregated parties. For instance, if the privatization of profit overwhelmingly favors socialization of the risks (e.g., contamination of the public drinking water resources), public financial resources will need to be made available to address the unfavorable outcomes. As such, a decision regarding what is a fair level of public financial burden will need to be determined.
5) An ideal outcome of this process should include the use of the most effective technologies and practices that would result in pragmatic policies that can meet key drinking water quality objectives with the least amount of burden endured by the grower community to ensure compliance, continual improvement, and restoration supported by defensible trend analyses.
6) While an enforcement component to drinking water resources management policy will eventually be required, given the complexities involved, many in the environmental community would be willing to accept an initial transitional period that emphasizes education and monitoring network deployment while acknowledging near term improvements to management practices as verified by defensible documentation (e.g., reduction in nitrate amendment exceedance and improved soil/water quality).
7) Given what we know about widespread contamination of our groundwater resources and what we understand about the loading already present in the vadose zone, the environmental community realizes progress will require years, even decades of effort, adding to the urgency to immediately initiate comprehensive monitoring and responses.
8) Low-cost denitrification bioreactors (Diaz et al., 2003; Christianson et al., 2013), engineered wetlands, and other types of passive treatment systems and approaches should be considered for many of the properties to reduce nitrate releases to the environment. Monitoring of these can also be accomplished via the emerging state-of-practice automation technologies to evaluate efficiency and to determine loads that can be tracked over time (Kram et al., 2011).
9) All hazardous material risks are comprised of source, pathway, and receptor components. The panel is advocating against understanding site-specific pathway components. It is impossible to manage what is not measured. Unlike the hazardous waste and groundwater remediation industries, the agricultural community has not yet been required to produce key site

assessments or to develop monitoring programs sufficient to adequately determine cause-and-effect relationships. The panel is suggesting that since this is complex, we should not attempt to pursue this type of relationship. This does not make sense from a scientific perspective, particularly since there exist decades of historical and ongoing related efforts, thousands of experienced practitioners, and comprehensive libraries full of standards and guidance documents available from analogous industries (e.g., groundwater assessment, groundwater and soil remediation, landfill and oil and gas industries), and new and emerging technologies that will greatly facilitate compliance (e.g., sensors, automation, geospatial mapping, remote sensing, drone deployed technologies, high resolution direct push sensing and well installation, etc.).

10) While many of the panel's recommendations (e.g., education, appropriate training for key entities in specific roles, tracking of nitrogen amendments, etc.) are exceptional, and they accurately point to many of the complexities associated with the challenges at hand, unfortunately, their recommendations as presented in the report will not enable the communities involved to meet key drinking water quality objectives. More specifically,
    a. The panel proposes extremely limited monitoring and reporting.
    b. The panel advocates for data collection activities at temporal and spatial scales that are not sufficient.
    c. The panel advocates for data collection and reporting at an aggregated coalition scale, as opposed to supporting site-specific understanding of the fate and transport of nitrate throughout the system at a granular scale sufficient to be able to eventually understand cause-and-effect, and that would allow for the identification of nitrate source areas where specific challenges persist.
    d. The panel appears to emphasize what is not possible, characterizes the application of well-founded scientific principals and methods as futile, and does not consider the important lessons that can be learned from the hazardous waste and groundwater restoration fields as well as the associated regulatory tools already in place (e.g., GeoTracker, ITRC guidance, etc.).
    e. The panel does not consider the many fine technologies available for expedited site characterization, automated sensing, analyses (temporal and spatial), and reporting that are commercially available or in beta testing. These technologies have the potential to greatly improve the understanding of conditions and trends, and could significantly alleviate the majority of the grower's site-specific assessment, monitoring and reporting burden.
    f. With respect to surface water considerations, while the panel advocates for monitoring in downstream areas to determine general locations of pollution sources, they also advocate against monitoring at specific discharge points. With new sensing technologies, an automated monitoring and data processing network at actual discharge points could be extremely helpful in identifying where issues persist, notifying the appropriate entities (not for punishment, but to assist with management decisions [at least initially]), and tracking trends and geospatiotemporal relationships with other factors (e.g., correlations with specific crops, climate, etc.).

g. Beyond modification of the amounts of nitrogen based materials purchased and applied, the panel does not consider alternative nitrate pollution control and containment options such as passive bioreactors, engineered wetlands, and other potential technologies.

Recommendations

Initial recommendations for consideration include the following:

1) Collectively identify a multi-pronged set of pragmatic solution components (e.g., education, monitoring of purchases, site-specific field and groundwater monitoring, changes over time and space, deployment and installation and monitoring of passive bioreactors, etc.) that result in nitrate load reductions while not excessively burdening farmers.
2) It is proposed that the term “non-point source” be discontinued where appropriate, and that new terminology be derived to better define some of these types of pollution sources (e.g., “aggregated source”). If application of an amendment at a specific location (or even materials from a canal or discharge pipe emanating from a specific activity or location) can be identified as the cause of drinking water quality impairment, the description of this type of source should no longer be ambivalent or imply that a pollution source cannot be identified and appropriately addressed.
3) We can’t manage what we can’t measure. As such, establish a monitoring network that will yield information appropriate for applying quantifiable performance based metrics (e.g., load reduction percentage in soil and concentration reduction in groundwater).
4) Water level maps (past, present, and automated updates) should be developed and maintained/updated to determine direction and flow of nitrate solute plumes. This mapping is synergistic with State initiatives to map, track, and potentially regulate withdrawals from over-tapped groundwater aquifers through programs such as CASGEM.
5) Comprehensive calibrated models need to be developed to specifically identify source terms, predicted nitrate concentration distributions over time and space under various scenarios and assumptions (e.g., nutrient loads, soil storage and fluxes, extraction rates, etc.) and evaluate specific remedial responses (e.g., percentage load reductions for specific agricultural tiles).
6) Need to establish location-specific nitrate reduction objectives based on tile and crop nutrient requirements relative to amounts administered, with detailed attention paid to developing a quantifiable and verifiable amendment allocation program with zero-net-excess and zero nutrient discharge objectives.
7) Comprehensive monitoring for nitrate in groundwater, soil, and at the soil surface should be implemented; preferably automated using innovative technologies for detection, remote reporting, and geospatiotemporal mapping and archiving.
8) An understanding of the spatiotemporal groundwater nitrate mobility and changes in mass discharge (ITRC, 2010; Kram et al., 2011; Suthersan et al., 2011) should be developed at local and regional scales to help determine whether water quality is improving, identify locations

where additional attention is warranted, and to better determine cause-and-effect relationships both in the near term and well into the future.

9) A comprehensive network of shallow groundwater monitoring wells and transects should be installed for determining mass discharge over time and space (ITRC, 2010).
10) Employ automated monitoring networks to better understanding source terms, mass flux and mobility distributions, to track changes/improvements over time and space, to evaluate bioreactor performance, and to recommend or automate modification of amendment practices (e.g., precision agriculture in the true sense of the concept).
11) Identify funding sources and develop new programs (e.g., establish a Nitrate Cleanup Fund Program, supported by surcharges on all nitrogen amendment purchases) to pay for the educational, monitoring, reporting, and management components required to resolve issues associated with impaired water quality.
12) Directly apply as many aspects as possible developed for the hazardous waste management and groundwater remediation industries. This would include technologies, policies, engagement of recognized expertise, and integration of tracking and regulatory tools such as GeoTracker and discharge permits.
13) Development of new standards and training tools that incorporate best agricultural management practices with an emphasis on reduction in excess nitrate amendment.

Specific Comments

Specific comments are organized by page number and specific section, where applicable, below.

1) p.ii - The expert panel recommends four key programmatic elements comprising a paradigm shift in regulatory attempts to reduce nitrate levels in groundwater. Responses to these components are briefly described below:
   a) I concur with most of Element #1 (e.g., "*All farmers should have good irrigation and nitrogen management plans*"). However, why should there be any exemptions from monitoring? Reducing nitrate loads to be equal to or below the natural attenuation capacity of the soil and surroundings is key, and if there are site specific characteristics associated with growing rice on clay soils, verification of claims associated with relative impact should be part of the process. If the objective is "*to ensure that ongoing efforts are protective of groundwater quality*", it is essential that a detailed understanding of cause-and-effect relationships and relative contributions to the total loads (even if suspected to be negligible) are developed and confirmed within the context of dynamic settings. If these relationships are not developed, it will be nearly impossible to meet the stated water quality objectives.
   b) Regarding Element #2, I concur that reporting should be simple and effective. However, the basic reporting elements should also include nitrogen amounts applied relative to the natural attenuation capacity (which should consist of soil and crop uptake considerations relative to the shortest vertical distance to groundwater and lateral distance to surface water discharge locations as well as residual nitrate resulting from previous amendment campaigns). Once a location-specific sustainable load capacity has been determined, monitoring can be

automated as much as possible so that farmers are not burdened with sampling and reporting requirements. The data could be represented by intuitive geospatial and temporal renderings so that farmers and their consultants can actively determine where the sustainable capacity has been exceeded based on quantified metrics such as nitrate concentrations in runoff and downgradient groundwater monitoring wells, canals and discharge pipes. Eventually, after the residual nitrate in the system stored from past practices has exceeded residence times, a more accurate depiction of the balance between amendment and impact will emerge. This will be different based on site specific conditions, crops, climate and other factors. As such, a granular-scaled monitoring effort will be essential for successfully reducing the nitrate levels within the groundwater and surface water resources.

c) Regarding Element #3, while grouping similar types of fields could be of interest from a broader perspective, and would be supported for general assessment purposes, emphasizing this in a policy driver will not resolve the issues at hand, as each site has very specific qualities that result in a range of impacts. While common characteristics such as crop and soil type may exist among properties in a certain region or coalition, when it comes to fate and transport of chemicals in the environment, heterogeneity prevails due to preferential pathways and other natural and anthropogenic factors. As such, the recommended grouping approach would not allow for data reduction at a level of resolution that is amenable to separating signal (e.g., specific groundwater contaminant sources) from noise. Therefore, it is recommended that the nitrate attenuation capacity be estimated and used as a metric for determining the maximum sustainable nitrate amendment policy for each property and set of growing conditions. This could be accompanied by source-specific monitoring efforts to assess whether the natural attenuation capacity has been properly estimated or exceeded, and then adjusted accordingly through time based on the monitoring results. This iterative granular-scaled approach has far greater probability of achieving the stated objectives that include modification of nitrate application practices to achieve improved water quality conditions.

d) Regarding Element #4, it is agreed that a comprehensive educational program should be implemented. This could include training related to determination of nitrate attenuation capacity, monitoring, striking a balance between amendment application and assimilation capacity, use of innovative technologies, and identifying methods for continuous process improvement. We recommend that the educational program be multi-lingual at all levels. Growers are not only Caucasian and Hispanic, but include Hmong and many tribal ethnicities from Central and South America. We would further add that the educational program must be continually available. The high rate of turnover of growers in some regions such as the Central Coast will require frequent and continuous educational offerings.

2) p.ii – In the General Understanding by the Panel section, the panel points to many challenges with the currently available data and cautions against misinterpreting future trends in groundwater quality. While there is agreement regarding the challenges that currently exist when deriving nitrogen loads and determining causes of observed changes, it is essential that a comprehensive monitoring effort be initiated immediately, that the monitoring campaign

encompasses multiple scales both spatially as well as temporally in both the vadose and groundwater zones, that a better understanding of nitrogen fate and transport be derived and observed, and that specific performance metrics be developed and evaluated based on corresponding data collection activities tied to key questions and irrigated land management strategies. While challenges exist, these objectives are very achievable given currently available technologies combined with newer technologies that have recently become available to understand key geospatial and temporal trends. A multiple-lines-of-evidence strategy can provide exceptional results when the data is collected at an appropriate scale. Had this type of monitoring program been in place years prior to the recent discovery of the nitrate challenges, it is likely that the regulatory and management strategies could have by now been far more effective at protecting drinking water and ecological resources. The longer it requires to initiate and implement such a strategy, the longer it will be before these challenges can be sufficiently resolved.

3) p.iv – While there are concerns with the Panels Key Points, a few highlights are presented below.
    a. The Panel's Point D (whereby the members argue against monitoring of the first water bearing zone) makes very little sense from a scientific perspective. Maintaining that monitoring should be avoided because interpretations are complex is not an effective argument. While it is recognized that the vadose zone can serve as a nitrate storage regime base on past practices, it is essential that observations over time and space in the shallow saturated zone be evaluated and monitored beginning as early as possible and over multiple scales. For reference, in the hazardous waste industry, conceptual models of contaminant distribution are typically developed for the vadose zone based on comprehensive sampling and materials are often excavated to protect receiving groundwater. While this would be cost-prohibitive for many locations, it could be very useful to at least begin monitoring areas with relatively shorter vadose zone residence times (e.g., shallow groundwater regions), develop estimates regarding fluxes and transport timing using multiple lines of empirical evidence, and then to generate projections regarding when to expect chemical signals that reflect current practices. Dynamic work plans and conceptual models identical to those employed in the EPA Triad Approach (ITRC, 2003) would be ideal for this situation.
    b. The Panel's Point F (use nitrogen applied to crop in lieu of NHI and groundwater concentration) is troubling. The NHI and groundwater concentrations relate to risk. While the amount of nitrogen applied is critical to track (and modify accordingly), ultimately it is the groundwater concentration and associated NHI that will be used to determine whether risks exist. It is recommended that both amount of nitrogen be monitored as well as the groundwater concentrations impacted by these soil amendments.
    c. The Panel's Point H (accurate assessments of deep percolation of individual fields are impossible to derive) argues against attempting to develop a range of flux and transport estimates. Without these, how then can management practices be determined to be appropriate? There is a cause-and-effect relationship between the amendment

management practice and the resulting health of the receiving water, and the linkage with respect to timing of the nitrate signal is represented by the specific rate and amount of material flowing through the vadose zone interface. Ideally, a balance between the amendment introduction and the assimilation capacity of the vadose zone must be struck in order to reduce the amount of nitrate infiltrating to the groundwater. Without an appropriate estimate of the maximum suspected transport time (and corresponding adjustment of the amendment introduction practice to err on the side of caution), a prudent and effective nitrate pollution management program will be impossible to develop or implement.

d. The Panel's Point S (an index should be developed, but groundwater nitrate concentration monitoring over the next 10-20 years may not reflect impact) is very important, as it is recognized that for some sites, nitrate stored in the vadose zone from past practices will continue to impact groundwater resources. It could be helpful, therefore, to select key locations for lysimeter sampling and other types of monitoring to track the nitrate transport front, and determine whether the regions just below the rhizosphere are improving based on adjusted amendment practices. In addition, newly available sensors can help track nitrogen in the soil over time and space. Regarding an index, an attempt to reflect the assimilative capacity of the vadose zone (which can be dynamic) in this metric is recommended. Ideally, the amount of nitrogen added should not exceed the amount that is required for the crop. Sensors can help evaluate whether this has been exceeded and can be monitored remotely to help identify where practices need to be adjusted. In addition, it is possible to use the sensor data to automate the nitrogen amendment activities (e.g., fertigation schedules). Furthermore, tracers may be added to the nitrogen amendment over specific intervals to help derive estimates of nitrate transport timing.

e. The Panel's Point T (only compare multi-year data) does not make sense from a scientific perspective. Data should be monitored on a continuous high-frequency basis, and trends can be identified and interpreted on an ongoing basis. As stated above, amendment practices can even be automated using sensor driven detection and logic based controllers.

f. The Panel's Point W (not to require annual nitrogen cycle computations) is an argument against improvement to the process or condition. To help facilitate farmer documentation and computation efforts with minimal disruption, automation should be pursued as much as possible. This could include software with an intuitive interface and minimal time for completion of the computations. When properly designed, key factors will remain the same over time. As such, the regulatory body can offer assistance to the farmers or their consultants for the first few years of data entry to facilitate computation and compliance. This should be included within the educational component of the nitrate management program.

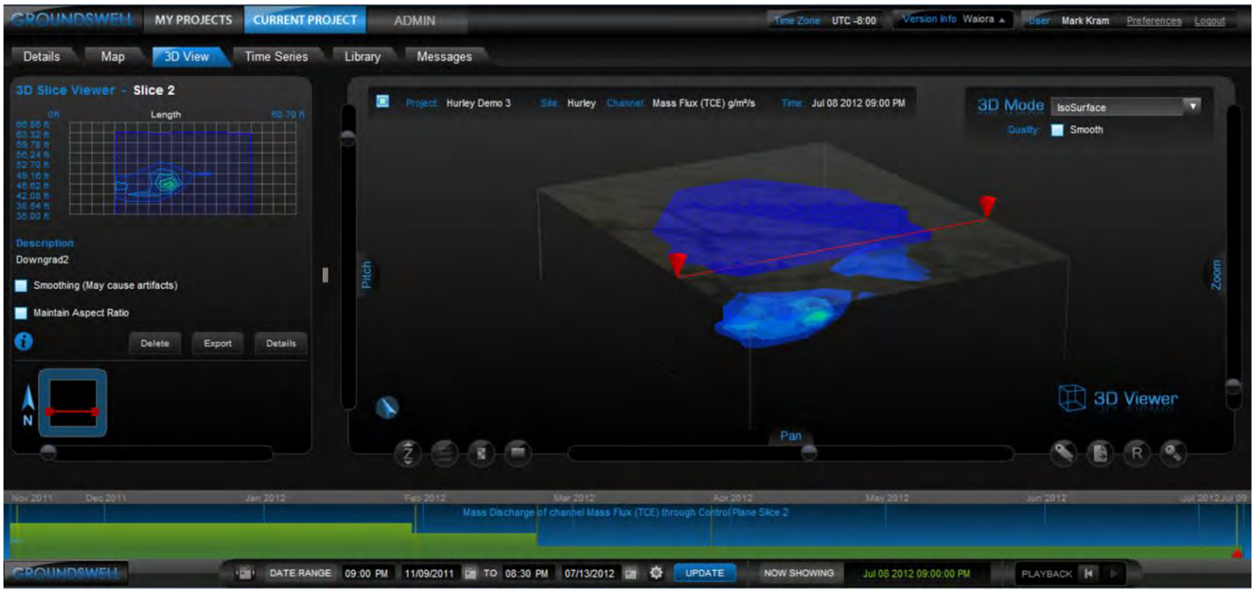
g. The Panel's Point BB (sampling throughout watershed but not at all discharge points) would not enable practitioners to determine cause-and-effect, as location-specific source identification is essential for facilitating appropriate resolution. While it is agreed that a sampling or sensor network in key portions of the watershed is essential, it is also essential to deploy sensors or samplers at all discharge points so that the source signal can be elucidated from the data collected. Prioritization can be driven by field teams who perform near real-time watershed load assessments during runoff periods. The term "nonpoint" source is misleading. It is proposed that this should no longer apply for this type of situation. A more appropriate descriptor should be adopted (e.g., "multi-point" or "aggregated" source) to reflect how there is a direct connection between the application practice, location, amount applied, crop, nitrogen consumption potential, and environmental factors at a given time and place, and the contribution to the resulting water quality condition.

4) p.6 – With respect to reporting (Section 2.4), it is important to note that during the Nitrogen Tracking and Reporting Task Force's second public meeting the group was "*urged to focus on identifying types of data that would be most useful to decision makers and provide real-time information while being practical to collect.*" There was a special emphasis on tracking mass balance that includes yield, nitrogen removed and "*on-farm, event based record keeping*". In their data elements descriptions, the Task Force maintains the Water Board right to request and access data at the individual farm scale. Based on the expert panel comments and recommendations presented in this document, the panel opposes many of these Task Force recommended measures, while many stakeholders in the process strongly encourage the Water Board to maintain and exercise these rights when warranted. Furthermore, Water Board implementation of sensor and GIS based reporting technologies to better identify key conditions, dynamics, and to verify positive trends is highly encouraged by the public sector. Furthermore, according to the Task Force, the Regional Water Boards are responsible for ensuring the accuracy of the data. However, measures for ensuring accuracy or quality control were not described.
5) p.7 – We are in agreement with Panel Finding Item 1 that just collecting data does not necessarily improve or clarify the situation. However, this should not become an argument against collecting critical data along with necessary and descriptive metadata. The data collected should be aimed at answering specific questions, understanding specific processes, and must be converted to decision-support quality information.
6) p.7 – With respect to Panel Finding Item 2, the argument against tracking nitrogen loads makes several key points. However, without data collection to understand (as best as possible) the range in loading rates, deriving appropriate decisions regarding safe practice becomes impossible, and as such, the resulting policies will be ineffective. It is possible to employ chemical forensics, sensors, sample results, and sufficient spatial distributions of field observations and measurements to determine or estimate worst case risk scenarios (e.g., highest vertical flux, maximum surface discharge, etc.) that can then be utilized to proactively modify nitrogen amendment schedules and volumes. We agree with the comment in 2c that states "*the approach should be directed toward inducing good farm management, not merely tracking and reporting what is being done.*" However, the approach should not exclude or

minimize the value gained by tracking and reporting data collected with specific objectives that result in overall water quality improvement through appropriate nitrate application practices.

7) p.7 – With respect to Panel Finding Item 3, groundwater monitoring for nitrate concentration should be accompanied by water level data to determine gradient and flow direction, and in many cases, hydraulic conductivity assessment to determine groundwater flow velocity and mass flux distributions with a directional component. See Kram et al. (2011) for additional information where this was employed to evaluate performance of a USDA designed passive nitrate pollution treatment cell, and to track the discharge of solute Cr(VI) into the Columbia River. Others (Diaz et al., 2003; Suthersan et al., 2011; Christianson et al., 2013) have successfully applied and advocated for similar approaches (ITRC, 2010). While sufficient data will need to be collected for some of these types of efforts, a phased approach for selected locations suspected of high impact where groundwater is relatively shallow could consist of the following:
    a. initial determination of groundwater flow directions;
    b. deployment of a direct push (e.g., hydraulic profiling tool [HPT] or high resolution piezocone [HRP]) sensor probe system to generate a double transect depiction of hydrogeologic characteristics in the shallow subsurface and aquifer (e.g., to 30' bgs);
    c. installation of direct push groundwater monitoring wells along two transects oriented perpendicular to the local groundwater gradient;
    d. installation of sensors for water level and nitrate concentration in the direct push wells;
    e. automated tracking of water level and nitrate concentration using sensors;
    f. with an understanding of hydraulic conductivity, water levels can be converted to Darcy velocity;
    g. by multiplying Darcy velocity by concentration, it becomes possible to track nitrate discharge through source control planes oriented perpendicular to the direction of groundwater flow;
    h. evaluation of subsurface nitrate discharge values over time to understand changes due to load reduction, vadose zone flushing, a combination of these, or to correlate with specific crop rotation and amendment activities.

Below is an example whereby TCE solute discharge was tracked to determine the extent of remediation attributed to a bioamendment injected into the subsurface at an industrial facility:



The three dimensional image represents the distribution of mobile solute for the selected time step. The cross-section represents the distribution of the mobile solute through a source control plane for that time step. The histogram represents the mass discharge through the control plane over time. Notice how a reduction in discharge can be readily observed, quantified, and can be processed in an intuitive format. Deeper groundwater zones can prove to be more expensive for this type of approach, but since the lithology is generally unconsolidated in the regions of interest, these types of monitoring systems can be installed using the same tooling and equipment described above.

8) p.13 – Panel Item #6 is very important, and we are in agreement. As such, it is recommended that more thorough characterization of site specific and regional hydrogeology be determined, that flux and discharge assessments be performed and tracked over time and space, and that a localized and regional understanding of this information continuously improve through support by USGS, USDA, NSF and other funding programs. Fortunately, tremendous progress has been made in the contaminant assessment and remediation industry, and as such, high-resolution expedited characterization (ITRC, 2006; Kram et al., 2008) and automated real-time monitoring and reporting technologies have become cost-effective, accurate, and readily available.
9) p. 14 – Panel Items #7 and #8 point to challenges in understanding key nitrogen fluxes and mass balance criteria. We are in agreement, which is why we are advocating for more appropriate data collection activities to help better understand key factors contributing to the issues at a local level so that correct decisions can be derived and implemented, and metrics employed to continuously improve water quality. The Harter study cited may have resulted in unanswered questions and uncertainties. However, had a data collection network and appropriate infrastructure been in place at the time the study was commissioned, it is highly probable that many of the shortcomings and uncertainties discussed would have been resolved. Given the state of our technology, and the direction of industry (e.g., precision agriculture, smart grid, sensor breakthroughs, DOE/EPA funding for similar endeavors, etc.), we are optimistic that currently available tools and those that are in development will enable stakeholders to derive

solutions to these challenges. However, advocating for less data because past investigations were challenged by lack of data represents a circular argument and will not enable stakeholders to meet the collective water quality objectives. Technologies developed for energy extraction and optimization, remediation, and even security industries can be directly applied to the challenges associated with nitrate water contamination and effective management strategies.

10) p.15 – Panel Item #12 is very important, as understanding the amount of nitrogen removed via crop harvest is a key component required to derive a mass balance. It appears that for some crops, this information is easier to estimate than for others. It is recommended that estimates be derived (as best as possible) by comparing the load to the soil and groundwater to the amount added to the crop where uncertainties exist. Innovative approaches (e.g., optically based remote sensing technologies and data visualization and processing; Quemada et al., 2014) can be explored as well. While this may be a new parameter for farmers to begin to track, it is essential that this be done so that resource managers can readily derive appropriate nitrogen requirements. To-date, these requirements have been over-estimated or applied incorrectly, which is why the groundwater and surface water resources have been impaired. Reporting nitrogen removed via crop harvest together with soil characterization and nitrogen applied will eventually lead to a comprehensive database that will allow for identification of outlier areas requiring additional attention and action.
11) p. 16 – Panel Item #13 is key, as the methods employed to-date are insufficient because appropriate types of monitoring have not yet been required. However, we do not agree with the panel's disregard for data collection activities as proposed by the California State Water Board. More specifically, it is absolutely possible to understand cause-and-effect relationships when appropriate data is collected and transformed into actionable information. For instance, key measurements such as nitrate added to a field, nitrate distributions in the rhizosphere, vadose zone profile, and shallow groundwater, when assimilated and processed in a geospatial and temporal context can yield exceptional information. While some of the sensing technologies are innovative, this is not a new approach to developing site conceptual models, determining fluxes, and responding accordingly with high resolution (both spatial and temporal) refinement of the assessment, and then subsequent responses. The Interstate Technology Regulatory Council (a different ITRC), the American Society of Testing and Materials (ASTM), EPA, and the California Department of Toxic Substances Control (DTSC) have produced consensus-based guidance documents over the past 30 years addressing effective assessment and response strategies for many types of soil and water pollutants. While these efforts will require funding, much can be gained from incorporating similar (and even identical) processes into the nitrate monitoring and management program. At a minimum, when an appropriate monitoring network has been deployed, relative changes over time (e.g., dynamic tracking of mass discharge through aquifer transects) can enable practitioners to understand critical cause-and-effect relationships at local and regional scales. With respect to the panel's proposed paradigm shift, there is a fundamental difference of opinion in that the objective is to restore and protect drinking water resources while burdening the farmer as little as possible. There is a minimum sustainability threshold that is achievable, and anything less will be at the expense of the public at large (e.g., increased taxes to restore impaired resources damaged by private activities). To-date, management practices

have been insufficient. As such, while certain components of the suggestion are warranted, we support an alternative paradigm shift that would emphasize exploitation of technology to simultaneously meet regulatory and public welfare needs while optimizing operations for increased revenues (e.g., reduction in the volume of amendments purchased and applied to the land, fewer notices of violation, penalties and legal expenses, etc.).

12) p. 16 – We are in complete agreement with Panel Item #14, which is why aggregation of fields or crops via consortia or coalition (while appropriate for a component of the management program from an analytical perspective) is not sufficient, as it will preclude resource managers and farmers from identifying specific areas and conditions that may cause impairment on a relative or even absolute scale. In the hazardous waste and groundwater remediation industries, which have many features in common with the challenges posed by nitrogen management, site-specificity is well accepted, and as such, project managers are encouraged to develop and test and continually monitor and revise site conceptual models based on a developed understanding over time and space. This approach has been effective and could directly apply to this situation.
13) p.17 – Section 3.2.1 discusses risks and vulnerability. The panel makes several good points regarding specific hydrogeologic conditions (e.g., exclusion of the Concoran Clay region, where groundwater above this can be impaired; pesticide applications may cover different areas than nitrogen application areas). As such, it is recommended that clarifications be derived by State Water Board representatives such that appropriate locations are accurately represented based on the potential for groundwater impairment either through direct application or via runoff and discharge to groundwater in areas remote from the initial application.
14) p.18 – Section 3.2.1.i presents a solid argument regarding the definition of vulnerability. Since most of the region has undergone extremely limited quantitative data collection activities, it is proposed that the initial zonation as derived be used as a first step, and that as more site-specific data relating to nitrogen sources and transport is compiled, revisions be derived. It is also recommended that this zonation be revised to more accurately reflect observations that exhibit vulnerability as defined in way that incorporates the following: “a weighted measure or index that reflects the susceptibility of an aquifer located below a specific field to become impaired by standard nitrogen amendment practices”. While this could be adjusted, it may be a good starting position, as it suggests that some practices and crops may not be appropriate for certain areas (or that specifics crops in these areas warrant additional attention) and leaves open the possibility of incorporating minimum residence time, maximum velocity/imbibition/infiltration, attenuation capacity, and other factors that can be used as metrics to be ranked in a geospatial context and then used as a basis for decision making. With respect to criticisms of extraction well solute data and how this may not always reflect applications to the surface, this is true to a certain extent – particularly when no previous monitoring has been performed to understand the amount of materials introduced into the environment or fate and transport specifics resulting in discharge via the extraction well. There are certainly examples where practices on the surface have impacted groundwater conditions immediately below. These facts argue for installation of monitoring wells (preferably in transects and grid patterns) so that a greater understanding of upgradient sources and most recent vadose zone releases and changes over time can be developed. The data derived from

extraction wells can sometimes be helpful for determining subsurface flow regimes and for model calibration, so it will be important to continue monitoring and remain cognizant of key well construction parameters such as screen depth ranges, extraction rates, and pumping test results. There will undoubtedly be cost considerations when it comes to monitoring well installations. However, in general, installation of direct push monitoring wells in unconsolidated soils is far less expensive than the amounts currently being invested in supply well installations throughout the region.

15) p.19 – When establishing areas of priority for action/attention based on risk, the panel recognizes challenges associated with farmer constraints such as soil and crop type and irrigation source, and recommends that the risk assessment tools proposed by the regulatory community be applied at basin, regional, and coalition-wide scales. While this could help alleviate some of the farmer's burden with respect to monitoring and risk classification, implementing the panel's recommended strategy will prohibit stakeholders from meeting key water quality improvement objectives, as risk classifications need to be established at the scale of nitrate application practices – which is at the field scale. Attribute variabilities and dynamics occur at the field scale. Expanding assessment units to include basins, crop-specific conglomerates, or coalitions will preclude stakeholders from being able to develop dependable references or indices, produce meaningful recommendations, or to gauge progress over time and space. An analogy can be drawn from the hazardous waste and groundwater remediation industries. For instance, if all leaking underground fuel tanks in an urban setting were addressed as an aggregated unit using limited groundwater quality monitoring and hydrogeologic data collection efforts, it would be very difficult to determine source locations or to derive and implement remedial strategies. Implementing the panel's recommendations in this regard would prove to be even more challenging from a source identification perspective, as nitrogen amendment practices occurring in rural settings can be even more spatially dense than leaking fuel storage tanks in an urban environment. As such, it behooves the Water Board to continue to advocate for site-specific cause-and-effect and quality improvement related monitoring endeavors.
16) p.20 – When addressing the probability of nitrate MCL exceedance in drinking water wells, the panel maintains that this should not be the responsibility of the regulated community. If it is discovered that water resources are contaminated by releases of pollutants, the Resource Conservation Recovery Act (RCRA) requires the responsible party to pay for the assessment, remediation and ongoing protection of the receptor community through groundwater monitoring. RCRA describes very specific situations where a waiver or exemption from groundwater monitoring can be issued. However, the owner-operator of the facility must demonstrate that there is very low potential for nitrate reaching the upper aquifer and subsequently migrating to a supply well. A comprehensive report is required, and this needs to be prepared and certified by a qualified geologist or geotechnical engineer. Given the current general lack of information required to make such an assessment at the field scale, and the cost requirements associated with performing such an assessment, it is understandable that the grower community would be concerned about these and related requirements. In the future, once additional information is collected and compiled, it may be easier for specific entities to

obtain waivers from this requirement. However, at present, these types of requirements are consistent with policies administered for hazardous waste releases. One pragmatic approach to minimizing costs would be to incorporate nitrate and other types of sensors in a flow-through configuration attached to the extraction well, and reporting the information automatically on a continuous basis, as the per-analysis costs would become negligible.

17) p.20 – When addressing deep percolation nitrate considerations and recommended methods for assessment, the panel offers a quote from Aristotle that suggests that they are advocating for limited data collection activities. We are not in concurrence with the panel in this regard. Alternatively, an "approximation of truth", as used in the selected quote, can be far superior when utilizing innovative technologies such as automated continuous monitoring, spatiotemporal analyses and appropriate empirically-based estimates (e.g., conservative/buffered estimates of maximum vertical migration rates, etc.) relative to the use of traditional data collection approaches, or even limited or no data.
18) p.21 – The panel's summary regarding vulnerability and risk cover key points addressed above. While many exceptional points are made, the general theme suggests that the panel believes that the nitrate pollution issues can be resolved by *not* collecting critical data, and by *not* investigating key factors at the field scale sufficient to identify location-specific sources. There is not concurrence, as it is believed that supporting the panel's position would result in continued resource impairment. The panel's arguments suggest that because of limited resources, the panel's preferred pathway is to focus on education. While there is agreement that education should be a key component, it would behoove the regulatory community to consider implementing innovative and cost-effective technologies that can help answer key questions related to local and regional water and nitrate flows, water quality changes over time and space, and to use this data to develop relationships that will result in the identification of unsustainable management practices at the field level, where changes can be recommended for the good of all communities involved. While complex and challenging (and imperfect but always subject to improvements), implementation of this type of approach is not impossible (as implied by the panel comments). On the contrary, many of the tools used to manage landfills and hazardous waste sites are readily applicable and available. For instance, nitrate sensors have been developed specifically for agricultural applications (see http://suprasensor.com/about/). When combined with groundwater level information, mass flux and mass discharge renderings can be automatically determined (Kram et al., 2011) to both identify "hot spots" as well as evaluate whether activities are resulting in improvements. Similar applications are about to be initiated in New Zealand (personal communication, Dr. Hugh Canard, Environmental Group Manager, Lincoln Agritech Ltd).
19) p.22 – With respect to management practices, the panel recommends that lists of best management practices be framed within the context of heightened awareness and education, and not be used to derive requirements. While awareness and education are clearly important, we recommend that specific practices also be tied directly to actions that can be implemented at the field level. For example, for a given crop and soil type, an assessment of the nitrate residing in the soil should be performed to gain a general understanding of the pre-application condition, an estimated understanding of the worst case risk scenario (e.g., maximum nitrogen

infiltration rate and minimum residence time) be derived from field measurements at the site or from similar nearby regimes, and then the sustainable volumetric application of nitrogen should be determined. The primary objective should be to reduce the amount of nitrate reaching groundwater or surface water bodies. If after some time of monitoring (depending upon site specific factors), improvements are not observed (terms to be negotiated), then additional restrictions should be considered. At a minimum, a tracking system should be established whereby a set of crop-specific and hydrogeologic condition-specific decision tools could be employed to determine the maximum amount of amendment allowed for each application at each site. Nutrient loads could be carefully tracked and amounts reported to minimize excess nitrate amendment. Since many growers currently use commercially available management information systems (MISs) already, this should not represent an additional or prohibitive burden. However, MIS vendors should be immediately encouraged to amend their platforms to incorporate key features related to soil permeability, maximum vertical transport velocity, climatic information and dynamics, and other features that are directly linked to the issues at hand. The good news is that some of the features (e.g., maximum vertical velocity) will either only need to be measured a limited amount of times (which could also be obtained through shared coalition results from the collective fields in a region), and much of the information can be gleaned from strategically placed sensors (e.g., soil moisture and conversion to saturated/unsaturated hydraulic conductivity, and nitrate concentration distributions). California is the high-tech capital of the world. Sensors, software, and intuitive business practices have already been incorporated into many irrigation practices. As such, much of the communication and software infrastructure is in place or at least somewhat familiar to key field managers who are adept at implementing efficiency strategies. Furthermore, entrepreneurial pursuits at the university level could be encouraged (e.g., prizes or start-up support) to develop specific niche technologies to bridge technology gaps identified through the regulatory process.

20) p.23 – The panel advocates for development and implementation of irrigation and nutrient management plans specific to each grower and similar management unit as well as educational programs. This is an exceptional recommendation and a solid starting point. The panel also recommends <u>using the data only for management purposes, and not for reporting</u>. This is not supported by the environmental community members, as the extent and complexity of groundwater impairment has reached a point where difficult decisions and pragmatic remediation strategies based on localized information need to be implemented. The steps advocated by the concerned communities are not intended to be punitive, as the benefits derived from a vibrant agricultural system are greatly appreciated and recognized as essential. However, a common objective must be to remediate the damaged water supply in a surgical manner within the shortest timeframe possible using the most efficient and effective tools currently available. The Water Board's stated mission reads as follows, "***The State Water Board's mission is to preserve, enhance and restore the quality of California's water resources, and ensure their proper allocation and efficient use for the benefit of present and future generations.***" Furthermore, "***The mission of the Regional Boards is to develop and enforce water quality objectives and implementation plans that will best protect the State's waters, recognizing local differences in climate, topography, geology and hydrology***." If the State and

Regional Water Boards do not have access to scale-appropriate decision-quality data that can be rapidly converted to actionable information, water quality will not improve in the foreseeable future. Self-regulation has rarely worked in the past, and given the complexities associated with this challenge, it is highly unlikely that implementing the panel's recommendation will result in meeting critical water quality objectives. In addition, industry has a very different mission, which is to generate as much profit as possible. This mission is not always in concert with the Water Board's mission. While there are exceptional examples of good stewardship, and this should be rewarded, it has been demonstrated that private industry will pursue the management pathway that meets the minimum level of requirement to reach compliance. This is not intended to be perceived as a negative statement, but only as a reflection of the economic system that persists in our society. This has been demonstrated in the hazardous waste and groundwater remediation industries, and directly applies to this situation. As such, GeoTracker (http://geotracker.waterboards.ca.gov/) was developed by California regulators to track site-specific assessment and remedial activities, to derive trend analyses, and to archive all reports, communications, and chemical information derived by Responsible Parties and their consultants. GeoTracker is discharge-specific, has been proven to be one of the most effective tools in the world for addressing impaired soil and groundwater challenges, and could be utilized for this situation. The data, information, and plans identified by the panel could be incorporated into the GeoTracker system as part of a new module tailored to meet the needs of the agricultural community. In addition, key performance metrics can be derived and used to help decision makers determine how effectively the plans and adjustments are performing. By maintaining monitoring data on the public-side of GeoTracker, key stakeholders and the public at-large will have the ability see site specific information pertinent to their own interests, and to drill down into the data as they see appropriate.

21) p.25 – The panel describes several vital components of a good grower/farmer education program. This is exceptional information. It is recommended that this list be expanded to include at least a cursory understanding of how to determine vadose zone flow characteristics, how to use nitrate, salinity and water level sensors and information, and how to recognize when nutrient applications exceed sustainable attenuation or uptake capacities. Where possible, the focus on these additional topics should be empirically based and tied to specific measurements that can be made through sensors or analysis of samples. Field trips for technology demonstrations should be part of the required curricula. Key metrics should be developed to help the growers determine whether the management practices they are implementing are still resulting in environmental impairment. The worst possible outcome would be where growers/consultants attend training, and then continue to implement practices that do not result in environmental improvement. The panel acknowledges this in follow-on discussions regarding material retention.

22) p.26 – The panel describes and emphasizes the need for several educational/awareness components that are very helpful. When describing the farmer's documentation obligations, we recommend that automated tracking and reporting be considered. The costs for some of this equipment (e.g., sensors, telemetry, software, etc.) could be reasonable when compared to the time and labor required for this type of tracking. This would significantly reduce the farmer's

burden while ensuring that critical data is not lost or that an important event (e.g., precipitation) is not missed. As such, the farmer and consultant should be trained to determine when the system requires maintenance or component replacement. Some of this information could also be included in the GeoTracker system.

23) p.28 – With respect to compliance, the panel recognizes that an enforcement component should be required, but does not offer a specific recommendation; only a suggestion that the purchase of nitrogen fertilizers be handled similarly to pesticide purchases. It is recommended that much more be required, as uncontrolled pesticide distributions are also prevalent in the environment, so the program has not been successful at removing these from areas they should not be; particularly where exposures in water and air can result in harm to receptors. While training and certification are supported, and training registration for nitrogen fertilizer purchases can be helpful, these steps alone will not result in remediation of the impaired groundwater resources. The growers obviously do not want to face enforcement challenges, and the environmental community aims to improve the drinking water supply and ecological conditions at local and regional scales. One possible plan could include the communities adopting a strategy in stages over the next few years described as follows:
    a) provide comprehensive training,
    b) restrict fertilizer purchases based on certification,
    c) implement comprehensive and properly scaled data collection programs (hydrogeologic, fate and transport, and soil and water quality),
    d) implement a comprehensive program to determine worst case risk scenarios (e.g., maximum nitrate infiltration rates) for key settings (e.g., specific farms, crops, irrigation/precipitation scenarios, etc.),
    e) develop comprehensive site-specific metrics and evaluations of each activity to determine whether localized management practices are improving or impairing groundwater conditions,
    f) provide initial support for farmers who are exceeding the nitrate attenuation capacity (by contact, training, encouragement, peer-pressure, etc.), and then (perhaps in two years)
    g) implement a progressively more strict enforcement program based on automated and other types of required field measurements to ensure that nitrate loads below the rhizosphere are being reduced.

    Would the growers be amenable to this strategy? Under this scenario, once sufficient understanding of the fate and transport can be determined for specific locales, and following the flush of nitrate currently stored in the vadose zone (which will differ depending on each site-specific situation), it may be possible to observe nitrate trends in groundwater that can be attributed to activities in upgradient areas managed by multiple growers. This information can be used to exert localized peer pressure on the entities that are not implementing appropriate policies.

24) p.29 – The panel raises several exceptional issues regarding implementation of an effective educational and awareness plan as well as potential concern about liability. They also

recommend several great ideas, and all of these will require funding. With respect to funding, in the hazardous waste management industry, the State Water Resources Control Board oversees an underground storage tank cleanup fund (http://www.waterboards.ca.gov/water_issues/programs/ustcf/) which "*provides a means for petroleum UST owners and operators to meet the federal and state requirements of maintaining financial responsibility to pay for any damages arising from their tank operations.*" It is recommended that something similar be developed to address the groundwater nitrate issue. For instance, funding for such a program could be derived through a surcharge attached to the sale of nitrogen amendments as has been recommended by previous nitrate panels.

25) p.30 – The panel presents a "Key Point Summary for Application of Management Practices". Many exceptional recommendations are made. Point "J" states that excess complexity and data collection/reporting will likely fail. There is, in general, a consensus about this point. However, the term "excess" is where there is significant disagreement, as the panel is advocating for a level of data collection and reporting at scales and frequencies that will not resolve the problem. All hazardous material risks are comprised of source, pathway, and receptor components. The panel is advocating against understanding site-specific pathway components. It is impossible to manage what is not measured. Unlike the hazardous waste and groundwater remediation industries, the agricultural community has not yet been required to produce key site assessments or to develop monitoring programs sufficient to adequately determine cause-and-effect relationships. The panel is suggesting that since this is complex, we should not attempt to pursue this type of relationship. This does not make sense from a scientific perspective, particularly since there exist decades of historical and ongoing related efforts, thousands of experienced practitioners, and comprehensive libraries full of standards and guidance documents available from analogous industries (e.g., groundwater assessment, groundwater and soil remediation, landfill and oil and gas industries), and new and emerging technologies that will greatly facilitate compliance (e.g., sensors, automation, geospatial mapping, remote sensing, drone deployed technologies, high resolution direct push sensing and well installation, etc.). For instance, deployments of continuous monitoring nitrate sensors in a sump located at the low topographic portion of a field could rapidly help determine whether nitrogen applications are exceeding crop requirements. A time-stamped geospatial rendering of this information from every field would enable managers to know where to immediately focus their efforts, as well as identify geospatiotemporal trends. Deployment of a system like this would even enable growers to reduce their expenses by lowering their costs for nitrogen based materials they will no longer require, collecting fewer samples for analyses, and reporting. Similar types of systems can be deployed to continuously track nitrate infiltration rates in the soil profile, groundwater impacts, and to remotely evaluate performance of passive bioreactors.

26) p.31 – With respect to verification measures, the panel suggests that trend monitoring using existing wells will be helpful, but recommends excluding the first encountered groundwater. From a hydrogeologic and fate and transport perspective, this makes very little sense, as identification of direct causes will not be achievable using this recommended approach. Alternatively, it is recommended that the Water Boards consider deployment and expansion of a comprehensive groundwater monitoring network sufficient to be able to resolve key

uncertainties such as field application impacts on groundwater resources. Monitoring prioritization and scale will need to be carefully considered by key stakeholders, and then revisited as more information becomes available. In addition, instead of requiring samples, the deployment of newer sensor and telemetric technologies and implementation of automated geospatial processing is recommended to facilitate reporting, data analyses and geospatiotemporal processing.

27) p.31 – The panel presents "Key Point Summary for Verification Measures" and emphasizes that nitrogen application data should only be used to provide a multi-year picture of nitrogen use on a regional scale. They advocate for multi-year trend analysis instead of a year-to-year comparison. This recommendation is adamantly opposed by key entities for its' lack of temporal and spatial resolution, inability to contribute much benefit with respect to groundwater quality improvements, and is most likely going to allow for far too much "business as usual", which could result in continued environmental impairment. As an alternative to this, a far more comprehensive monitoring and metrics based evaluation system is advocated for. This would be comprised of high frequency continuous monitoring, automated processing where applicable, nitrogen loading reporting for every crop that is planted in highly sensitive regions (as determined through appropriate groundwater monitoring and other NHI screening criteria), estimates of projected crop uptake percentage for every planting event, estimates of soil attenuation capacity and maximum infiltration rates, field observations that include factors related to nitrate residence time and migration through the soil profile, measurement of local groundwater conditions and trends (including mass discharge analyses through localized control planes as well as in a regional context), measurement of nitrate in runoff, as well as estimates of total nitrate balance and geospatiotemporal trends analyses. This level of comprehensive verification will be prohibitive at first, but it is essential or it will be impossible to enact any meaningful policies that will result in achieving the stated water quality objectives.
28) p.32 – The panel recommends that data collection and reporting be coordinated by a third party, and that growers should not be required to report directly to the Regional Water Boards. The panel also stresses that current groundwater quality should not trigger reporting or regulation of above-ground activity. Their point is that nitrate detected in groundwater cannot be pinpointed to the specific source based on above-ground activities or nitrogen fertilizer purchases. With all due respect, the panel's logic is flawed. The panel is advocating against reporting and monitoring because there is not currently an appropriate monitoring and reporting system in place to be able to connect source and pathway to receptor. While it is recognized that nitrate is currently stored in the vadose zone, and it will require time for the material to move through the soil column, the mature field of fate and transport of pollutants currently utilizes approaches to determine these types of relationships. As such, it behooves the regulatory community to begin collecting this essential data immediately, and to finally begin addressing this serious issue by determining these relationships. This should include an assessment and estimate of the transport and residence times for each field so that entities can anticipate when and where direct causes due to above-ground activities will be observed.

With respect to estimation of irrigation water applied to individual fields, sensors for the water distribution activities as well as soil moisture measurements will greatly facilitate the understanding of these critical parameters in a spatiotemporal context. Nitrogen cycle computations are indeed complex. However, with sensor based monitoring and reporting and automated analyses implemented at the field level, a range of estimates can be derived to at least begin to gain an understanding of the sensitivity of key attributes and the potential impacts on water quality.

The panel recommends that the data collected be used for education and development of management plans, but not for enforcement. This runs counter to a common sense strategy. Compliance should be back-stopped by potential enforcement. While not advocated for in the immediate future, eventually, enforcement must come into play. An analogy can be derived from the hazardous waste management and groundwater remediation fields, for which a tremendous amount of experience can be leveraged to resolve this challenge. If enforcement were not incorporated as a driver, some responsible parties (e.g., firms on the receiving end of regulatory enforcement efforts) would continue to exhibit poor practices with impunity, as the costs associated with compliance reduces profits. Economics is a key driver, and appropriate regulatory enforcement can be framed (and accounted for) as an economic ledger component for entities engaged in the agricultural related businesses. Since the regulatory community has avoided this issue for so long, it is agreed that the grower should not be held completely responsible for the current water quality situation. Growers were complying with minimum (or no) regulatory requirements. Note, however, that the courts have many times determined that defendants assuming this position are not insulated from fault, and they have lost cases based on this strategy due to CERCLA's delayed discovery rule. While many groups are willing to grant growers some leeway in this regard, eventually the practices must change, and as such, enforcement must be part of the strategic solution. Contrary to what the panel is advocating for, through a comprehensive monitoring, assessment (including fate and transport estimates at the field scale), reporting, education and management system, it will be possible to attribute above-ground activities to water quality. A perfect example of this is through the sensor based measurement of surface runoff sumps along the low topographic areas of each property. This component of a monitoring strategy will not require years to determine whether nitrate added to the surface is excessive, or whether appropriate controls are in place. This approach could be used to remotely monitor activities, track trends over time and space, and to initially trigger alerts when exceedances are measured. Eventually, after several years of data collection and experience, an enforcement component can be adopted based on very specific performance metrics. This information could also be used to identify where passive and active treatment systems could be installed.

29) p.33 – The panel proposes nitrogen computational variables. They also point to a few shortcomings that could at least partially be addressed by the employment of sensors to determine residual nitrate following crop harvest operations. This information can help growers determine subsequent purchases and amendment practices appropriate for the next crop planting efforts. The panel advocates for extremely limited, low frequency data collection and reporting requirements at scales that will preclude entities from reaching specific management

decisions, identifying specific sources of pollution or poor management practices, or determining appropriate action. The effort recommended by the panel "*purposefully limits data collection to basic information that can be easily obtained and all farmers need and should be knowledgeable of as part of their nutrient management….This data collection effort does not require farmers to account for nitrogen applications to individual fields….It does not necessitate mapping or farm-scale spatial analysis*." Unfortunately, the panel's positon is unacceptable, as it represents status quo, avoids the use of commercially available management technologies for optimization and efficiency, and has an extremely low probability of resulting in improvements to groundwater quality. The panel maintains that their recommended data collection policy "*addresses the probability of nitrogen leaving the crop root zone via deep percolation.*" However, support for this claim was not provided. Without appropriate chemical, moisture, and mass transport information at the field scale, it is unlikely that the probability of deep percolation of nitrogen can be determined.

30) p.34 – The panel presents a Key Point Summary for Reporting. The panel repeats and emphasizes much of what has been presented earlier, including limited monitoring, reporting, and aggregation of fields into units that are not field-specific. The panel unfortunately does not acknowledge that employment of state-of-the-practice automated monitoring and geospatial analytical tools allows for continuous monitoring over more appropriate timeframes than the recommended annual or semi-annual trend analyses. As an alternative, we point to GeoTracker as a proposed initial model for reporting and data management within the agricultural community. This system can be modified to account for agricultural-specific reporting and analytical components. Amendments to include geospatial trend analyses and estimates of fate and transport related computations at the field scale will enable regulators and others within the community to identify where improvements in management practices will be required. It is not a perfect system, will require time and resources to allow for residual nitrate loads to work their way through the strata, but eventually, once this system is rolled out, it should be possible to begin performing cause-and-effect analyses. This, along with the utilization of commercially available sensor based monitoring and geospatial analytical platforms should benefit growers (e.g., less money and time allocated to nutrient amendment, reporting, and enforcement) as well as other community members who are just as concerned about water quality.

31) p.35 – The panel discusses monitoring logistics and recommendations for surface water discharges. The panel mentions the use of continuous sample collection equipment, which can be useful. However, new lower costs sensor based alternatives have recently been developed, and new methods for protecting from vandalism are currently available (e.g., inexpensive GPS placed on all field vehicles and on the sensor communication hardware, alerting when signal is dropped or system is moved, etc.). The panel further states "*The sampling should be of sufficient density (spatially and temporally) to identify general locations of possible pollution. For example, a single measurement point at the downstream discharge of a very large watershed would be insufficient. When/if problems are identified, sampling should move upstream with sampling to locate the source of the problem."* Furthermore, the panel's key point summary includes the following statement "*A network of sampling points in drains and streams throughout a watershed, with emphasis on downstream areas, is recommended*

to identify if there are pollution problems upstream. This is recommended rather than sampling at each discharge point." We are in agreement to a certain extent. We agree that receiving waters should be routinely monitored and a network of telemetered sensors in receiving waters and drains will be helpful for both urban stormwater and irrigated agriculture programs. We also strongly recommend deployment of sensors at discharge points. Most environmental programs and discharge permits require discharge monitoring and reporting. As such, the irrigated lands program should not be any different, particularly when the data will be critical for monitoring the immediate discharger and evaluating the potential for the discharged water to impact the environment and migrate to surface and subsurface drinking water resources. We advocate for the use of sensors and telemetry so that continuous measurements can be recorded and sent to a Cloud based management platform, automated geospatial analyses be performed, and an immediate alert delivered to key points of contact (e.g., coalition leaders, specific growers, etc.) when water quality thresholds are exceeded. Implementation of the panel's recommendation as described could result in a time lag between detection in the downstream location and mobilization of a sampling entity, thereby prohibiting the team from meeting source detection objectives. Limiting monitoring to only the receiving waters and then tracking back upstream is also complicated by the additional costs and lag time associated with sample collection and addressing the private property rights concerns as the investigation personnel work their way upstream.

Summary and Conclusions

1) A well-functioning and environmentally sustainable agricultural community is critical for reasons related to societal benefits associated with economic, security, drinking water, energy and long-term environmental considerations.
2) Since agricultural practices in California have been granted exemption or leniency regarding addressing the potential nitrate contaminant issues for so long, and a comprehensive nitrate management policy has not yet been developed or implemented by the regulatory community, it is critical to understand that contamination emanating from legacy activities will need to be considered when addressing relationships between cause-and-effect for current and future agricultural practices. As such, implementation of compliance programs will need to be flexible and account for temporal, spatial, and site-specific characteristics, as a one-size-fits-all or even an aggregated (e.g., by crop, region, or common field characteristics) approach may not be appropriate.
3) Any solution proposed will require substantial financial resources for development of policies, integration of new practices, monitoring, education, and implementation of private sector and government programs. As such, financial support for key parties and stakeholders should be procured as soon as possible. This may require expansion of ongoing programs or development of new programs, with an analogy represented by the California UST Cleanup Fund Program. Revenues are derived by adding a surcharge for purchases of gasoline. Similarly, a California Nitrate Cleanup Fund Program could be capitalized by adding a surcharge for all purchases of

nitrogen amendment materials. Legislation may also be needed to fund expansion of the State Water Board's Groundwater Ambient Monitoring and Assessment Program, establish a regulatory framework, and to improve coordination among the various government entities (CA Water Boards, 2013).

4) It is in the best interest of all parties to derive a balanced approach towards managing agricultural practices that weighs public benefits against the interests of individuals or aggregated parties. For instance, if the privatization of profit overwhelmingly favors socialization of the risks (e.g., contamination of the public drinking water resources), public financial resources will need to be made available to address the unfavorable outcomes. However, as with the hazardous waste management industry, private investment to meet regulatory requirements should also be considered part of the business process. As such, a decision regarding what is a fair level of public financial burden will need to be determined.
5) An ideal outcome of this process should include the use of the most effective technologies and practices that would result in pragmatic policies that can meet key drinking water quality objectives with the least amount of burden endured by the grower community to ensure compliance, continual improvement, and restoration supported by defensible trend analyses. As such, this approach cannot be "business-as-usual", but must be developed with the outcomes being amenable to performance metrics for unequivocal demonstration of groundwater quality improvement.
6) While an enforcement component to drinking water resources management policy will eventually be required, given the complexities involved, many in the environmental community would be willing to accept an initial transitional period that emphasizes education and monitoring network deployment while acknowledging near term improvements to management practices as verified by defensible documentation (e.g., reduction in nitrate amendment exceedance and improved soil/water quality). Enforcement actions available to the regulatory community should initially be non-punitive, with an emphasis on data collection, determination of cause-and-effect, establishment of a comprehensive monitoring network and program, and continuous improvements motivated by a rewards structure. After an established amount of time has passed, an enforcement program could include more punitive components similar to what is currently employed in the NPDES and RCRA programs addressing the management of hazardous waste discharges and remediation efforts.
7) Given what we know about widespread contamination of our groundwater resources and what we understand about the loading already present in the vadose zone, the environmental community realizes progress will require years, even decades of effort, adding to the urgency to immediately initiate comprehensive monitoring and responses.
8) Low-cost denitrification bioreactors (Diaz et al., 2003; Christianson et al., 2013), engineered wetlands and other types of passive treatment systems and approaches should be considered for many of the properties to reduce nitrate releases to the environment. Monitoring of these can also be accomplished via the emerging state-of-practice automation technologies to evaluate efficiency and to determine loads that can be tracked over time (Kram et al., 2011).
9) All hazardous material risks are comprised of source, pathway, and receptor components. The panel is advocating against understanding site-specific pathway components. It is impossible to

manage what is not measured. Unlike the hazardous waste and groundwater remediation industries, the agricultural community has not yet been required to produce key site assessments or to develop monitoring programs sufficient to adequately determine cause-and-effect relationships. The panel is suggesting that since this is complex, we should not attempt to pursue this type of relationship. This does not make sense from a scientific perspective, particularly since there exist decades of historical and ongoing related efforts, thousands of experienced practitioners, and comprehensive libraries full of standards and guidance documents available from analogous industries (e.g., groundwater assessment, groundwater and soil remediation, landfill and oil and gas industries), and new and emerging technologies that will greatly facilitate compliance (e.g., sensors, automation, geospatial mapping, remote sensing, drone deployed technologies, high resolution direct push sensing and well installation, etc.).

10) While many of the panel's recommendations (e.g., education, appropriate training for key entities in specific roles, tracking of nitrogen amendments, etc.) are exceptional, and they accurately point to many of the complexities associated with the challenges at hand, unfortunately, their recommendations as presented in the report will not enable the communities involved to meet key drinking water quality objectives. As such, the panel's recommendations fall far short of objectives that include groundwater and surface water improvement in the foreseeable future. More specifically,
    a. The panel proposes extremely limited monitoring and reporting.
    b. The panel advocates for data collection activities at temporal and spatial scales that are not sufficient.
    c. The panel advocates for data collection and reporting at an aggregated coalition scale and receiving surface water scale, as opposed to supporting site-specific understanding of the fate and transport of nitrate throughout the system at a granular scale sufficient to be able to eventually understand cause-and-effect, and that would allow for the identification of nitrate source areas where specific challenges persist.
    d. The panel appears to emphasize what is not possible, characterizes the application of well-founded scientific principals and methods as futile, and does not consider the important lessons that can be learned from the hazardous waste and groundwater restoration fields as well as the associated regulatory tools already in place (e.g., GeoTracker, ITRC guidance, etc.).
    e. The panel does not consider the many fine technologies available for expedited site characterization (e.g., high-resolution direct push characterization, well design and installation), automated sensing, analyses (temporal and spatial), and reporting that are commercially available or in beta testing. These technologies have the potential to greatly improve the understanding of conditions and trends, and could significantly alleviate the majority of the grower's site-specific assessment, monitoring and reporting burden. When properly executed, regulators and other stakeholders can immediately respond to areas of concern or even automate specific activities (e.g., when/where/how long to irrigate, fertigate, etc.).

f. With respect to surface water considerations, while the panel advocates for monitoring in downstream areas to determine general locations of pollution sources, they also advocate against monitoring at specific discharge points. With new sensing technologies, an automated monitoring and data processing network that includes discharge points could be extremely helpful in identifying where issues persist, notifying the appropriate entities (not for punishment, but to assist with management decisions [at least initially]), and tracking trends and geospatiotemporal relationships with other factors (e.g., correlations with specific crops, climate, etc.).
g. Beyond modification of the amounts of nitrogen based materials purchased and applied, the panel does not consider alternative nitrate pollution control and containment options such as passive wood chip denitrification bioreactors and other potential options. The USDA has been extremely active in their installation and evaluation of low cost nitrate effluent bioreactor technologies (Christianson et al., 2012; 2013), and has initiated bioreactor standards development and optimization activities (personal communication, Dr. Thomas Moorman, USDA-ARS). These systems can reduce nitrate loads by up to 90 percent. As such, these treatment options should be considered, as well as performance monitoring metrics and methods for such options.

References

California Department of Food and Agriculture, 2013. *Nitrogen Tracking and Reporting Task Force, Final Report*, December 2013.

California Water Boards, 2013. *Recommendations Addressing Nitrate in Groundwater*, State Water Resources Control Board Report to the Legislature, 20 February, 2013.

Christianson, L., A. Bhandari, M. Helmers, K. Kult, T. Sutphin, and R. Wolf, 2012. *Performance Evaluation of Four Field-Scale Agricultural Drainage Denitrification Bioreactors in Iowa*. Transactions of the American Society of Agricultural and Biological Engineers. v.55, issue 6, p.2163-2174.

Christianson, L., M. Helmers, A. Bhandari, and T.B. Moorman, 2013. *Internal Hydraulics of an Agricultural Drainage Denitrification Bioreactor*. Ecological Engineering. v.52, p.298-307, http://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=1722&context=abe_eng_pubs.

Diaz, R., J. Garcia, R. Mujeriego, and M. Lucas, 2003. *A Quick, Low-Cost Treatment Method for Secondary Effluent Nitrate Removal Through Denitrification*. Environ. Eng. Sci. 20, 693–702.

ITRC, 2006. *Technical and Regulatory Guidance for the Use of Direct Push Well Technology for Long-Term Environmental Monitoring in Groundwater Investigations*, Washington, D.C.: Interstate Technology and Regulatory Council, www.itrcweb.org.

ITRC, 2003. *Technical and Regulatory Guidance for the Triad Approach: A New Paradigm for Environmental Project Management*, Washington, D.C.: Interstate Technology and Regulatory Council, www.itrcweb.org.

ITRC, 2010. *Use and Measurement of Mass Flux and Mass Discharge*, MASSFLUX-1. Washington, D.C.: Interstate Technology and Regulatory Council, Integrated DNAPL Site Strategy Team, www.itrcweb.org.

Kram, Mark L., Gary Robbins, Jessica Chau, and Amvirossious Bagtzoglou, 2008. *Detailed Hydraulic Assessment Using a High-Resolution Piezocone Coupled to the GeoVIS, Final Report, ESTCP ER-0421,* NAVFAC TR-2291-ENV, April, 2008, 99pp.

Kram, Mark L., Steve Airhart, Daniel Tyler, Amy Dindal, Andrew Barton, John L. McKernan, and Gregg Gustafson, 2011. *Web-Based Automated Remediation Performance Monitoring and Visualization of Contaminant Mass Flux and Discharge*, Remediation Journal, Summer 2011, v. 21, issue 3, p.89-101.

Quemada, Miguel, Jose Luis Gabriel, and Pablo Zarco-Tejada, 2014. Airborne Hyperspectral Images and Ground-Level Optical Sensors as Assessment Tools for Maize Nitrogen Fertilization, Remote Sensing, v.6, p.2940-2962.

Suthersan, Suthan, Craig Devine, Joseph Quinnan and Eric Nichols, 2010. *Flux-Informed Remediation Decision Making*, Ground Water Monitoring and Remediation, Winter 2011, v.30, issue 1, p.34-43.

Selected Technology Vendors/Contacts

Geoprobe Systems (http://geoprobe.com/)

gThrive (http://www.gthrive.com/)

Instrumentation Northwest (http://inwusa.com/)

Iowa Soybean Association Denitrification Bioreactors (http://www.iasoybeans.com/environment/programs-initiatives/programs/bioreactors)

Soilmoisture Equipment Corporation (http://www.soilmoisture.com/)

SupraSensor (http://suprasensor.com/)

TrackR (http://stickr.thetrackr.com/)

USDA Bioreactor Expert (Dr. Thomas Moorman, http://www.ars.usda.gov/pandp/people/people.htm?personid=3940)

Dr. Kram's Bio

Dr. Mark Kram is an award winning Hydrogeologist/Geochemist who has worked for the US Navy, UCSB, Groundswell Technologies, as an independent consultant, and has served as an expert witness on high-profile legal cases. Dr. Kram earned his Ph.D. in Environmental Science and Management from the University of California at Santa Barbara, an M.S. degree in Geology from San Diego State University, and his B.S. degree in Chemistry from the University of California at Santa Barbara. He has over 30 years of experience using and developing innovative environmental assessment techniques, has authored articles, national standards and book chapters on the subject, and has taught graduate level courses on related topics. Dr. Kram is an internationally recognized expert in site characterization and remediation, and has been instrumental in the areas of sensor development and implementation, innovative GIS applications, DNAPL site characterization, chemical field screening, well design, mass flux/discharge based remediation performance, and groundwater basin yield and storage change assessment. Dr. Kram has patented inventions for automated sensor based contouring and multivariate analyses, automatic determination of groundwater basin storage change, water sustainability to protect from basin overdraft, seawater intrusion and stream depletion, and for in-situ measurement of groundwater contaminant flow rates and directions. Dr. Kram has been featured in Forbes (http://www.forbes.com/sites/michaeltobias/2012/01/31/environmental-security-sensing-the-world-in-4-d/), is an active member of the National Ground Water Association (NGWA), American Society of Testing and Materials (ASTM Subcommittees D18.21 and E50.02), and the Interstate Technology Regulatory Council (ITRC), and is currently preparing national guidance for vapor intrusion and environmental characterization applications. Dr. Kram recently co-chaired an ASTM International symposium on continuous soil vapor chemical measurements, served as Editor for the ASTM International book entitled "*Continuous Soil Gas Measurement: Worst Case Risk Parameters*" (http://www.astm.org/BOOKSTORE/PUBS/STP1570.htm), is the recipient of the NGWA's prestigious Technology Award (http://www.ngwa.org/Media-Center/press/2011/Pages/Kram-wins-2011-Technology-Award-from-the-National-Ground-Water-Association2.aspx), and received the 2014 ASTM Committee D18 Technical Editors Award.

Selected Publications/Presentations:

Bartlett, S.A., Robbins, G.A., Mandrick, J.D., Barcelona, M.J., McCall, W., and Kram, M.L., 2004, Comparison of Hydraulic Conductivity Determinations in Direct Push and Conventional Wells, Naval Facilities Engineering Service Center Technical Report, TR-2252-ENV, October, 2004, 88pp.

James Jacobs, Kram, Mark L., and Stephen H. Lieberman, 2000. *Direct Push Technology Sampling Methods* in Standard Handbook of Environmental Science, Health, and Technology, Jay Lehr, ed., McGraw-Hill, 2000, pp.11.151 – 11.176.

Keller, Arturo A., Sanya Sirivithayapakorn, Mark L. Kram, and Michael Joy, 2000. *Innovative Treatment of MTBE in Groundwater, Soil and Air: A Case Study*, Soil Sediment and Groundwater, March 2000, pp. 92 - 93.

Keller, Arturo A., Britta Bierwagon, Sanya Sirivithayapakorn, and Mark L. Kram, 1999. *Advances in Groundwater Treatment to Remove MTBE*, Hazardous and Industrial Wastes, Proceedings of the Thirty-First Mid-Atlantic Industrial and Hazardous Waste Conference, pp. 199-208.

Keller, Arturo A. and Mark L. Kram, 1999. *Use of Laser Induced Fluorescence to Detect DNAPL and Fluorophore Mixtures In-Situ*, Proceedings of the XXVIII IAHR Congress, Graz, Austria, 22-27 August, 1999, p.6.

Keller, Arturo A., Sanya Sirivithayapakorn, and Mark L. Kram, 1999. *Remediation of MTBE-Contaminated Water and Soil*, Remediation, Winter 1999, pp. 55 - 68.

Koglin, Eric N., Edward J. Poziomek, and Mark L. Kram, 1994. *Emerging Technologies for Detecting and Measuring Contaminants in the Vadose Zone* in Vadose Zone Characterization and Monitoring: Principles, Methods, and Case Studies, 896 pp., Lewis Publishers.

Kram, Mark L., Peter Morris and Lorne G. Everett, 2013, *Dynamic Subsurface Explosive Vapor Concentrations,* in D18 Symposium on Continuous Soil Gas Measurements: Worst Case Risk Parameters, Eds.: Mark Kram and Lorne Everett, Special Technical Publication #1570.

Kram, Mark L., Peter Morris and Lorne G. Everett, 2011. *Dynamic Subsurface Explosive Vapor Concentrations – Observations and Implications*, Remediation Journal, Winter 2011, v.22, issue 1, p.59-69.

Kram, Mark L., Steve Airhart, Daniel Tyler, Amy Dindal, Andrew Barton, John L. McKernan, and Gregg Gustafson, 2011. *Web-Based Automated Remediation Performance Monitoring and Visualization of Contaminant Mass Flux and Discharge*, Remediation Journal, Summer 2011, v. 21, issue 3, p.89-101.

Kram, Mark L., Steve Airhart and Daniel Tyler, 2011. *Automated Monitoring and Visualization of Groundwater and Surface Water Interactions*, Sixth International Conference on Remediation of Contaminated Sediments (New Orleans, Louisiana; February 2011).

Kram, Mark L., R. Edward Beighley, and Hugo A. Loaiciga, 2010. *Automatic Analysis*, Pollution Engineering, June 2010, v.42, no.6, p.18-23, http://digital.bnpmedia.com/publication/?i=39268.

Kram, Mark L., R. Edward Beighley, and Hugo A. Loaiciga, 2010. *Automated Environmental Monitoring, Data Visualization, and Critical Resource Management*, A-093, in K.A. Fields and G.B. Wickramanayake (Chairs), *Remediation of Chlorinated and Recalcitrant Compounds—2010.* Seventh International Conference on Remediation of Chlorinated and Recalcitrant Compounds (Monterey, CA; May 2010). ISBN 978-0-9819730-2-9, Battelle Memorial Institute, Columbus, OH, www.battelle.org/chlorcon.

Kram, Mark L. and Per Ljunggren, 2010. *Use of the High Resolution Piezocone for Geoenvironmental Applications*, in Proceedings of CPT '10: International Symposium on Cone Penetration Testing, eds. Dr. Peter Robertson, May 9-11, 2010, Huntington Beach, CA.

Kram, Mark L. R. Edward Beighley, Hugo A. Loaiciga, and Clark Easter, 2010. *Automated Environmental Monitoring and Visualization for Optimized Project Management*, in Proceedings of the 20th Annual International Conference on Soils, Sediments, Water, and Energy, March 15-18, 2010, San Diego, CA.

Kram, Mark L., R. Edward Beighley, and Hugo A. Loaiciga, 2010. *Automated Environmental Monitoring and Visualization for Optimized Groundwater Management,* in Proceedings of North American Environmental Field Conference and Exposition, January 12-14, 2010, Tampa, Fla.

Kram, Mark L., R. Edward Beighley, and Hugo A. Loaiciga, 2009. *Automated Environmental Monitoring, Data Visualization, and Critical Resource Management,* in Proceedings of SERDP and ESTCP Partners in Environmental Technology Technical Symposium and Workshop, December 1-3, 2009, Washington D.C.

Kram, Mark L., Thomas D. Dalzell, and Per Ljunggren, 2009. *Rapid Single Mobilization Solutions for High-Resolution Contaminant Flux Characterization, Network Design, and Monitoring System Deployment*, in Proceedings for NovCare2009, May, 2009, Leipzig, Germany.

Kram, Mark L., R. Edward Beighley, and Hugo A. Loaiciga, 2009. *Automated Environmental Monitoring and Data Visualization for Streamlined Groundwater Management*, in Proceedings for Second Western Forum on Energy and Water Sustainability, UCSB, April 10, 2009, Santa Barbara, CA.

Kram, Mark L., Thomas Dalzell, and Per Ljunggren, 2009. *Expedited High-Resolution Mass Flux Assessments Using Direct Push Technologies*, in Proceedings of First Remediation Technology Summit (RemTec), March 2009, Atlanta, GA.

Kram, Mark L., R. Edward Beighley, and Hugo A. Loaiciga, 2008. *Automated Environmental Monitoring and Data Visualization*, in Proceedings of SERDP and ESTCP Partners in Environmental Technology Technical Symposium and Workshop, December 2-4, 2008, Washington D.C.

Kram, Mark L., and Gregg Gustafson, 2008. *Triad: Beyond Characterization to Long-Term Management of Groundwater Contaminant Plumes*, USEPA Technology Innovation Program Sponsored Workshop, September 12, 2008, http://www.clu-in.org/conf/tio/beyondcharacterization/.

Kram, Mark L., 2008. *Using High-Resolution Piezocone to Determine Hydraulic Parameters and Mass Flux Distribution*, USEPA Technology Innovation Program Sponsored Workshop, August 27, 2008, http://www.clu-in.org/conf/tio/piezocone/.

Kram, Mark L., Norm Jones, Jessica Chau, Gary Robbins, and Amvirossious Bagtzoglou, 2008. *Mass Flux Distribution Using the High-Resolution Piezocone and GMS*, in: Proceedings of the Sixth International Conference on Remediation of Chlorinated and Recalcitrant Compounds (Monterey, CA; May 2008), Paper Q-017. ISBN 1-57477-163-9, published by Battelle, Columbus, OH, www.battelle.org/chlorcon.

Kram, Mark L., Gary Robbins, Jessica Chau, and Amvirossious Bagtzoglou, 2008. *Detailed Hydraulic Assessment Using a High-Resolution Piezocone Coupled to the GeoVIS, Final Report, ESTCP ER-0421,* NAVFAC TR-2291-ENV, April, 2008, 99pp.

Kram, Mark L., Gary Robbins, Jessica Chau, and Amvirossious Bagtzoglou, 2008. *Detailed Hydraulic Assessment Using a High-Resolution Piezocone Coupled to the GeoVIS, Cost and Performance Report, ESTCP ER-0421*, April, 2008, 59pp.

Kram, Mark L., William Major, Louise Parker, Joel Michaelsen, and Tim McHale, 2008. *Demonstration/Validation of Long-Term Monitoring Using Wells Installed by Direct Push Technologies, Cost and Performance Report, ESTCP ER-0011*, March, 2008, 32pp.

Kram, Mark L., 2008. *Two New Technologies for Expedited Groundwater Contaminant Remediation Design and Monitoring*, RPM Newsletter, Spring 2008, p.10-14.

Kram, Mark L. and Norm Jones, 2007. *3D Flux Model Development Using the High-Resolution Piezocone and GMS*, in Proceedings of the 17th Annual AEHS Meeting and West Coast Conference on Soils, Sediments, and Water, March 19-22, 2007, San Diego, CA.

Kram, Mark L., Gary Robbins, Ross Bagtzoglou, Jessica Chau, Meridith Metcalf, Norm Jones, 2006. *Detailed Hydraulic Assessment Using a High-Resolution Piezocone and 3-D Conceptual Models*, in Proceedings of the Groundwater Resources Association Symposium on High Resolution Site Characterization and Monitoring, Long Beach, CA, November 14-15, 2006.

Kram, Mark L., 2006. *DNAPL Characterization Methods and Approaches: Performance and Cost Comparisons*, in The Practical Handbook of Environmental Site Characterization and Ground-Water Monitoring, D. M. Nielsen, Editor, CRC Press/Taylor & Francis Publishers, Boca Raton, FL, p.473-516.

Kram, Mark L., Gary Robbins, Renduo Zhang, Lanbo Liu, Norm Jones, 2006. *Detailed Hydraulic Assessment Using a High-Resolution Piezocone Coupled to the GeoVIS*, in Proceedings of the North American Environmental Field Conference, Tampa, FL.

Kram, Mark L., Arturo A. Keller, Steve M. Massick, and Leroy E. Laverman, 2006. *Complex NAPL Site Characterization Using Fluorescence*, in Proceedings of the North American Environmental Field Conference, Tampa, FL.

Kram, Mark L., R. Edward Beighley, and Sanya Sirivithayapakorn, 2006. *Sensor and GIS Integration for Automated Environmental Monitoring and Data Visualization*, in Proceedings of the North American Environmental Field Conference, Tampa, FL.

Kram, Mark L., Arturo A. Keller, Steve M. Massick, and Leroy E. Laverman, 2004. *Complex NAPL Site Characterization Using Fluorescence* in Treating Dense Non-Aqueous-Phase Liquids, Remediation of Chlorinated and Recalcitrant Compounds, G.B. Wickramanayake, A.R. Gavaskar, and N. Gupta, eds.

Kram, Mark L., Arturo A. Keller, Steve M. Massick, and Leroy E. Laverman, 2004. *Complex NAPL Site Characterization Using Fluorescence, Part 1: Selection of Excitation Wavelength Based on NAPL Composition*, Soil and Sediment Contamination: an International Journal, March/April, v.13, no.2, pp.103-118.

Kram, Mark L., and Arturo A. Keller, 2004. *Complex NAPL Site Characterization Using Fluorescence, Part 2: Analysis of Soil Matrix Effects on the Excitation/Emission Matrix*, Soil and Sediment Contamination: an International Journal, March/April, v.13, no.2, pp.119-134.

Kram, Mark L., and Arturo A. Keller, 2004. *Complex NAPL Site Characterization Using Fluorescence, Part 3: Detection Capabilities for Specific Excitation Sources*, Soil and Sediment Contamination: an International Journal, March/April, v.13, no.2, pp.135-148.

Kram, Mark L., D. Lorenzana, J. Michaelsen, B. Major, L. Parker, C. Antworth, and T. McHale, 2003. *Direct-Push Wells for Long-Term Chemical Monitoring*, WWJ, April, p.16-19.

Kram, Mark L., D. Lorenzana, L. Parker, J. Michaelsen, B. Major, and E. Lory, 2003. *Performance Comparison Between Direct-Push and Conventional Hollow Stem Auger Installed Monitoring Wells*, GWMR.

Kram, Mark L., 2002. *DNAPL Contaminant Detection Using Optimized Fluorescence Methods*, Ph.D. Dissertation, University of California, Santa Barbara, September, 2002, 255pp.

Kram, Mark L., Arturo A. Keller, Joseph Rossabi, and Lorne G. Everett, 2002. DNAPL Characterization Methods And Approaches, Part 2: Cost Comparisons, *GWMR, v.22, p.46-61.*

Kram, Mark L., Arturo A. Keller, Joseph Rossabi, and Lorne G. Everett, 2001. DNAPL Characterization Methods And Approaches, Part 1: Performance Comparisons, *GWMR, v.21, no.4, p.109-123.*

Kram, M., D. Lorenzana, J. Michaelsen, and E. Lory, 2001. *Performance Comparison Between Direct-Push and Conventional Hollow Stem Auger Monitoring Wells*, in Proceedings: Tri-Service Environmental Technology Symposium, San Diego, CA, TMC Design Corporation, Smithfield, VA, pp.80-83.

Kram, Mark L., Stephen H. Lieberman, Jerome Fee, and Arturo A. Keller, 2001. *Use of LIF for Real-Time In-Situ Mixed NAPL Source Zone Detection*, GWMR, v.21, no.1, pp. 67-76.

Kram, Mark L., 2001. *Direct-Push Versus HSA Drilled Monitoring Wells*, RPM News, Spring 2001, p.6 - 7.

Kram, Mark, D. Lorenzana, J. Michaelsen, E. Lory, 2001. Performance Comparison: Direct-Push Wells Versus Drilled Wells, Naval Facilities Engineering Service Center Technical Report, TR-2120-ENV, January 2001, 55pp.

Kram, Mark L., Arturo A. Keller, and Lorne G. Everett, 2000. *DNAPL Site Characterization Methods and Approaches: Cost and Performance Comparisons* in Treating Dense Non-Aqueous-Phase Liquids, Remediation of Chlorinated and Recalcitrant Compounds, G.B. Wickramanayake, A.R. Gavaskar, and N. Gupta, eds., pp. 59-68.

Kram, Mark L., Stephen H. Lieberman, and James Jacobs, 2000. *Direct Sensing of Soils and Ground Water* in Standard Handbook of Environmental Science, Health, and Technology, Jay Lehr, ed., McGraw-Hill, 2000, pp. 11.124 – 11.150.

Kram, Mark L., Sanya Sirivithayapakorn, Michael Joy, Ernest Lory, and Arturo A. Keller, 2000. MTBE Remediation Using Hollow Fiber Membrane and Spray Aeration Vacuum Extraction

Technologies, Naval Facilities Engineering Service Center Contract Report, CR 00-004-ENV, September, 2000, 52pp.

Kram, Mark L. and Fred Goetz, 1999. Natural Attenuation General Data User's Guide, Naval Facilities Engineering Command document UG-2035-ENV, February, 1999, 35 pp.

Kram, Mark L., Sanya Sirivithayapakorn, Michael Joy, Ernest Lory, and Arturo A. Keller, 1999. *MTBE Remediation Using Hollow Fiber Membrane and Spray Aeration Vacuum Extraction Technologies* in Abstracts for the Proceedings of the 1999 American Geophysical Union Annual Conference, December 1999.

Kram, Mark L., 1998. *Use of SCAPS Petroleum Hydrocarbon Sensor Technology for Real-Time Indirect DNAPL Detection.* Journal of Soil Contamination, 1998, Volume 7, No. 1, pp. 73-86.

Kram, Mark L., 1998. *Use of SCAPS Suite of Tools to Rapidly Delineate a Large MTBE Plume*, Remedial Project Manager News, Winter 1998, pp. 13-15.

Kram, Mark L., 1998. *New Tool for Rapidly Evaluating Ground Water Transport Properties Now Available,* Remedial Project Manager News, Summer 1998, p. 4.

Kram, Mark L., 1998. *This is the Year of the Ocean: Let's Clean it Up*, Santa Barbara News-Press, Tuesday, August 18, 1998.

Kram, Mark L. and Ernest Lory, 1998. *Use of SCAPS Suite of Tools to Rapidly Delineate a Large MTBE Plume,* Conference Proceedings for the Annual Meeting of the Environmental and Engineering Geophysical Society, March 22-26, 1998, Chicago, Illinois, pp. 85-99.

Kram, Mark L., 1997. *Use of SCAPS Petroleum Hydrocarbon Sensor Technology for Real-Time Indirect DNAPL Detection.* Proceedings of the Seventh Annual AEHS West Coast Conference on Contaminated Soils and Groundwater: Analysis, Fate, Environmental and Public Health Effects, and Remediation, Oxnard, CA, 1997.

Kram, Mark L., Marlene Dean, and Rod Soule, 1997. *The ABCs of SCAPS*. Soil and Groundwater Cleanup, May 1997, pp. 20-22.

Kram, Mark L., 1996. *Framework for Successful SCAPS Deployment*. Proceedings of the Sixth Annual AEHS West Coast Conference on Contaminated Soils and Groundwater: Analysis, Fate, Environmental and Public Health Effects, and Remediation, Newport Beach, CA, 1996.

Kram, Mark L., 1996. *SCAPS Team Efforts Saves Navy Dollars: Success Stories*, Remedial Project Manager News, v.2, no.4, December 1996.

Kram, Mark L., Vern Novstrup and Stephen H. Lieberman, 1994. *Fast-Track Environmental Site Characterization Using Cone Penetrometer Technology*. White Book, Society of American Military Engineers.

Kram, Mark L., 1993. *Free Product Recovery: Mobility Limitations and Improved Approaches.* Naval Facilities Engineering Service Center Information Bulletin #IB-123, October 1993.

Kram, Mark L., 1990. *Measurement of Floating Petroleum Product Thickness and Determination of Hydrostatic Head in Monitoring Wells.* Navy Energy and Environmental News Information Bulletin, November 1990, p.7-10.

Kram, Mark L., 1989. *Fate and Distribution of Organotin in Sediment of Four United States Harbors.* Masters' Thesis, San Diego State University, 147 pp.

Kram, Mark L., 1989. *World Security.* Environmental Science and Technology, v.23, no.12, p.1434.

Kram, Mark L., Peter M. Stang, and Peter F. Seligman, 1989. *Fate and Distribution of Organotin in Sediment of Four United States Harbors.* U.S. Navy Technical Report #1280, 79 pp.

Kram, Mark L., Peter M. Stang, and Peter F. Seligman, 1989. *Adsorption and Desorption of Tributyltin in Sediments of San Diego Bay and Pearl Harbor.* Applied Organometallic Chemistry, v.3, p.523-536.

Kram, Mark L., 1988. *Earth Day Festival Comes Back to Life.* San Diego State University Daily Aztec, April 22nd, p.1.

Kram, Mark L., 1987. *Practical Approaches to Environmental Solutions.* San Diego State University Daily Aztec, December 4th, p.3.
Lieberman, Stephen H., Vern Novstrup, and Mark L. Kram, 1995. *Fast-Track Environmental Site Characterization Accomplished Using CPT*, Remedial Project Manager News, v.1, no. 4, March 1995.
J. Rossabi, B. D. Riha, C. A. Eddy-Dilek, and M. L. Kram, 2000. *Field Tests of Cone Penetrometer-Based, DNAPL Characterization Methods*, Groundwater Research, Rosbjerg *et al.* eds., Balkema, Rotterdam, Denmark.
Sinclair, Nate and Mark Kram, 1998. *High Resolution 3-D Seismic Reflection Surveys for Characterization of Hazardous Waste Sites*, in Proceedings for the Third Tri-Service ESTCP Workshop, 18 August, 1998.
Stang, Peter M., Peter F. Seligman, Richard F. Lee and Mark L. Kram, 1990. *Distribution and Fate of Butyltin Compounds in Marine Sediments.* Proceedings of the 3rd International Organotin Symposium, Monaco, 17-20 April 1990, pp. 49-54.
Widdowson, M., F. Chapelle, C. Casey and M. Kram, 2008. *Estimating Cleanup Times Associated with Combining Source-Area Remediation with Monitored Natural Attenuation, Final Report,* ESTCP ER-0436, February, 2008, 65pp.

Served as technical reviewer or contributing author for numerous additional reports, standards, books, and publications including the following:

ASTM D5088, *Standard Practice for Decontamination of Field Equipment Used at Nonradioactive Waste Sites*. Annual Book of ASTM Standards, v.04.08.
ASTM D5092, *Standard Practice for Design and Installation of Ground Water Monitoring Wells in Aquifers*. Annual Book of ASTM Standards, v.04.08.
ASTM D6001, *Standard Guide for Direct-Push Water Sampling for Geoenvironmental Investigations*. Annual Book of ASTM Standards, v.04.08.
ASTM D6067, *Standard Guide for Using the Electronic Cone Penetrometer for Environmental Site Characterization*. Annual Book of ASTM Standards, v.04.08.
ASTM D6187, *Standard Practice for Cone Penetrometer Technology Characterization of Petroleum Contaminated Sites with Nitrogen Laser-Induced Fluorescence*. Annual Book of ASTM Standards, v.04.08.
ASTM D6724, *Standard Guide for Installation of Direct Push Ground Water Monitoring Wells*. Annual Book of ASTM Standards, v.04.08.
ASTM D6725*, Standard Practice for Direct-Push Installation of Prepacked Screen Monitoring Wells in Unconsolidated Aquifers*. Annual Book of ASTM Standards, v.04.08.
ASTM PS85, *Guide for Expedited Site Characterization of Hazardous Waste Contaminated Sites.*
ASTM STP1570, *Continuous Soil Gas Measurements: Worst Case Risk Parameters*, Eds.: Lorne Everett and Mark Kram, Special Technical Publication, 182pp.
ASTM WK#32621, *Standard Practice for Evaluating Potential Hazard as a Result of Methane in the Vadose Zone*, Subcommittee E50 on Real Estate Assessment and Management, in draft.
Boulding, J. Russell, 1994. Practical Handbook of Soil, Vadose Zone, and Ground-Water Contamination: Assessment, Prevention, and Remediation, 976 pp., Lewis Publishers.
ESTCP, 1999. Cost and Performance Report: High Resolution Seismic Reflection to Characterize and Plan Remediation and Hazardous Waste Sites, 40pp.
ESTCP, 2000. Cost and Performance Report: Electromagnetic Surveys for 3-D Imaging of Subsurface Contaminants, 54pp.

ESTCP, 2008. Final Report: Demonstration/Validation of Long-Term Monitoring Using Wells Installed by Direct-Push Technologies (ER-0011).

ESTCP, 2008. Cost and Performance Report: Estimating Cleanup Times Associated with Combined Source-Area Remediation with Monitored Natural Attenuation (ER-0436).

ESTCP, 2008. Final Report: Estimating Cleanup Times Associated with Combined Source-Area Remediation with Monitored Natural Attenuation (ER-0436), February 2008, Navy Technical Report, TR-2288-ENV, 65pp.

ESTCP, 2008. Cost and Performance Report: Detailed Hydraulic Assessment Using a High-Resolution Piezocone Coupled to the GeoVIS (ER-0421), April 2008, 59pp.

ESTCP, 2008. Final Report: Detailed Hydraulic Assessment Using a High-Resolution Piezocone Coupled to the GeoVIS (ER-0421), April 2008, NAVFAC TR-2291-ENV, 99pp.

ESTCP, 2008. Cost and Performance Report: Demonstration/Validation of Long-Term Monitoring Using Wells Installed by Direct Push Technologies, Cost and Performance Report (ER-0011), March, 2008, 32pp.

ITRC, 2006. *Technical Regulatory Guide for Installation and Use of Direct Push Monitoring Wells.*

ITRC, 2010. *Use and Measurement of Mass Flux and Mass Discharge*. MASSFLUX-1. Washington, D.C.: Interstate Technology & Regulatory Council, Integrated DNAPL Site Strategy Team. www.itrcweb.org.

Kresic, N., and Mikszewski, A, 2012. Hydrogeological Conceptual Site Models: Data Analysis and Visualization, CRC Press Taylor and Francis Publishers, 600pp.

NAVFACENGCOM Guide Specification for Extraction and Monitoring Wells, NFGS-02670.

NEESA 1992. *Immediate Response to Free Product Discovery.* NEESA Document No. 20.2-051.4, November 1992, 11 pp.

Nielsen, D.M., 2006. Practical Handbook of Environmental Characterization and Ground-Water Monitoring, Second Edition, CRC Taylor and Francis Publishers, 1318pp.

U.S. Air Force, 1994. United States Air Force Remediation Handbook for POL-Contaminated Sites.

U.S.D.O.E., 2001. Induced Fluorescence Sensors for Direct Push Systems, Innovative Technology Summary Report, Tech ID 2237, CMST-CP-SCFA, 28pp.

U.S.E.P.A., 1993. Subsurface Characterization and Monitoring Techniques, A Desk Reference Guide, Volume II: The Vadose Zone, Field Screening and Analytical Methods, Appendices C and D. Office of Research and Development, Washington DC 20460, May 1993, EPA/625/R-93/003b.

U.S.E.P.A., 2003. Applied and Potential Technologies for DNAPL Investigations. Technology Innovation Office, Washington DC, 2003, EPA/524/R-01/03.

Attachment 15

Communities that rely on a contaminated groundwater source for their drinking water

COMMUNITIES THAT RELY ON A CONTAMINATED GROUNDWATER SOURCE FOR DRINKING WATER

STATE WATER RESOURCES CONTROL BOARD

REPORT TO THE LEGISLATURE

January 2013

STATE OF CALIFORNIA
Edmund G. Brown Jr., Governor

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
Matthew Rodriquez, Secretary

STATE WATER RESOURCES
CONTROL BOARD
P.O. Box 100 Sacramento, CA 95812
(916) 341-5250
Homepage: http://www.waterboards.ca.gov

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES (CONT.)

APPENDICES

ABBREVIATIONS AND ACRONYMS

1,2,3-TCP	1,2,3-Trichloropropane
AB 2222	Assembly Bill 2222 (Caballero, Chapter 670, Statutes of 2008)
ARRA	American Recovery and Reinvestment Act of 2009
CDPH	California Department of Public Health
COC	Constituent of Concern
Cr-6	Hexavalent Chromium
DBCP	1,2-Dibromo-3-chloropropane
DDWEM	CDPH Division of Drinking Water and Environmental Management
DLR	Detection Limit for Purposes of Reporting
DPR	Department of Pesticide Regulation
DWR	Department of Water Resources
GAMA	Groundwater Ambient Monitoring and Assessment
HSC	California Health and Safety Code
IRWM	Integrated Regional Water Management
MCL	Maximum Contaminant Level
mg/L	milligrams per liter (parts per million)
NDMA	N-Nitrosodimethylamine
NL	CDPH Notification Level
OEHHA	Office of Environmental Health Hazard Assessment
PCE	Tetrachloroethylene
PICME	DDWEM Permits, Inspections, Compliance, Monitoring and Enforcement (PICME) database

ABBREVIATIONS AND ACRONYMS (cont.)

POE	Point-of-Entry
POU	Point-of-Use
Proposition 50	Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002
Proposition 84	Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Act of 2006
SRF	State Revolving Fund (Safe Drinking Water)
SWRCB	State Water Resources Control Board
TCE	Trichloroethylene
µg/L	micrograms per liter (parts per billion)
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
USTCF	Underground Storage Tank Cleanup Fund
UV	Ultraviolet light

EXECUTIVE SUMMARY

AB 2222 (Caballero, Chapter 670, Statutes of 2008) requires the State Water Resources Control Board to submit a report to the Legislature that identifies: 1) communities in California that rely on contaminated groundwater as a primary source of drinking water; 2) the principal contaminants and other constituents of concern; and 3) potential solutions and funding sources to clean up or treat groundwater or provide alternative water supplies.

A “community,” for the purposes of this report, is defined as a Community Public Water System (Health and Safety Code Section 116395). When this report refers to communities that rely on a contaminated groundwater source, it is referring to community public water systems that draw water from a contaminated groundwater source prior to any treatment. Over 95 percent of the 38 million Californians get their drinking water from a public water system. The findings in this report do not reflect private domestic wells or other unregulated water systems since the state does not require these groundwater users to sample their wells, and consequently a comprehensive database for these groundwater sources does not exist.

This report identifies 680 community water systems that, prior to any treatment, relied on a contaminated groundwater source during the most recent California Department of Public Health (CDPH) compliance cycle (2002-2010). It is important to note that, according to CDPH, over 98% of Californians on public water supply are served safe drinking water. Although many water suppliers draw from contaminated groundwater sources, most suppliers are able to treat the water or blend it with cleaner supplies before serving it to the public. Consequently, when this report refers to communities that rely on contaminated groundwater, it is referring to community public water systems that draw water from one or more contaminated groundwater wells prior to any treatment or blending.

Some community water systems, however, cannot afford treatment or lack alternative water sources, and have served water that exceeds a public drinking water standard. Of the 680 community water systems that rely on a contaminated groundwater source, 265 have served water that exceeded a public drinking water standard during the most recent CDPH compliance cycle (2002-2010).

For this report, a “principal contaminant” is defined as a chemical detected above a public drinking water standard on two or more occasions between 2002 and 2010. The ten most frequently detected principal contaminants are summarized in the table on the next page.

Ten Most Frequently Detected Principal Contaminants			
Principal Contaminant	**Number of Wells**	**Number of Community Water Systems**	**Type of Contaminant**
Arsenic	587	287	Naturally occurring
Nitrate	451	205	Anthropogenic nutrient[1]
Gross alpha activity	333	182	Naturally occurring
Perchlorate	179	57	Industrial/military use[1]
Tetrachloroethylene (PCE)	168	60	Solvent
Trichloroethylene (TCE)	159	44	Solvent
Uranium	157	89	Naturally occurring
1,2-dibromo-3-chlropropane (DBCP)	118	36	Legacy pesticide
Fluoride	79	41	Naturally occurring
Carbon tetrachloride	52	17	Solvent
Notes: 1. Also can be naturally occurring, but typically at levels below maximum contaminant level			

Potential solutions to address contaminated groundwater sources fall into three categories: pollution prevention, cleanup, and alternative water supplies or treatment. Where pollution prevention and cleanups are not feasible, the focus should be on providing safe drinking water through alternative water supplies or treatment. Public funding for alternative water supplies or treatment is limited, and is non-existent for private domestic well users or other water systems not regulated by the state.

INTRODUCTION

This report has been prepared pursuant to the requirements of AB 2222 (Caballero, Chapter 670, Statutes of 2008) which requires the State Water Resources Control Board (State Water Board), in consultation with the California Department of Public Health (CDPH), Department of Water Resources (DWR), Department of Pesticide Regulation (DPR), Office of Environmental Health Hazard Assessment (OEHHA), and other appropriate agencies, to submit a report to the Legislature that identifies:

- Communities that rely on contaminated groundwater as a primary source of drinking water.
- Principal contaminants, other constituents of concern (COCs), and contamination levels affecting groundwater.
- Potential solutions and funding sources to clean up or treat groundwater, or to provide alternative water supplies, to ensure the provision of safe drinking water.

BACKGROUND

CDPH estimates that 85 percent of California's community public water systems[1] (community water systems), supplying more than 30 million residents, rely on groundwater for at least part of their drinking water supply. California's reliance on groundwater increases during times of drought and will continue to increase with the growing demand from municipal, agricultural, and industrial sources. Changes in surface water availability resulting from possible global climate change may further increase the role of groundwater in California's future water budget. Due to California's reliance on groundwater, and because many community water systems are entirely reliant on groundwater for their drinking water supply, contamination of this resource can have far-reaching consequences.

Many groundwater basins throughout California are contaminated with either naturally occurring or anthropogenic pollutants, or both. As a result, many community water systems in the state incur significant costs to remove the contaminants from the groundwater before serving it to their customers as drinking water. According to CDPH estimates, over 98 percent of Californians using a public water supply receive safe drinking water that meets all public health standards, even though some groundwater sources may contain elevated concentrations of contaminants. This estimate does not include the percentage of people who rely on private domestic wells and other drinking water sources not regulated by the state, since data on the quality of that drinking water does not exist or is not available in a publicly accessible database.

When a groundwater source is contaminated, community water systems must use costly treatment systems to ensure that the water is safe to drink. Where treatment and

[1] A community public water system (community water system) serves at least 15 service connections used by yearlong residents or regularly serves at least 25 yearlong residents. Community water systems are regulated by CDPH.

alternative water supplies are not available, some community water systems serve contaminated groundwater until a solution is implemented.

Small community water systems typically lack the infrastructure and economies of scale of larger water systems, and in some cases cannot afford to treat or find alternative supplies for a contaminated drinking water source. As a result, small community water systems may be more vulnerable to serving contaminated groundwater to their customers than larger water systems.

In addition, approximately 2 million Californians rely on groundwater from either private domestic wells or other groundwater-reliant systems not regulated by the state. Many of these well owners are unaware of the quality of their well water, because the state does not require them to test their water quality.

Contamination of the state's groundwater resources results in higher costs for ratepayers and consumers due to the necessity of additional treatment and can pose a threat to public health for community water systems that cannot afford the necessary treatment systems. Identification of community water systems that rely on a contaminated groundwater source may help focus available efforts and resources to ensure the provision of safe drinking water. This report identifies community water systems that rely on a contaminated groundwater source for drinking water. This report also includes information on principal contaminants, COCs, contamination levels, potential solutions, and funding sources to clean up, treat, or provide alternative water supplies to ensure the provision of safe drinking water.

This report is not a CDPH compliance report. The most recent CDPH compliance reports are available here:
http://www.cdph.ca.gov/certlic/drinkingwater/Pages/Publications.aspx.

Data Included in this Report

The State Water Board used public water quality data and information available in the CDPH Division of Drinking Water and Environmental Management's water quality monitoring database (hereafter referred to as the CDPH database) to develop this report. The CDPH database is the largest source of drinking water quality data in the state. These data are also publicly available on the State Water Board's GeoTracker Groundwater Ambient Monitoring and Assessment (GAMA) groundwater information system http://geotracker.waterboards.ca.gov/gama. The CDPH database includes analytical water quality data for all community water system drinking water sources. Compliance data was obtained from CDPH using the Permits, Inspections, Compliance, Monitoring, and Enforcement (PICME) system information database http://www.cdph.ca.gov/certlic/drinkingwater/Pages/EDTlibrary.aspx.

This report only includes data from community water system sources that were active during the most recent CDPH compliance cycle (January 1, 2002 through December 31, 2010). Furthermore, the data analysis only considered water samples collected from two types of sources:

- Active Raw: Groundwater sampled directly from the well.
- Active Untreated: Groundwater sampled at a point between the well and a treatment system.

Both types of samples are characteristic of ambient, raw groundwater that is used for drinking water. It is important to note that these data do not reflect the quality of water that is served to the public, which is typically treated prior to delivery.

Water Systems or Data Not Evaluated

This report does not evaluate certain types of systems and contaminants for which data is not available, or where the data does not come from a community water system. The types of systems and information that are not included, as well as the rationale for exclusion and limitations associated with those systems and data, are summarized below.

State and Local Small Systems: Water quality data for “state small” systems (systems serving less than 25 people a year, with 5 to 14 service connections) and local small systems (systems serving less than 25 people per year, with two to four service connections). These systems are regulated at a local level and as a result, the data are not available in a readily accessible database.

Private Domestic Wells:
A comprehensive water quality database for domestic wells does not exist. The state does not regulate the quality of private domestic well water, and does not require private domestic well owners to test for water quality. Because the state lacks comprehensive data on these wells, they are excluded from this report.

For information purposes only, some data have been collected by the State Water Board’s GAMA Domestic Well Project and are discussed in Appendix 2.3.

In addition, DPR conducts groundwater monitoring for a wide variety of pesticides. The DPR dataset includes groundwater samples collected from public supply wells, irrigation wells, and domestic wells, although the DPR dataset primarily includes shallow domestic wells in areas where pesticides are used. The DPR data are available to the public from DPR or through the GeoTracker GAMA groundwater information system.

Non-community Systems: Transient non-community water systems, such as rest stops, gas stations, and campgrounds, do not serve the same group of people over time. Another excluded system type is a non-transient non-community water system that serves a similar group of people, but does not serve them year round. An example is a school with its own water system. There are over 13,000 schools in California, the vast majority of which are connected to a community water system. However, approximately 420 schools are not connected to a community water system and rely on their own well for water supply. These school water systems are classified as "non-transient non-community" and, as a result, do not meet the definition of community water system used in this report. Although data on these school systems are not included here, information is available to the public on the internet at the GeoTracker GAMA groundwater information system or directly from CDPH.

Bacteriological Information: Community water systems are required to rigorously test for bacteria since they are a health concern. However, water samples for bacteria are primarily collected within the distribution system, and are not collected from raw groundwater. For instance, the bacteriological data available in the CDPH database constitutes compliance-related reporting that reflects the quality of the water within the distribution system. In addition, most of the compliance-related reports are for total coliform bacteria that naturally occur in soil and groundwater. Total coliform bacteria, while indicative of possible contamination between a well and the surface, does not demonstrate whether groundwater in the aquifer is contaminated.

In 2009, CDPH adopted by reference the Federal Groundwater Rule that provides increased protection against bacteria in drinking water. Where total coliform tests positive as a result of routine sampling, a community water system will be required to conduct a monitoring program at the source. These data will be available as part of the CDPH database in the future.

Definitions Used in this Report

AB 2222 (Caballero, Chapter 670, Statutes of 2008) includes several terms and phrases that do not have statutory or regulatory definition. The definitions used by the State Water Board for these terms and phrases are provided below.

Community Water System: A public water system that serves at least 15 service connections used by yearlong residents or regularly serves at least 25 yearlong residents (California Health and Safety Code § 116395). Community water systems serve the same group of people, year round, from the same group of water sources.

Groundwater Reliant Community: A community water system that gets at least part of its drinking water from a groundwater source. For the purposes of this report, a community water system with at least one active drinking water well is considered a groundwater-reliant community. Even if a community gets the majority of its drinking water from surface water, there may be parts of that community that are 100 percent reliant on groundwater wells for drinking water. Furthermore, the relative dependence on a well can change based on seasonal precipitation, time of the year, or changing use patterns. Appendix 8 includes information on which community water systems are 100 percent groundwater reliant, those that are 50 to 99 percent groundwater reliant, and those that are less than 50 percent groundwater reliant.

Active Well: A well that was being used to provide drinking water to a community public water system at the time that this report was being drafted (October 2011), and was also sampled two or more times during the most recent CDPH compliance cycle (2002-2010).

Maximum Contaminant Level (MCL): MCLs are health-based protective drinking water standards developed by CDPH which public drinking water systems are required to meet. MCLs take into account the health risk, detectability, treatability, and costs-of-treatment associated with a chemical. Please note that MCLs are used in two ways in this report: to help define a principal contaminant (as explained below) and to help identify community water systems that have served contaminated groundwater to their customers.

Principal Contaminant: A chemical detected in a groundwater source sample above a primary MCL on two or more occasions during the most recent CDPH compliance cycle (2002-2010).

Constituents of Concern: A chemical detected in a groundwater source above a CDPH Notification Level two or more times during the most recent CDPH compliance cycle (2002-2010).

Notification Levels are health-based advisory levels established by CDPH for chemicals in drinking water that lack or do not yet have an MCL. Not every community water system collects samples for constituents with a Notification Level, and as a result, the findings in this report may not capture the full distribution of these contaminants in California's groundwater used for drinking.

Contaminated Groundwater Source: A well where a principal contaminant was detected above an MCL on two or more occasions during the most recent CDPH compliance cycle (2002-2010).

Community that Relies on a Contaminated Groundwater Source for Drinking Water: A community water system where a principal contaminant was detected in an active raw or active untreated drinking-water well, at a concentration above an MCL on two or more occasions during the most recent CDPH compliance cycle (2002-2010). It is important to note that although many water suppliers draw from contaminated groundwater sources, most suppliers are able to treat the water or blend it with cleaner supplies before serving it to the public. Consequently, when this report refers to "communities that rely on a contaminated groundwater source for drinking water", it is referring to community public water systems that draw water from one or more contaminated groundwater wells prior to any treatment or blending. According to CDPH, over 98% of Californians on public water supply are served safe drinking water.

The methods used to identify communities that rely on a contaminated groundwater source for drinking water are outlined in Appendix 1.

SUMMARY OF FINDINGS

The summary below provides a brief description of the findings of this study. A more detailed description of these findings is included in Appendices 1 through 8.

Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

This study identified a total of 2,584 community water systems in California that rely on groundwater as a primary source of drinking water. There are 8,396 active wells that are associated with these groundwater-reliant community water systems.

This study identified 680 community water systems that rely on a contaminated groundwater source. It is important to note that over 98% of Californians using a public water supply receive safe drinking water that meets all health standards. Although many water suppliers draw from contaminated groundwater sources, most of them are able to treat the water or blend the contaminated water with cleaner water before serving it to the public.

There are 1,659 active wells where contamination was detected that are associated with these 680 community water systems. Figure 1 shows the 15 counties (out of the 58 counties in California) with the greatest number of community water systems that rely on contaminated groundwater sources.

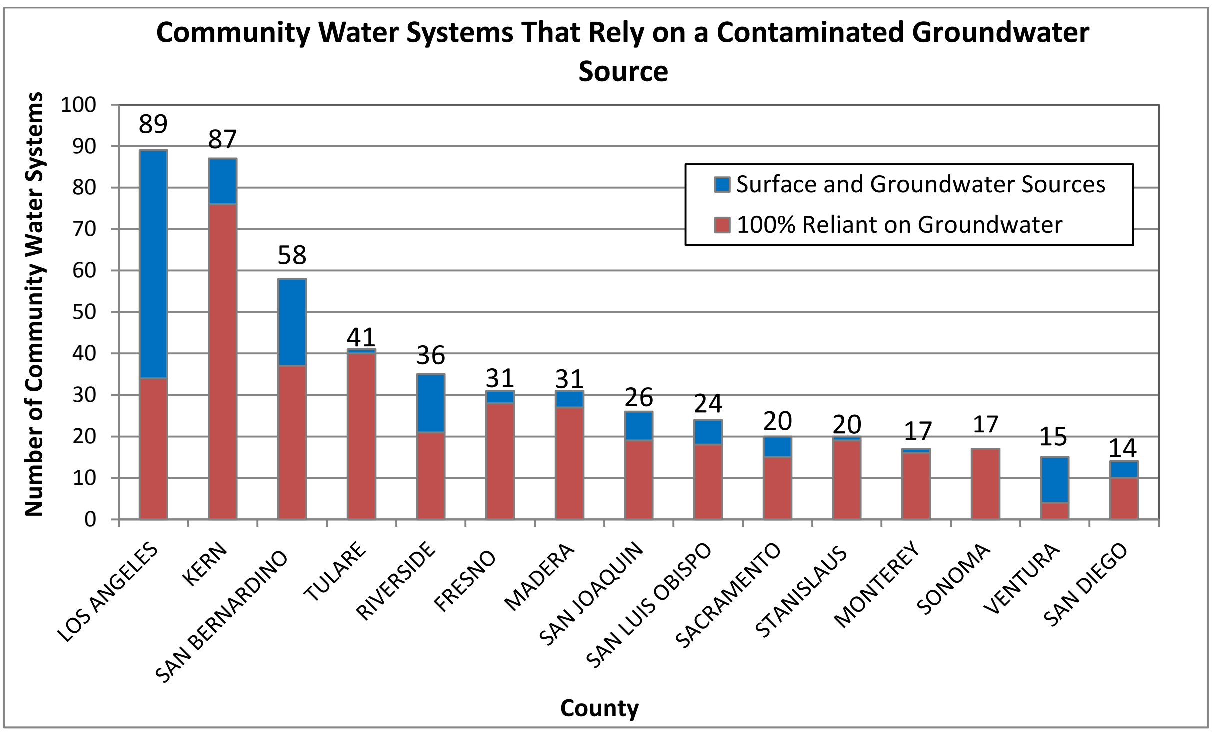


Figure 1: Top 15 Counties with the Greatest Number of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

Of the 680 community water systems that rely on a contaminated groundwater source, 507 systems (75 percent) rely entirely on groundwater. Community water systems that are entirely reliant on groundwater may be highly vulnerable to groundwater contamination, since these community water systems may not have alternative, uncontaminated sources of water. A complete list and additional information on the 680 community water systems that rely on a contaminated groundwater source can be found in Appendix 1 and Appendix 8.

It is important to note that these findings reflect raw, untreated groundwater quality and not necessarily the quality of the water that is eventually served to the public. Community water systems that rely on contaminated groundwater typically treat their well water before it is delivered and consumed. However, in some cases, when a community cannot afford treatment or alternative sources of water are not available, contaminated water is served to the public until a solution is implemented.
CDPH provided a list of community water systems that have received a drinking water quality violation (above the MCL) during the most recent compliance cycle (2002-2010). Of the 680 community water systems that rely on a contaminated groundwater source for drinking water, 265 systems have received a notice of an MCL violation from the CDPH during this period. These community water systems are identified in Appendix 4.

The locations of the 8,396 active wells used by groundwater-reliant community water systems in California are shown in Figure 2. The locations of the 1,659 wells where contaminated groundwater was detected are shown in Figure 3.

Population that Relies on a Contaminated Groundwater Source for Drinking Water

CDPH provides estimates for the population served by each community water system in the state. These population estimates were compiled to understand better the number of people that rely on a contaminated groundwater source (see Appendix 1, Tables 1.3 and 1.4). In total, the 680 community water systems that rely on a contaminated groundwater source serve nearly 21 million people. As discussed previously, the phrase "communities that rely on a contaminated groundwater source for drinking water" is referring to community public water systems that draw water from one or more contaminated groundwater wells prior to any treatment or blending. Most water suppliers are able to treat the contaminated water source or to blend it with cleaner sources of drinking water before distributing it to the public.

Twenty-five percent of the 680 community water systems use surface water in addition to groundwater for their drinking water supply and may be more able to mix water sources to dilute the level of contaminants to a level below the MCL or rely on alternative water supplies when groundwater is contaminated. The community water systems that do not use surface water and are 100 percent reliant on contaminated groundwater serve an estimated 4.1 million people. Many of the community water systems that are 100 percent reliant on groundwater are located in rural areas of the state (see Appendix 1).

In terms of population, many more people are served by community water systems using mixed sources (groundwater and surface water) than those that only use groundwater for drinking. For example, there are 89 community water systems in Los Angeles County that serve approximately 8.4 million people. However, only 11 percent of that population is solely reliant on a contaminated groundwater source. In contrast, Tulare County has 41 community water systems that rely on contaminated groundwater source that serve approximately 205,000 people. Sole reliance on groundwater for these communities stands at 99 percent.

Rural community water systems often tend to be small (serving less than 3,300 people), and the vast majority are 100 percent reliant on a contaminated groundwater source for drinking water. Small rural community water systems, especially those that are low income and experience greater difficulty in obtaining funding solutions, tend to have more physically vulnerable infrastructure and may experience a persistent contamination problem. Larger community water systems may be better able to afford treatment or alternative supply solutions.

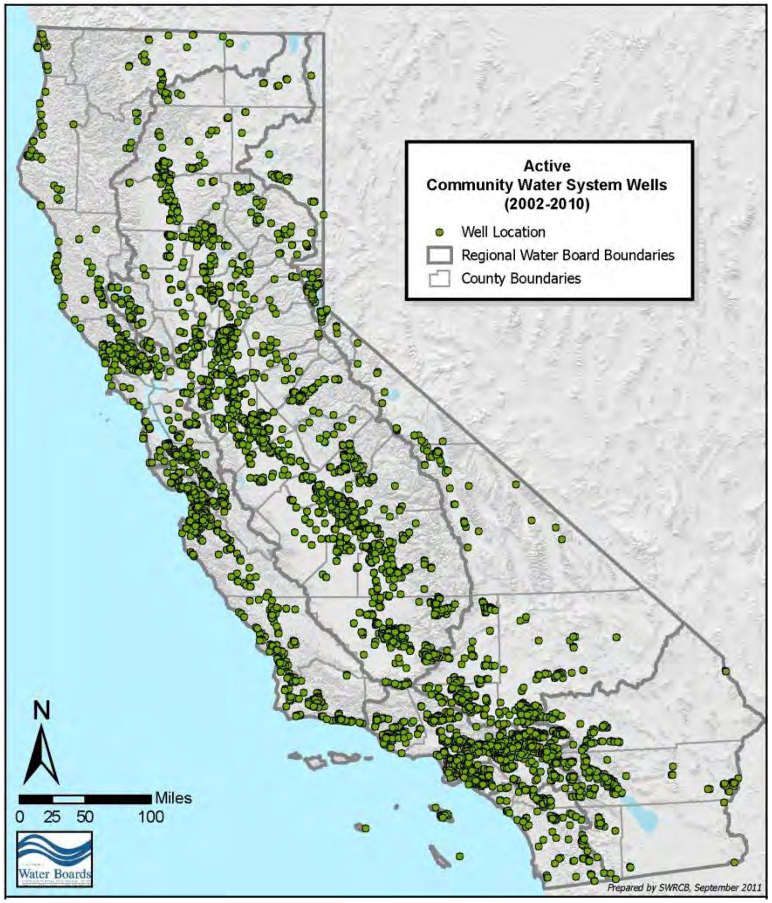


Figure 2: Active Community Water System Wells Sampled Two or More Times between 2002 and 2010 (8,396 Wells / 2,584 Community Water Systems)

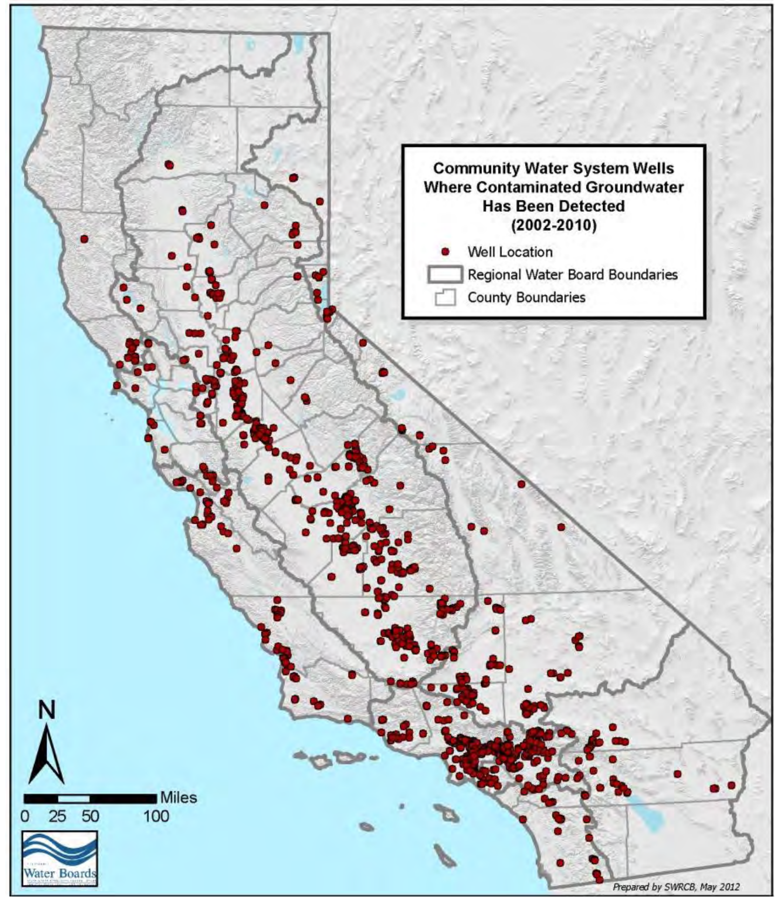


Figure 3: Active Community Water System Wells Where Contaminated Groundwater Has Been Detected Above an MCL Two or More Times between 2002 and 2010 (1,659 Wells / 680 Community Water Systems)

Principal Contaminants

Thirty-one principal contaminants were identified in the community water systems that rely on a contaminated groundwater source (see Figure 4).

The ten most frequently detected principal contaminants (summarized in Table 1) were found in over 90 percent of the active contaminated groundwater sources (wells) identified in this report. Both naturally occurring and anthropogenic principal contaminants were identified (see Figure 4). Approximately 70 percent of the wells were characterized by only one detected principal contaminant.

Information on contaminant levels, the number of detections above the MCL, the date of the most recent detection above the MCL, maximum concentrations, average concentrations, and maps displaying the distribution of principal contaminants, are provided in Appendix 2.

Some principal contaminants were more frequently detected within certain regions of the state, while other principal contaminants were found statewide. Maps showing the distribution of principal contaminants in community water systems are provided in Appendix 2. The number of community water systems where a principal contaminant was detected is shown in Figure 5.

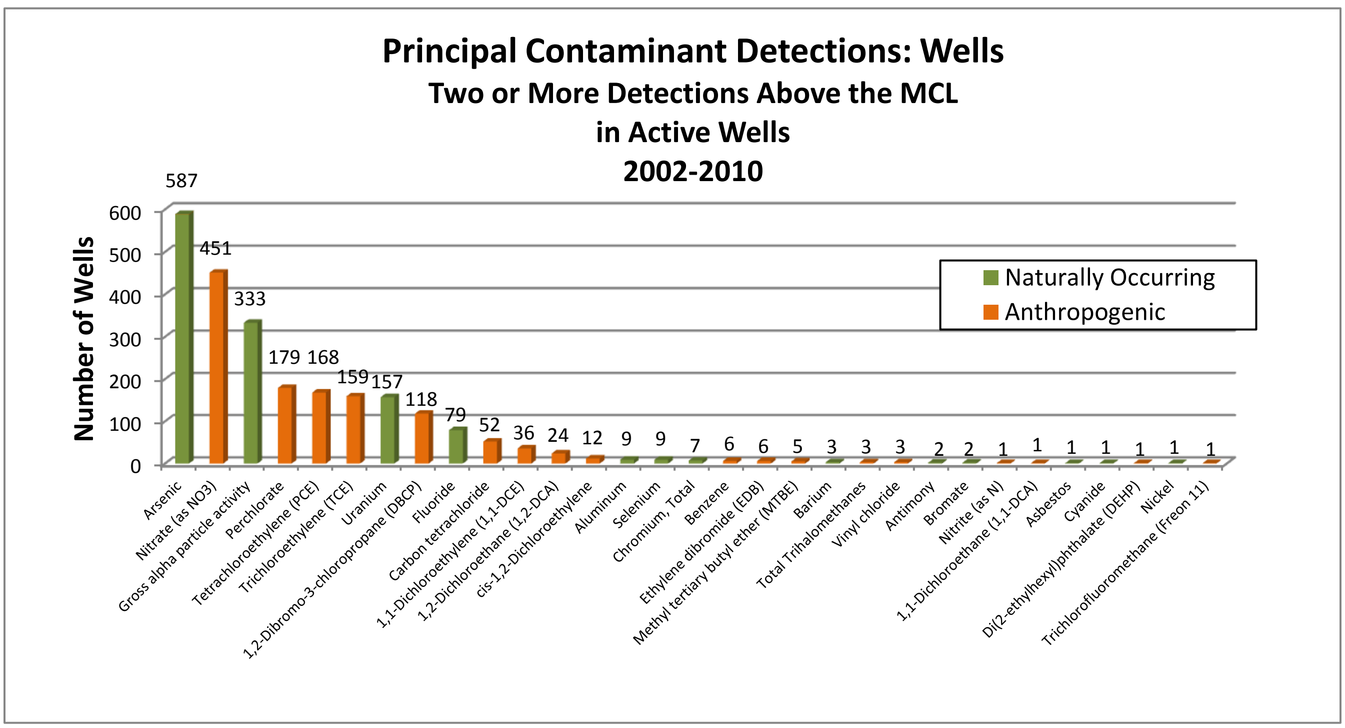


Figure 4: Principal Contaminant Detections in Active Community Water System Wells

Table 1: Ten Most Frequently Detected Principal Contaminants			
Principal Contaminant	**Number of Wells**	**Number of Community Water systems**	**Type of Contaminant**
Arsenic	587	287	Naturally occurring
Nitrate	451	205	Anthropogenic nutrient[1]
Gross alpha activity	333	182	Naturally occurring
Perchlorate	179	57	Industrial/military use[1]
Tetrachloroethylene (PCE)	168	60	Solvent
Trichloroethylene (TCE)	159	44	Solvent
Uranium	157	89	Naturally occurring
1,2-dibromo-3-chlropropane (DBCP)	118	36	Legacy pesticide
Fluoride	79	41	Naturally occurring
Carbon tetrachloride	52	17	Solvent

Notes:

1. Also can be naturally occurring, but typically at levels below maximum contaminant level

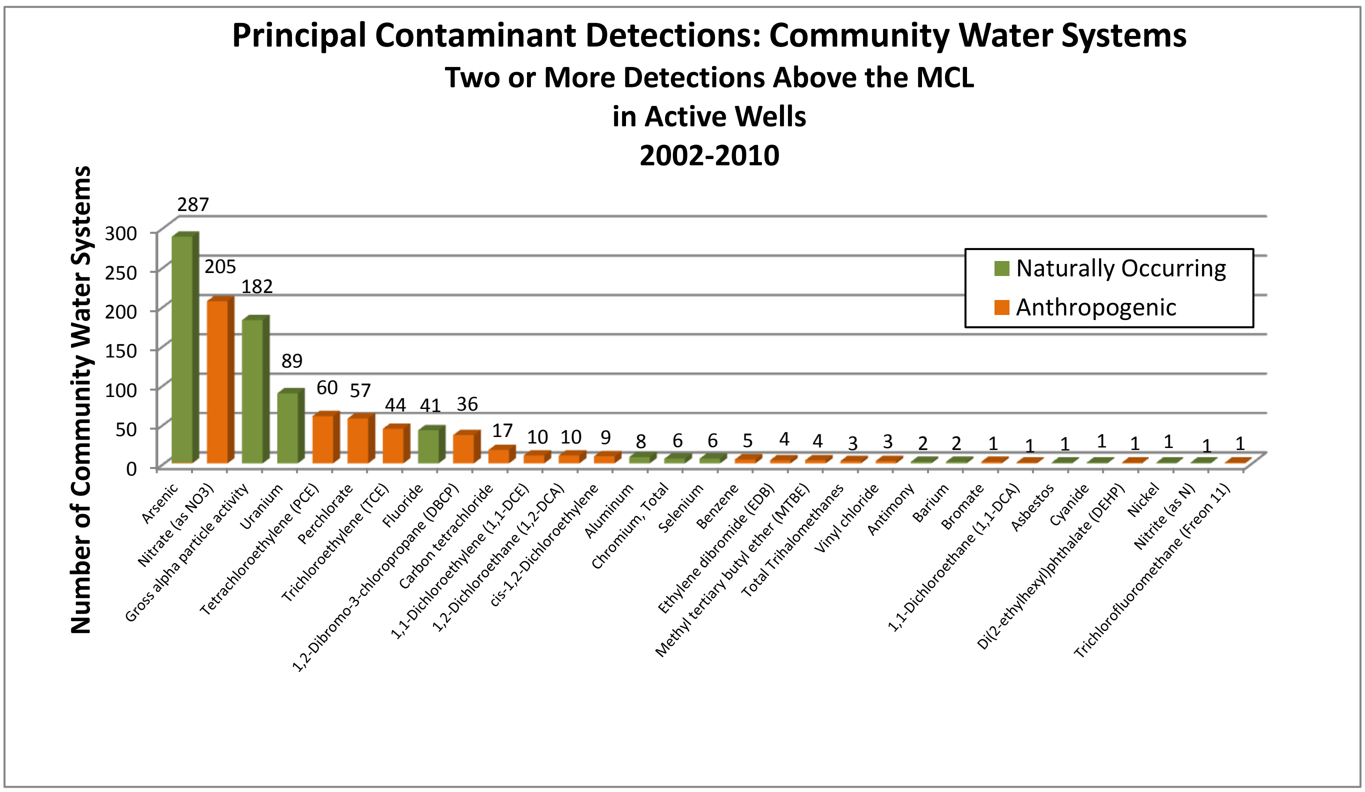


Figure 5: Principal Contaminants in Community Water Systems that Rely on a Contaminated Groundwater Source

Constituents of Concern

This report has identified nine constituents of concern (COCs): Hexavalent Chromium (Cr-6), 1,2,3-Trichloropropane (1,2,3-TCP), Boron, Manganese, Vanadium, 1, 4-Dioxane, N-Nitroso-dimethylamine (NDMA), Lead, and Tertiary butyl alcohol (TBA). The COCs are summarized in Table 3.1, Appendix 3. Cr-6 was also evaluated as an emerging COC, even though it does not have a Notification Level. Cr-6 is a widely detected groundwater contaminant with both anthropogenic and natural sources. A total of 1,378 active wells, in 314 community water systems, had two or more detections of Cr-6 above the 1 microgram per liter (µg/L) CDPH detection limit for the purposes of reporting or DLR. 1,2,3-TCP, which has many industrial and pesticide uses, including as a paint and varnish remover, cleaning and degreasing agent, and a cleaning and maintenance solvent, was the most frequently detected. Both Cr-6 and 1,2,3-TCP have Public Health Goals established by the Office of Environmental Health Hazard Assessment, which is the first step in the establishment of an eventual MCL. Appendix 3 includes additional information on the COCs identified by this report.

Regional Patterns

Regional groundwater patterns may be inferred from the drinking water quality data used in this report. These patterns are based on the available data from community water systems and may not be representative of groundwater quality conditions in certain areas.

In general, naturally occurring contaminants are detected statewide, while anthropogenic contaminants tend to be detected in particular regions of the state. For example, arsenic (naturally occurring) is detected in a wide distribution of community water system wells across the state (see Figure 2.7, Appendix 2). In contrast, nitrate at concentrations above the MCL is considered anthropogenic and is predominantly detected above the MCL in areas of the state with current or historical agricultural activity, including the southern San Joaquin Valley, the Salinas Valley, and in the Southern California Inland Empire (see Figure 2.8, Appendix 2). Volatile organic compounds such as tetrachloroethylene (PCE) and trichloroethylene (TCE) are also anthropogenic, and are largely detected in the Southern California Inland Empire area. A more detailed description of regional trends for the ten most frequently detected principal contaminants is included in Appendix 2. Maps showing the distribution of each of the 31 principal contaminants are also included in Appendix 2.

Potential Solutions to Ensure the Provision of Safe Drinking Water from Groundwater

Although groundwater sources can be contaminated, communities typically use a variety of methods to ensure that they deliver safe drinking water. Solutions to address groundwater contamination affecting drinking water supplies fall in to three broad categories:

- Pollution prevention or source protection,
- Cleanup contaminated groundwater, or
- Provide safe drinking water through treatment or alternative supplies.

These potential solutions are outlined in Table 2 and are discussed in detail in Appendix 5. In general, costs and funding are the primary challenge for each of the identified solutions.

Source protection and pollution prevention are the most effective ways of ensuring a continued supply of safe drinking water. In addition, removal of contaminants from groundwater is important from both a public health and an environmental health perspective. Groundwater cleanups can allow continued use of existing groundwater supplies. However, pollution prevention and cleanups are not always appropriate (e.g., for naturally occurring contaminants), or may not be feasible. Consequently, any practical solution to groundwater contamination must also focus on strategies to provide safe drinking water to consumers through treatment and alternative water supplies. The most common types of solutions associated with providing safe drinking water include:

- Regional consolidation with nearby larger public water systems
- Alternative Sources or Supplies
- Short Term Mitigation Measures (e.g. Bottled Water)
- New Well(s)
- Treatment

When contamination is detected in private domestic wells or other water systems not regulated by the state, cleanup options are limited. Groundwater cleanup efforts are costly and many private domestic well owners may not be able to afford a remediation system. Treatment systems, including point-of-use/point-of-entry (POU/POE), are typically the most cost-effective method of addressing groundwater contamination for small systems and private well owners. Regional consolidation with nearby larger public water systems may be an option for some smaller systems relying on contaminated groundwater source.

Table 2: Cleanup, Treat, or Provide Alternative Sources of Water Supply - Potential Obstacles and Options to Address Obstacles			
Goal	**Related Activities for Achieving Goal**	**Potential Obstacles**	**Options to Address Obstacles**
Provide Safe Drinking Water	Consolidation Self-supply New well Treatment Surface water	Costs Fund availability Location/environment, and availability of clean alternative groundwater or surface supplies Planning and infrastructure support may not be available Multiple contaminants in a well may affect treatment options	Highlight benefits of consolidation, provide seed money for consolidation efforts Make public funds available for meeting other existing public funding criteria Increase available funding
Groundwater Cleanup	Groundwater cleanup programs (USTCF, others)	Scale Cost Fund availability Naturally-occurring contaminants	Support programs that help clean up known groundwater contamination Support efforts to identify sources of groundwater contamination Focus on methods to provide clean drinking water
Pollution Prevention	Continue and support existing programs; Regulatory oversight Monitoring	Naturally-occurring contaminants Prevention too late	Continue to develop and strengthen existing regulatory efforts Expand regulation of emerging pollution sources For identified community water systems, focus on methods to provide clean drinking water

Potential Funding Sources to Clean Up or Treat Groundwater, or to Provide Alternative Water Supplies, to Ensure the Provision of Safe Drinking Water

The need to address water quality issues exceeds the available public funding options. The United States Environmental Protection Agency (USEPA) estimated that over the next 20 years, California will need to spend approximately $40 billion on infrastructure improvements to ensure the delivery of safe drinking water (USEPA Needs Analysis, 2007,http://water.epa.gov/infrastructure/drinkingwater/dwns/upload/2009_03_26_needssurvey_2007_report_needssurvey_2007.pdf). The funding for the estimated $40 billion in infrastructure development and improvements may come from a number of sources, including self-financing, contributions from ratepayers and customers, local government fees, federal and state funding sources, and local loans and grants.

The State of California provides public funding to community water systems in need of financial assistance to address drinking water quality issues. Over the last ten years, three major state public funding sources were made available for public drinking water or water quality improvement projects: Proposition 50, Proposition 84, and the Safe Drinking Water State Revolving Fund (SRF) (see Table 3). Proposition 50 and Proposition 84 directed funds to the State Water Board, CDPH, and DWR. The Safe Drinking Water SRF is administered by the CDPH.

Proposition bond funding to both the State Water Board and CDPH are fully allocated beyond 2012 (see Table 3). CDPH's only public funding source beyond 2012 is the Safe Drinking Water SRF, with annual loan expenditures ranging from $150 million to $250 million. There are limited Proposition 84 bond funds available through DWR for Integrated Regional Water Management (IRWM) Projects. Proposition 84 has allocated $1 billion to DWR to use for IRWM funding; an estimated $774 million remained as of October 2011.

Of the 680 community water systems that are identified as relying on a contaminated groundwater source, 514 have at least applied for funding to address their water quality concerns. Information on which systems have actually received funding is not available. A list of the 680 community water systems and the funding sources to which they have applied is provided in Appendix 6.

CDPH provided a list of community water systems that have received a drinking water quality violation (above the MCL) during the most recent compliance cycle (2002-2010). Of the 680 community water systems that rely on a contaminated groundwater source, 265 systems have received a notice of an MCL violation during this period. According to the funding data, 42 of these 265 systems were <u>not</u> seeking funding as of October 2011 (see Appendix 6) to address their drinking water issues. These systems may lack the institutional knowledge and guidance required to apply for and receive funding, and may require additional assistance in meeting funding criteria developed by administering agencies in order to ensure that safe drinking water is provided to the public with outlined mitigation measures in place.

As of October 2011, there was no public funding available for private domestic well owners or other groundwater systems not regulated by the state. The needs of these systems cannot be assessed until data are available. The lack of data is a significant gap in terms of evaluating raw groundwater quality and in identifying areas with drinking water quality issues.

Table 3: Public Funding Sources That May Be Used to Address Drinking Water Quality Issues, 2002-2012[1]

Funding Source	Type of Project	Total Funding[2] and Status[3]
Proposition 50 (CDPH)	Community water systems; Small systems: monitoring, treatment, infrastructure; Grants for treatment and contaminant removal; Grants for water quality monitoring; Source water protection; Colorado River Use Reduction; Contaminant treatment; UV/Ozone Maximum Contaminant Level (MCL) Violation	$508,000,000 Status: Fully Allocated
State Revolving Fund (CDPH)	Water treatment facilities; other infrastructure; planning; consolidation	$150,000,000[4]
Proposition 50 (DWR)	Integrated Regional Water Management Planning and Implementation	$250,000,000 Status: Fully Allocated
Proposition 50 (State Water Board)	Pollution prevention, reclamation, water quality improvement, blending and exchange projects; source protection; restore/protect surface and groundwater; Integrated Regional Water Management Planning and Implementation	$450,000,000 Status: Fully Allocated
American Reinvestment and Recovery Act (ARRA)	For deposit into State Revolving Fund	$160,000,000 Status: Fully Allocated
Proposition 84 (CDPH)	Emergency Clean Water Grants; Small community infrastructure and nitrate; Grants to reduce or prevent contamination of groundwater that serves as a source of drinking water	$250,000,000 Status: Fully Allocated
Proposition 84 (DWR)	Integrated Regional Water Management Planning and Implementation	$1,000,000,000 Status: <$774,000,000 available[5]

Notes:

1. Funding amounts included in this table based on information available October 2011.
2. Total available funds based upon amounts allocated as found within the California Water Code and original Proposition language, except where noted otherwise.
3. "Status" refers to the estimated amount of funds remaining in each respective funding source.
4. State Revolving Fund (SRF) funding varies annually, based upon allocation from federal government, previous year expenditures, loan and interest repayment, and state matching funds. The value shown here is an approximation based upon previous SRF expenditures and CDPH 2011-2012, Intended Use Plan (CDPH, 2011).
5. As of October 2011. DWR Integrated Regional Water Management (IRWM) funding is ongoing; this number will likely change.

CONCLUSIONS

- Although 98 percent of Californians receive safe drinking water, contamination of groundwater occurs in community water systems across California.
- Community water systems face potential health risks and financial burdens from a contaminated groundwater source used for drinking.
- Additional data are needed to address water quality issues for private domestic well users and water systems not regulated by the state (i.e., local and state small systems with fewer than 15 connections). Water quality data from these sources either do not exist or are not easily available in a centralized database.
- Pollution prevention and cleanup are necessary to protect groundwater resources. However, groundwater cleanup may not always be feasible.
- Providing alternative water supplies or treatment may be the most feasible solution in areas of groundwater contamination.
- Public funding sources to address groundwater supply and contamination issues are limited.

APPENDIX 1 – COMMUNITY WATER SYSTEMS THAT RELY ON A CONTAMINATED GROUNDWATER SOURCE FOR DRINKING WATER

APPENDIX 1: COMMUNITY WATER SYSTEMS THAT RELY ON A CONTAMINATED GROUNDWATER SOURCE

1.1 Data Used

This report used public water quality data and information available in the California Department of Public Health (CDPH) Division of Drinking Water and Environmental Management's water quality monitoring database (hereafter referred to as the CDPH database) to define community public water systems (community water systems) that rely on contaminated groundwater as a primary source of drinking water. CDPH data are available on the State Water Resources Control Board's GeoTracker Groundwater Ambient Monitoring and Assessment (GAMA) groundwater information system. It includes analytical water quality data for all drinking water sources used by a community water system.

Chemical information from the CDPH database was used to identify contaminated groundwater sources (wells) in 2,584 groundwater reliant community water systems in California. The data were filtered so that only "Active Raw" and "Active Untreated" community water system wells that were active at the time this report this report was being drafted (October 2011) and had been sampled at least twice during the most recent CDPH compliance cycle (2002-2010) were used.

- Active Raw: Groundwater sampled directly from the well
- Active Untreated: Groundwater sampled at a point between the well and a treatment system.

These two types of samples are characteristic of ambient, raw groundwater quality that is used as a source for public drinking water supplies. However, data from these two sources may not reflect the quality of water that is delivered to the public, which often undergoes treatment prior to delivery. When a community water system cannot afford treatment and alternative sources of water are not available, data from these two sources may be representative of delivered water.

Data collected from the CDPH-defined "Class C" Community Water Systems were used in this report, which is further described below. Table 1.1 summarizes the types of community water systems in California.

Table 1.1: Types of Community Water Systems in California

Water System Type	Description	Number of Systems	Data used in This Report?	Reason
Class "C" Community Water System	Serves at least 15 service connections used by yearlong residents or regularly serves at least 25 yearlong residents of the area served by the system (example: homes)	3,037	Yes	Community water systems serve the same group of people, year round, from the same water sources.
Class "N" Transient Non-Community Water System	A system that does not consistently serve the same people. (Example: rest stops, campgrounds, and gas stations).	3,077	No	Exposure to water from these sources is temporary. Any health risks associated with consuming contaminated water from these systems are generally lower than health risks associated with year-round exposure in community systems.
Class "P" Non-Transient Non-Community Water System	Systems that serve the same people, but not year-round. (Example: schools that have their own water system).	1,470	No	Non-transient non-community systems serve a similar group of people but do not serve them year round. Any health risks associated with consuming contaminated water from these systems are generally lower than health risks associated with year-round exposure in community systems.

1.2 Definitions used to Identify Communities that Rely on a Contaminated Groundwater Source for Drinking Water and Findings

AB 2222 (Caballero, Chapter 670, Statutes of 2008) included terms and phrases for which there is no statutory or regulatory definition. To develop the methods that were used to identify communities that rely on a contaminated groundwater source, the State Water Board, in consultation with CDPH, defined the following terms as described in the language of the law:

- Community
- Groundwater Reliant Communities
- Contaminated Groundwater Source
- Principal Contaminant
- Primary Source of Drinking Water
- Constituent of Concern

"Community" and "Groundwater Reliant Community"

The term "community" in this report is considered the same as the California Health and Safety Code (HSC Code § 116395) definition for community water system: a water system that serves at least 15 service connections used by yearlong residents or regularly serves at least 25 yearlong residents. Community water systems serve the same group of people, year round, from the same group of water sources.

- **Finding**: There are 3,037 community water systems in California.

For the purposes of this report, a community water system with at least one active drinking water well is considered a groundwater-reliant community, even if the percentage of the total drinking water supply that comes from that well is low. Depending on the location of a well in one system, certain neighborhoods or parts of a community may be more reliant on groundwater. Even if a community water system gets the majority of its drinking water from surface water, there may be parts of that community water system that are still 100% reliant on local groundwater wells for their drinking water needs. Furthermore, the relative dependence on a well can change based on seasonal precipitation, time of the year, or changing use patterns.

- **Finding**: There are 2,584 groundwater-reliant community water systems (with at least one drinking water well) in California.

Groundwater-reliant community water systems fall into two categories based upon the distribution of their drinking water sources. Mixed systems use both surface and groundwater for their drinking water supply, and 100-percent groundwater-reliant systems only use groundwater. It is important to distinguish between community water systems that only use groundwater and community water systems that use mixed sources, because those that only use groundwater for their drinking water supply are more vulnerable to groundwater contamination. Appendix 8 includes additional information on which community water systems are 100 percent reliant on groundwater, 50 to 99 percent reliant on groundwater (mixed surface water and groundwater), and less than 50 percent reliant on groundwater (mixed surface water and groundwater).

- **Finding**: There are 2,180 community water systems that are 100 percent groundwater reliant.

"Contaminated Groundwater Source" and "Principal Contaminant"

Contaminated groundwater source is a well in which concentrations of a principal contaminant (see below) are detected above a public drinking water standard (Primary Maximum Contaminant Level, or MCL) on two or more occasions during the most recent CDPH compliance cycle (2002-2010).

A principal contaminant is a chemical that was detected above a primary MCL on two or more occasions during the most recent CDPH compliance cycle (2002-2010). MCLs are health-based protective drinking water standards to be met by public water systems, developed by CDPH, that take into account a chemicals' health risk, detectability, treatability, and costs of treatment. (Note: The gross alpha data evaluated in this report were not adjusted with respect to uranium or radon. The MCL for gross alpha is only used as a benchmark value and does not represent a compliance level.)

The two-detection threshold (two or more detections above an MCL) was used in order to help eliminate reporting errors or other spurious data. The two detections can occur at any time within the CDPH compliance cycle (the nine-year cycle during which every community water system should have collected groundwater quality data, as defined in Health and Safety Code §64400.20).

"Communities that Rely on a Contaminated Groundwater Source"

The CDPH database was reviewed to determine the total number of community water systems that rely on a contaminated groundwater source. The total number of groundwater sources (wells) and contaminated sources were also determined using the CDPH database. This information is provided in Table 1.2, below.

- **Finding:** 680 community water systems rely on a contaminated groundwater source, out of a total of 3,037 community water systems in the state.

1.3 Summary

In summary, a community water system that relies on a contaminated groundwater source for drinking water is defined as a community water system where:

- A chemical was detected in an active raw or active untreated drinking-water well, at a concentration above a California Primary MCL, on two or more occasions (January 1, 2002 through December 31, 2010).

In addition:

- There are 680 communities (22 percent of the total number of community water systems in the state) that rely on a contaminated groundwater source for drinking water.
- There are 1,659 wells with detected principal contaminants in these communities.

These findings are summarized in Table 1.2, below. The locations of all active raw and active untreated wells are shown in Figure 1.1. The location of all wells where groundwater contamination has been detected (using the definitions as described above) are shown in Figure 1.2.

Appendix 2 provides information on which chemicals (principal contaminants) were detected. Appendix 8 lists every community water system, well, and contaminant detected above the MCL (on two or more occasions, 2002 to 2010).

Table 1.2: Summary of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

System Description	Number
Number of community water systems[1] in California, 2002-2010	3,037
Groundwater Reliant community water systems[1] with active[2] wells sampled two or more times between 2002 and 2010	2,584 out of 3,037 (8,396 wells)
Number of community water systems[1] that are 100% reliant on groundwater	2,180 out of 3,037
Community water systems [1] that rely on a contaminated groundwater source (well)	680 out of 3,037 (1,659 out of 8,396 wells)

Notes:

1. In general, drinking water from public supply wells is treated to achieve public drinking water health standards.
2. Active as of the time that this report was being drafted in October 2011

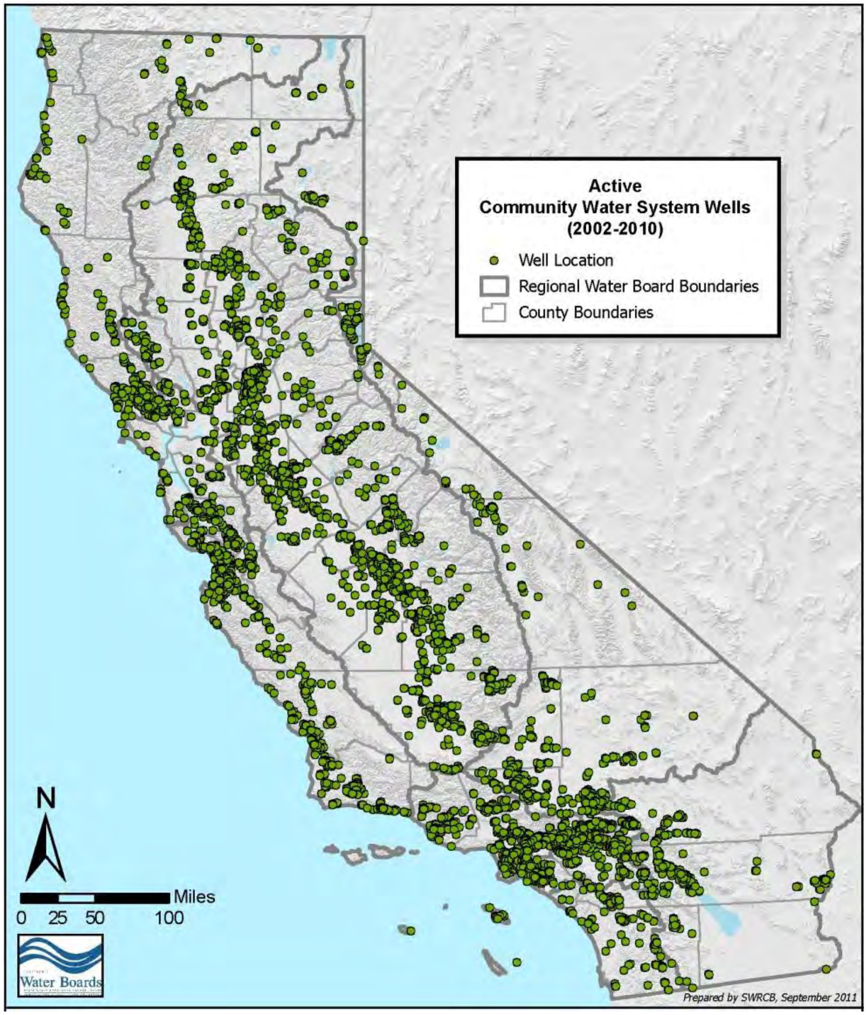


Figure 1.1: Active Community Water System Wells Sampled Two or More Times between 2002 and 2010 (8,396 Wells / 2,584 Community Water Systems)

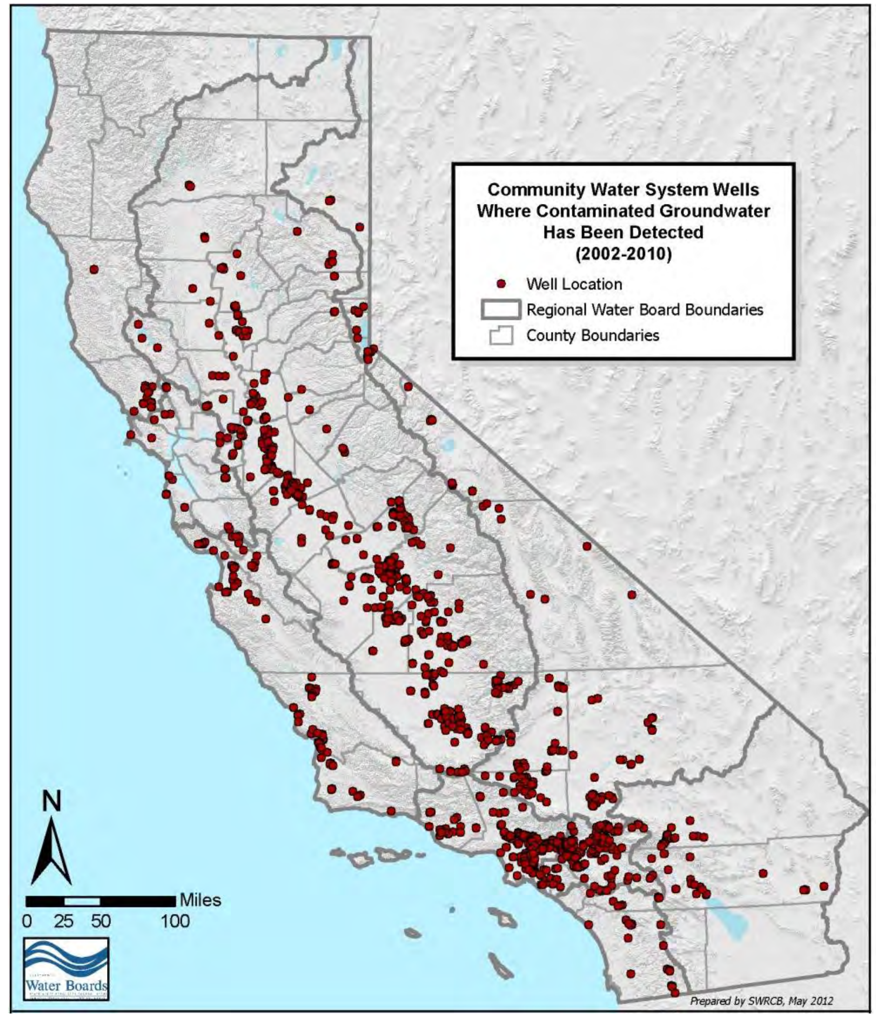


Figure 1.2: Active Community Water System Wells Where Contaminated Groundwater Has Been Detected (Two or More Detections above an MCL, 2002-2010). (1,659 Wells / 680 Community Water Systems)

1.4 Water Systems or Data Not Evaluated

The types of systems and information that are not included, as well as the rationale and limitations associated with those systems and data, are summarized below. The findings in this report do not reflect private domestic wells or other unregulated water systems since the state does not require these groundwater users to sample their wells, and consequently a comprehensive database for these groundwater sources does not exist.

State and Local Small Systems: Water quality data for State Small systems (systems that serve to less than 25 people a year and have five to 14 service connections) and Local Small systems (systems that serve to less than 25 people a year and have two to four service connections) are not included in the CDPH database. These systems are typically regulated at a local or county level; therefore, a comprehensive database for these groundwater sources does not exist.

Private Domestic Wells: Since the state does not require these groundwater users to sample their wells, a comprehensive database for these groundwater sources does not exist.

Some domestic well data is available from the State Water Board’s GAMA Domestic Well Project. These data are summarized in Appendix 2. The Department of Pesticide Regulation (DPR) conducts groundwater monitoring for a wide variety of pesticides. The DPR dataset includes test results from public supply wells, irrigation wells, and domestic wells, although the DPR data set primarily includes domestic wells in areas where pesticides are used. The DPR sampling regime often does not include general groundwater chemistry information, or data on principal contaminants other than pesticides. The DPR data is available to the public through the State Water Board’s GeoTracker GAMA website.

Non-community Systems: Transient non-community water systems do not serve the same group of people over time, such as rest stops, gas stations, and campgrounds. Another excluded system type is a non-transient non-community water system that serves a similar group of people, but does not serve them year round. An example is a school with its own water system. There are over 13,000 schools in California, the vast majority of which are connected to a community water system. However, approximately 420 schools are not connected to a community water system and rely on their own well for water supply. Drinking water quality for these 420 schools may be of local interest, especially in areas where groundwater quality is a concern. These school water systems are classified as "non-transient non-community" and therefore do not meet the definition of community water system used in this report. Although data on these school systems are not included here, information is available to the public on the internet at the GeoTracker GAMA groundwater information system or directly from CDPH.

Bacteriological Information: Bacteria and other microbes in drinking water are a health concern. CDPH requires that public water systems rigorously test for bacteria.

However, water samples for bacteria are primarily collected within the distribution system, and are not collected from raw groundwater. CDPH was unable to provide any bacteriological data for raw groundwater. The bacteriological data that is available in the CDPH database constitutes compliance-related reporting that reflects the quality of the water within the distribution system. In addition, most of the compliance-related reports are for total coliform bacteria. Total coliform bacteria are ubiquitous in nature, and naturally occur in soil and groundwater. The presence of total coliform bacteria, while indicative of possible communication between a well and the surface, does not demonstrate whether groundwater in the aquifer is contaminated with bacteria. This report evaluates the quality of raw groundwater, for which no data related to bacteriological information were available. As a result, bacteria are not included as a principal contaminant in this report.

The lack of bacteriological data is a significant data gap in terms of evaluating the quality of raw groundwater. In 2009, CDPH adopted by reference the Federal Groundwater Rule. The purpose of the Groundwater Rule is to provide increased protection against bacteria. As part of this new rule, community water systems will conduct monitoring at the source (well) that is triggered by a total coliform positive as a result of routine sampling. These data will be available as part of the CDPH database in the future.

1.5 Population that Relies on a Contaminated Groundwater Source

CDPH provides estimates for the population served by each community water system in the state. These population estimates were compiled to understand the number of people in community water systems that were identified as relying on a contaminated groundwater source (see Table 1.3). In total, the 680 community water systems that rely on a contaminated groundwater source serve nearly 21 million people.

Some of these community water systems use surface water in addition to groundwater for their drinking water supply, and are able to mix water from these sources or rely on alternative water supplies, when groundwater is contaminated. Of the 680 community water systems that rely on a contaminated groundwater source, 506 (74 percent) are 100 percent reliant on groundwater (see Figure 1.3), and 174 use both surface and groundwater (mixed) sources (see Figure 1.4). The community water systems that are 100 percent reliant on a contaminated groundwater source are estimated to serve nearly 4.1 million people. Many of the systems that are 100 percent reliant on groundwater are located in rural areas of the state (see Figures 1.3 and 1.4).

In terms of population, many more people are served by community water systems using mixed sources than those that are 100 percent groundwater reliant. For example, there are 89 community water systems in Los Angeles County that rely on a contaminated groundwater source, serving approximately 8.4 million people. However, only 900,000 use community water systems that are 100 percent reliant on groundwater (approximately 11 percent of the population). In contrast, in Tulare County 41 community water systems rely on a contaminated groundwater source, serving approximately 205,000 people. Here the community water systems that solely rely on groundwater account for 99 percent of the population. In general, rural communities tend to be more heavily reliant on groundwater and have a greater relative number of people that are 100 percent reliant on a contaminated groundwater source for drinking water.

Many of the community water systems that are entirely reliant on groundwater are small (serving less than 3,300 people) and rural. Such community water systems may be more reliant on a contaminated groundwater source than larger community water systems that are better able to afford treatment or alternative supply solutions.

Table 1.4 provides population estimates for drinking water sources in California, including community water systems, community water systems that rely on a contaminated groundwater source, and private domestic wells.

TABLE 1.3: Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water, by County and Population Served

County	Number of Community Water Systems Grouped by Population				Population Served by Community Water Systems				Community Water Systems 100% Reliant on Groundwater	Population 100% Reliant on Groundwater
	Total	Population			Total	Population				
		<3,300	3,300-9,999	≥10,000		<3,300	3,300-9,999	≥10,000		
ALAMEDA	1	0	0	1	54,496	0	0	54,496	0	0
AMADOR	2	2	0	0	70	70	0	0	2	70
BUTTE	6	4	1	1	106,848	359	6,403	100,086	6	106,848
CALAVERAS	1	1	0	0	150	150	0	0	0	0
COLUSA	3	3	0	0	1,038	1,038	0	0	3	1,038
CONTRA COSTA	7	5	0	2	108,729	837	0	107,892	5	837
EL DORADO	3	2	0	1	63,104	3,104	0	60,000	3	63,104
FRESNO	31	23	2	6	657,776	8,484	15,251	634,041	28	101,085
GLENN	1	1	0	0	150	150	0	0	1	150
INYO	8	8	0	0	923	923	0	0	8	923
KERN	87	63	9	33	771,229	28,501	53,261	689,467	76	428,905
KINGS	12	8	1	3	111,177	7,464	0	103,713	12	111,177
LAKE	3	3	0	0	320	320	0	0	3	320
LASSEN	2	1	0	1	12,450	1,500	0	10,950	2	12,450
LOS ANGELES	89	20	14	55	8,469,248	18,891	104,929	8,345,428	34	911,696
MADERA	31	29	1	1	72,186	10,008	4,000	58,178	27	69,022
MARIN	2	2	0	0	106	106	0	0	1	55
MARIPOSA	2	2	0	0	865	865	0	0	2	865
MENDOCINO	1	1	0	0	1,301	1,301	0	0	1	1,301
MERCED	10	4	2	4	170,603	3,020	9,250	158,333	10	170,603
MONO	5	4	1	0	9,356	1,142	8,214	0	4	1,142
MONTEREY	17	14	0	3	248,247	4,330	6,585	237,332	16	125,755
NAPA	2	2	0	0	225	225	0	0	2	225
NEVADA	3	2	0	1	14,648	348	0	14,300	3	14,648
ORANGE	13	5	1	7	1,146,037	674	5,742	1,139,621	5	674
PLACER	2	2	0	0	170	170	0	0	1	120
PLUMAS	5	5	0	0	3,540	3,540	0	0	5	3,540
RIVERSIDE	35	17	4	14	1,584,461	14,749	24,316	1,545,396	21	283,264
SACRAMENTO	20	12	0	8	767,332	3,093	0	764,239	15	121,276
SAN BENITO	5	5	0	0	418	418	0	0	5	418

TABLE 1.3: Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water, by County and Population Served (cont.)

County	Number of Community Water Systems Grouped by Population				Population of Community Water Systems				Community Water Systems 100% Reliant on Groundwater	Population 100% Reliant on Groundwater
	Total	Population			Total	Population				
		<3,300	3,300-9,999	≥10,000		<3,300	3,300-9,999	≥10,000		
SAN BERNARDINO	58	26	8	24	1,836,570	29,045	49,558	1,757,967	37	757,204
SAN DIEGO	14	12	0	2	1,308,105	6,374	0	1,301,731	10	5,824
SAN JOAQUIN	26	19	1	6	496,733	6,015	3,640	487,078	19	152,135
SAN LUIS OBISPO	24	16	4	4	104,288	6,869	27,719	69,700	18	26,958
SAN MATEO	5	2	1	2	165,953	1,431	5,412	159,110	1	1,000
SANTA BARBARA	9	4	2	3	169,687	1,366	11,042	157,279	5	36,578
SANTA CLARA	9	7	0	2	125,242	2,446	34,600	88,196	8	37,046
SANTA CRUZ	6	2	1	3	167,348	1,495	83,849	82,004	4	13,146
SHASTA	1	0	0	1	85,703	0	0	85,703	0	0
SIERRA	1	1	0	0	225	225	0	0	1	225
SOLANO	4	2	2	0	17,588	934	16,654	0	4	17,588
SONOMA	17	13	2	2	86,242	1,635	15,525	69,082	17	86,242
STANISLAUS	20	14	3	3	338,102	2,390	18,554	317,158	19	126,102
SUTTER	7	5	1	1	21,730	4,055	7,475	10200	7	21,730
TEHAMA	3	3	0	0	1,609	1,609	0	0	3	1609
TULARE	41	34	4	3	205,246	18,208	21,322	165,716	40	203,342
TUOLUMNE	3	3	0	0	1,504	1,504	0	0	1	230
VENTURA	15	6	1	8	1,380,387	3,035	6,400	1,370,952	4	1,740
YOLO	3	2	0	1	58,063	2,063	0	56,000	3	58,063
YUBA	5	4	0	1	10,135	135	0	10,000	5	10,135
TOTALS	**680**	**425**	**66**	**189**	**20,957,663**	**206,614**	**539,701**	**20,211,348**	**507**	**4,091,572**

Notes: Population data from CDPH Permits, Inspections, Compliance, Monitoring, and Enforcement (PICME) System Information Database as reported in GeoTracker GAMA.

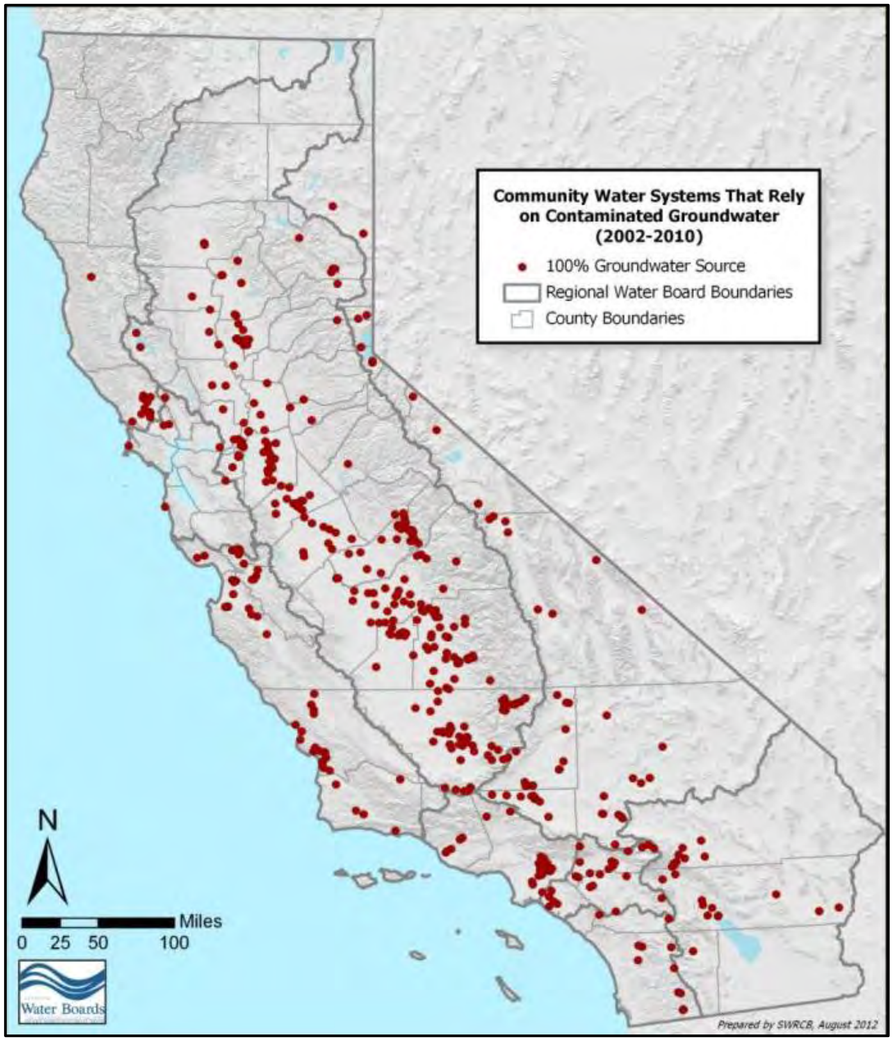


Figure 1.3: Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water: 100 Percent Reliant on Groundwater as a Primary Source of Drinking Water (506 systems) (Two or More Detections above an MCL in at Least One Active Well, 2002-2010)

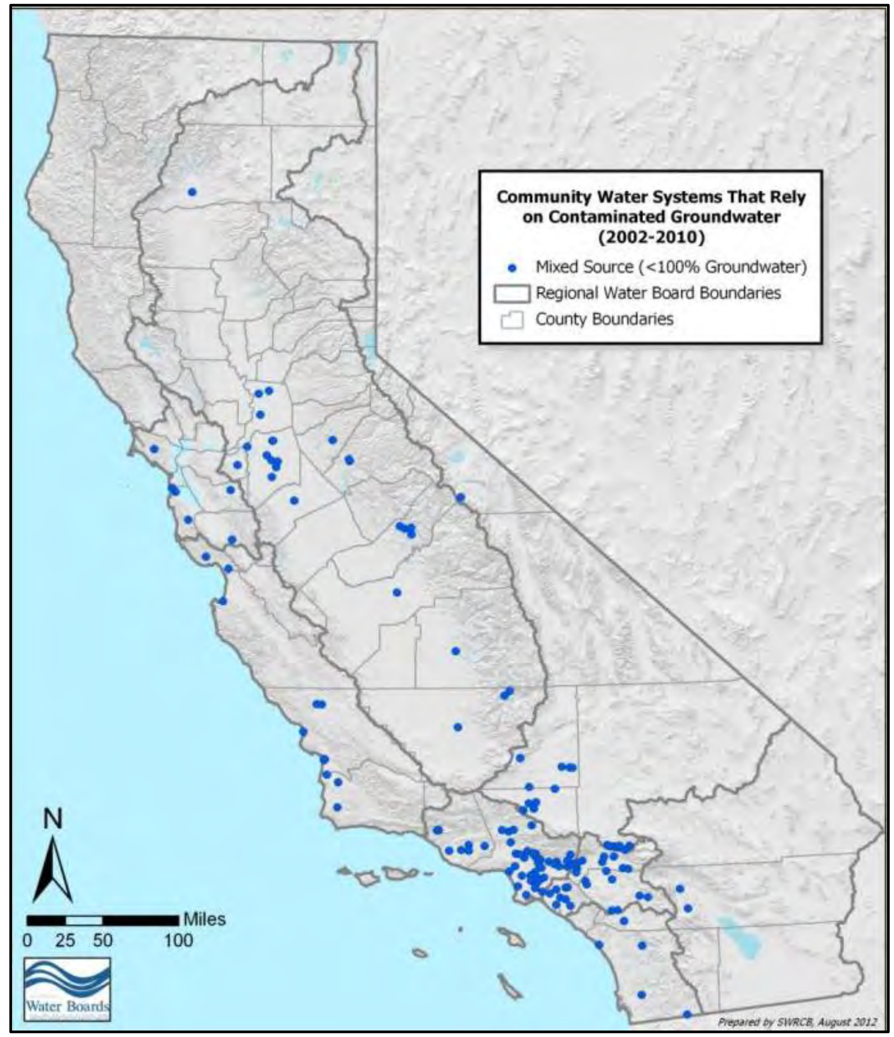


Figure 1.4: Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water: Use Surface Water for Part of Their Drinking Water (174 systems) (Two or More Detections above an MCL in at Least One Active Well, 2002-2010)

TABLE 1.4 Population Estimates for Drinking Water Systems

Category	Number of Systems or Wells	Population (Percent)
Background Statistics		
2011 Population of California	--	37,691,912[1]
Resident Population on Class "C" Community Water Systems (CWS)	--	36,000,000[2]
Population Estimates[3]		
Class "C" CWS	3,037 (100%)	40,630,685 (100% of population on CWS)[3]
Groundwater Reliant CWS[4]	2,586 (85% of total CWS)	30,386,688 (75% of population on CWS)
100% Groundwater Reliant CWS	2,180 (72% of total CWS)	6,132,797 (15% of population on CWS)
CWS that rely on a Contaminated Groundwater Source for Drinking Water	680 (22% of total CWS)	19,254,060 (47% of population on CWS)
100% Groundwater Reliant CWS that rely on a Contaminated Groundwater Source for Drinking Water	506 (17% of total CWS)	3,720,335 (9% of population on CWS)
Private Domestic Wells	200,000 to 600,000[5]	660,000 to 2 million[5]
Groundwater Systems not Regulated by CDPH (State and Local Small Systems)	Data Not Available[6]	Data Not Available[6]
CWS that Rely on a Contaminated Groundwater Source for Drinking Water that have Received an MCL Violation from CDPH, 2002-2010	265 (9% of total CWS)[7]	2,173,410 (5% of population on a CWS)[7]
CWS that Rely on a Contaminated Groundwater Source for Drinking Water that have Received an MCL Violation, 2010	116 (4% of total CWS)[7]	449,239 (1% of population on a CWS)[7]
Other Statistics		
Class "P" Non-Transient Non-Community Water Systems	1,470	372,963 (pct. NA)[8]
Class "N" Transient Non-Community Water Systems	3,077	797,188 (pct. NA)[8]

Notes:

1. 2011 estimate, US Census Bureau: http://quickfacts.census.gov/qfd/states/06000.html
2. Estimate provided by CDPH for the purposes of this report and represents permanent residents. See note 3 below.
3. Population estimates for Community Water Systems (CWS) are from CDPH PICME database. The PICME population estimates, provided to CDPH by the CWS, take in to account transient persons (i.e. visitors) within the water system boundary. Consequently, the estimate here is greater than the resident population estimate using US Census Bureau data.
4. A groundwater-reliant CWS has at least one active raw or active untreated well used for drinking water (as of Oct 2011).
5. Lower range estimate provided by CDPH, upper range based on 1990 census data for domestic wells (500,000), and adjusted based on 10% population increase per decade (growth from 2000 to 2010) http://quickfacts.census.gov/qfd/states/06000.html. Population estimates assume 3.3 persons per household.
6. The number of state small systems (5-14 service connections, or less than 25 people per year) is not available in a centralized dataset since these systems may be regulated at a county or local level.
7. Violation data provided by CDPH for the purposes of this report, available in the CDPH PICME database
8. Percentage not applicable. Class N and Class P water systems do not serve as permanent sources of drinking water – e.g., the entire population of California is served by either a CWS, by a private domestic well, or by another small, unregulated groundwater source. Class N and Class P water systems represent temporary or non-permanent sources of drinking water, the population of which overlaps with permanent drinking water sources (Class C water systems, private domestic well or other unregulated groundwater sources). Population data provided by CDPH, available in the CDPH PICME database.

1.6 Additional Information

Additional figures related to the distribution of community water systems that rely on a contaminated groundwater source for drinking water are included below. These graphs pertain to the distribution of community water systems with respect to the source of their water supply and the population of those community water systems.

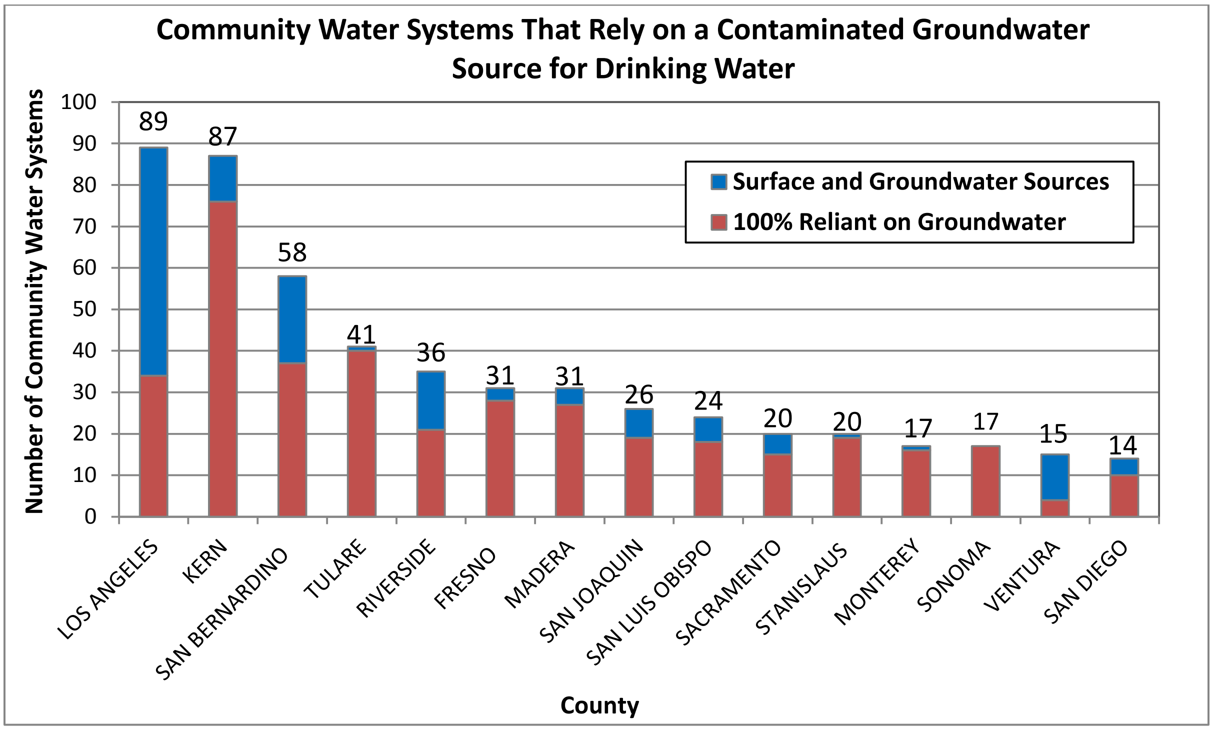


Figure 1.5: Top 15 Counties by Number of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

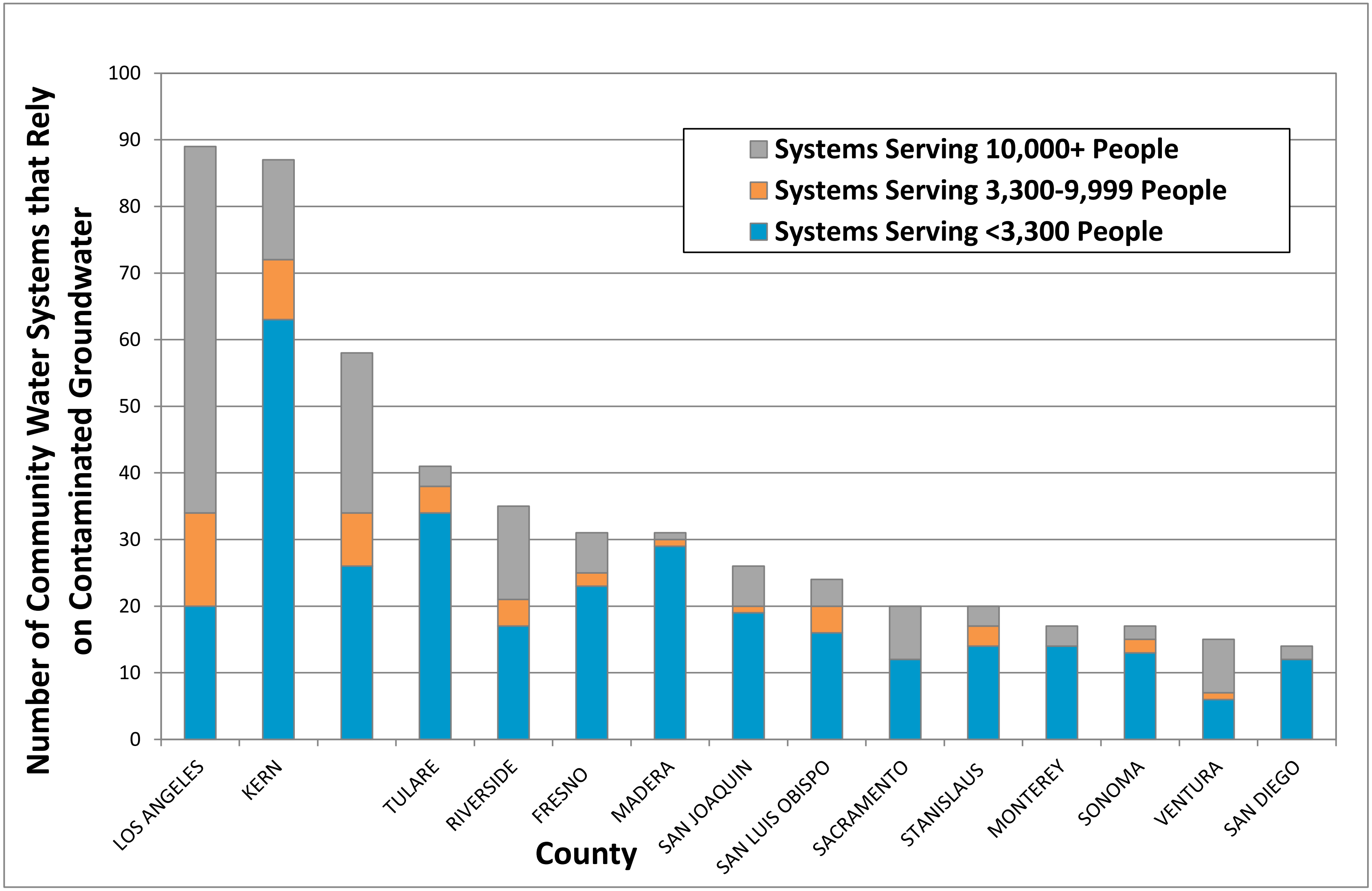


Figure 1.6: Top 15 Counties by Size and Number of Communities that Rely on a Contaminated Groundwater Source for Drinking Water

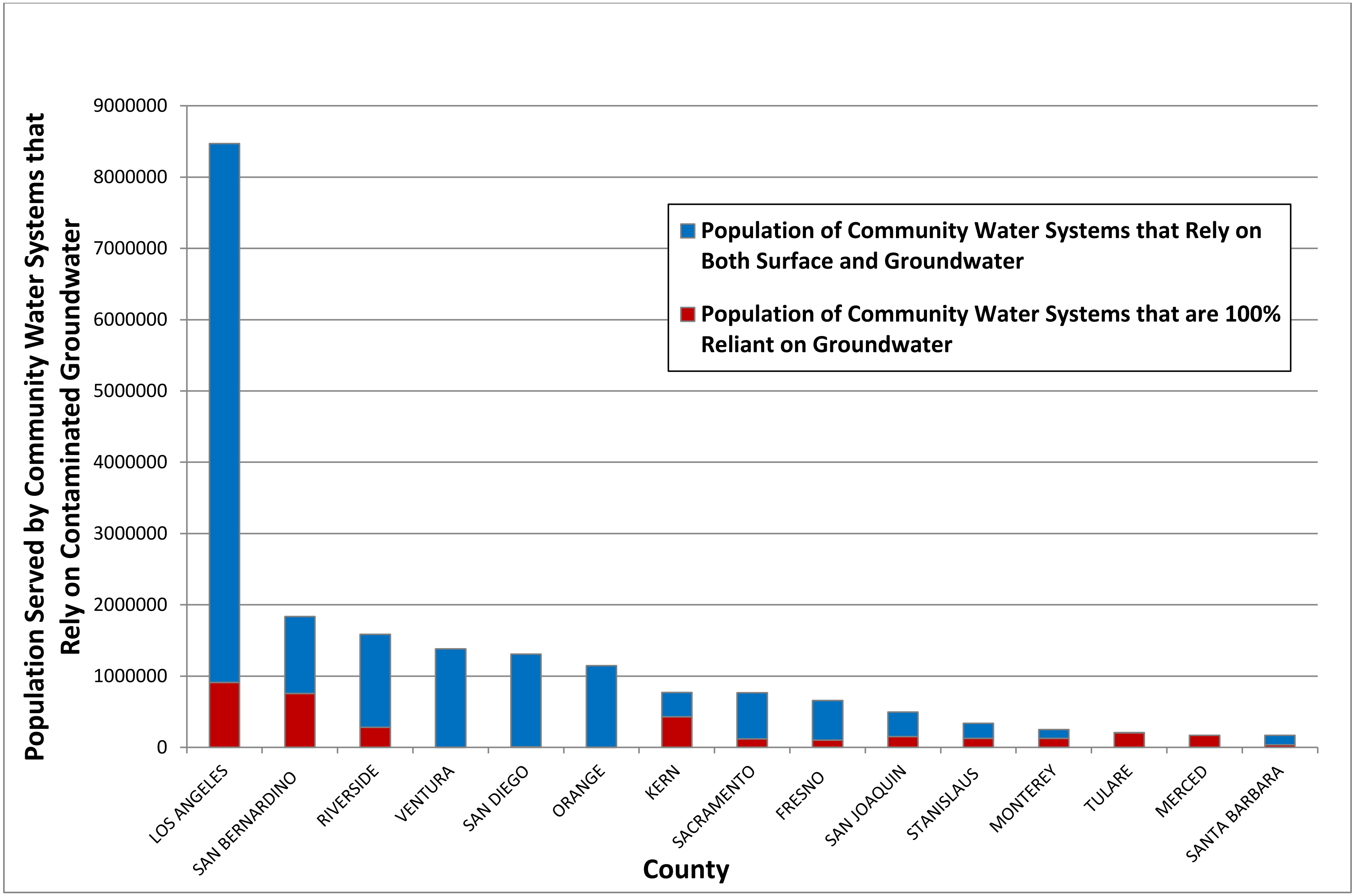


Figure 1.7: Top 15 Counties - Population Served by Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

APPENDIX 2 – PRINCIPAL CONTAMINANTS

Appendix 2: Principal Contaminants

This appendix summarizes the principal contaminants in the 680 community public water systems (community water systems) that rely on a contaminated groundwater source for drinking water. Additional information on principal contaminant levels in active community water system wells, including the number of detections above the Maximum Contaminant Level (MCL), date of most recent detection above the MCL, maximum concentration, and average concentration is included in Appendix 8 at the end of this report.

2.1 Principal Contaminants

Principal contaminants are defined as chemicals that were detected above a primary MCL, on two or more occasions, during the most recent CDPH compliance cycle (2002-2010). Thirty-one principal contaminants are identified and are listed in Table 2.2 by frequency of detection, along with the number of wells in which the contaminant was detected, and the number community water systems in which the contaminant was detected.

The ten most frequently detected principal contaminants in active community water system wells are shown in Table 2.1. A community water system well is considered active if it was being used to provide drinking water at the time that this report was being drafted in October 2011.

Table 2.1: Ten Most Frequently Detected Principal Contaminants

Principal Contaminant	Number of Wells	Number of Community Water Systems	Type of Contaminant
Arsenic	587	287	Naturally occurring
Nitrate	451	205	Anthropogenic nutrient[1]
Gross alpha activity	333	182	Naturally occurring
Perchlorate	179	57	Industrial/military use[1]
Tetrachloroethylene (PCE)	168	60	Solvent
Trichloroethylene (TCE)	159	44	Solvent
Uranium	157	89	Naturally occurring
1,2-dibromo-3-chlropropane (DBCP)	118	36	Legacy pesticide
Fluoride	79	41	Naturally occurring
Carbon tetrachloride	52	17	Solvent

Notes:
1. Also can be naturally occurring, but typically at levels below the MCL

The ten principal contaminants listed above account for over 90 percent of the total number of contaminated community water system wells identified in this report. Figures showing distribution of all 31 principal contaminants in community water systems that rely on a contaminated groundwater source for drinking water are included at the end of this appendix.

Principal contaminants were detected in 1,659 active community water system wells. Most (68 percent) of the wells detected only one principal contaminant (see Figure 2.1). Co-contaminants (more than one detected principal contaminant) were found in 32 percent of the wells. Naturally-occurring principal contaminants were detected in just over half of the wells; anthropogenic principal contaminants were detected in 42 percent of the wells (see Figure 2.2). Both naturally occurring and anthropogenic principal contaminants were detected in 6 percent of the wells. Naturally-occurring and anthropogenic contaminants are discussed in the following section.

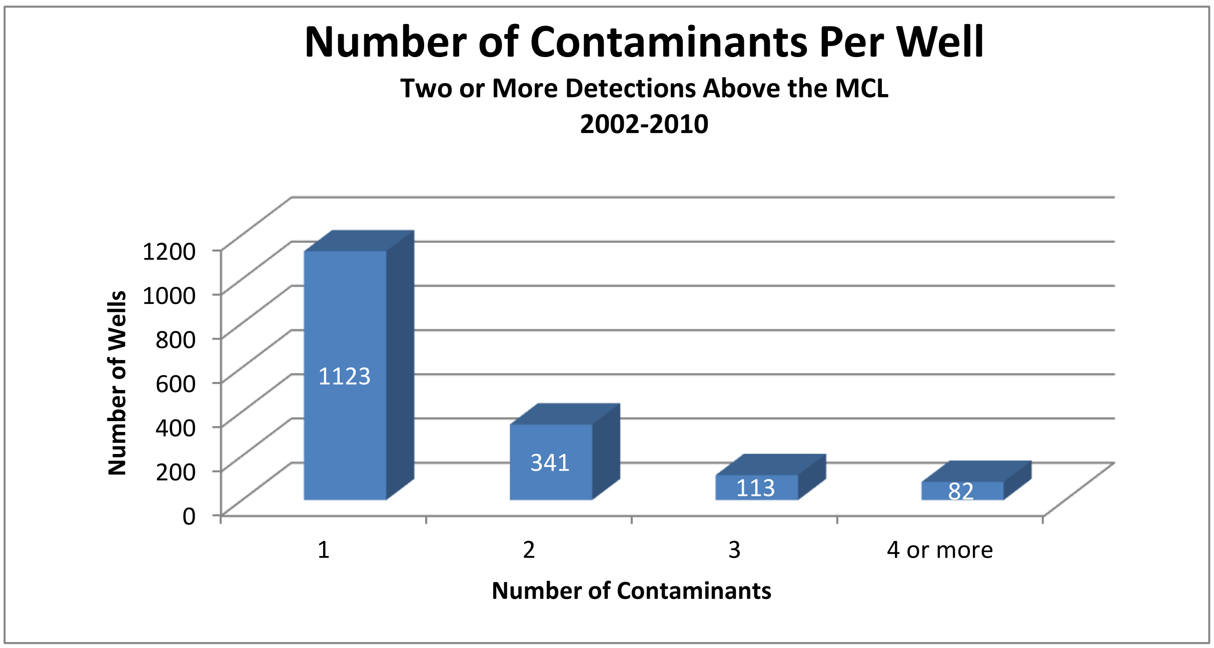


Figure 2.1: Number of Principal Contaminants Detected per Active Community Water System Well

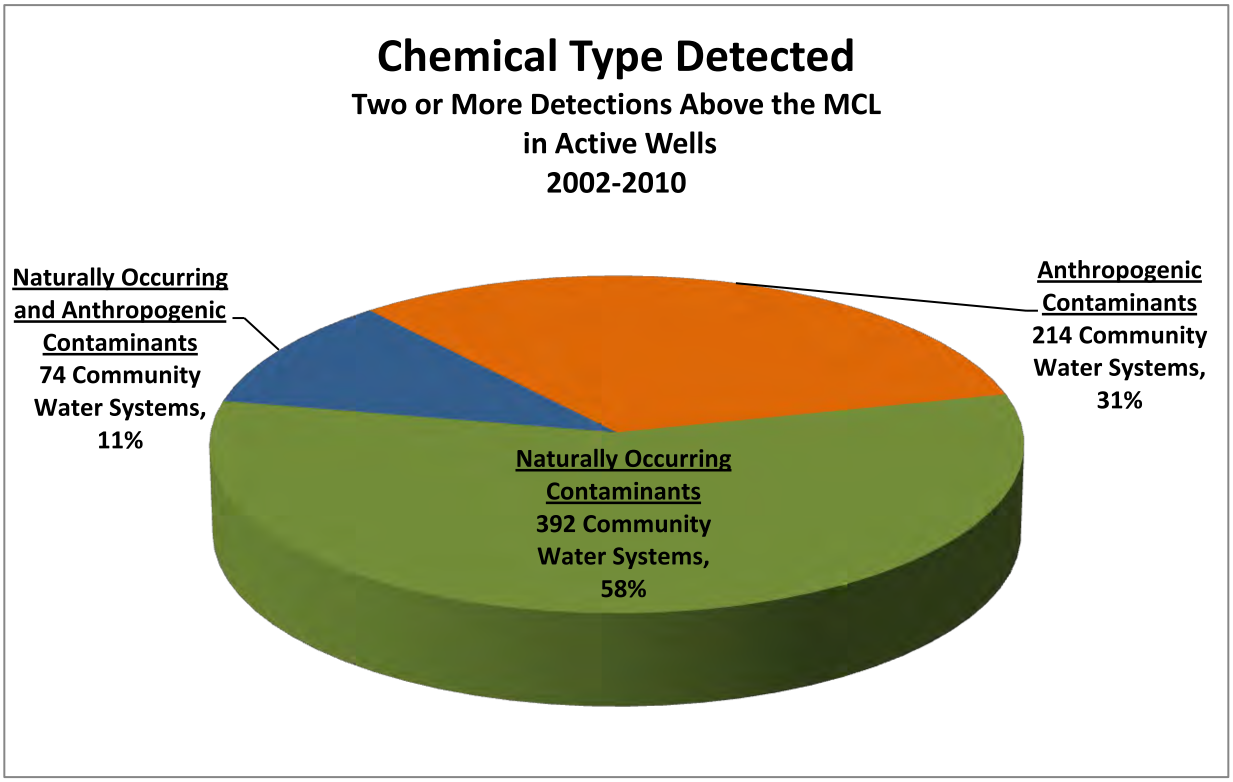


Figure 2.2: Type of Principal Contaminant Detected in Active Community Water System Wells

Table 2.2: Principal Contaminants Detected in Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

Principal Contaminant (PC)	Community Water Systems Where PC Has Been Detected[a]	Community Water System Wells With Identified PC[b]	Wells Sampled for PC[c]	% of Sampled Wells Above MCL[d]	MCL (µg/L)	Contaminant Type[e,f]
Arsenic	287	587	7,232	8.1	10	Inorganic
Nitrate (as NO_3)	205	451	8,167	5.5	45,000	Inorganic/ Nutrient
Gross alpha particle activity	182	333	7,405	4.5	15[h]	Radionuclide
Perchlorate	57	179	6,999	2.6	6	Inorganic
Tetrachloroethylene (PCE)	60	168	6,214	2.7	5	VOC[f]
Trichloroethylene (TCE)	44	159	6,217	2.6	5	VOC[f]
Uranium[g]	89	157	3,201	4.9	30[h]/20	Inorganic/ Radionuclide
1,2-Dibromo-3-chloropropane (DBCP)	36	118	4,330	2.7	0.2	VOC[f] / Legacy Pesticide
Fluoride (natural)	41	79	6,972	1.1	2,000	Inorganic
Carbon tetrachloride	17	52	6,209	0.8	0.5	VOC[f]
1,1-Dichloroethylene (1,1-DCE)	10	36	6,200	0.6	6	VOC[f]
1,2-Dichloroethane (1,2-DCA)	10	24	6,207	0.4	0.5	VOC[f]
cis-1,2-Dichloroethylene	9	12	6,199	0.2	6	VOC[f]
Aluminum	8	9	6,945	0.1	1,000	Inorganic
Selenium	6	9	6,900	0.1	50	Inorganic
Chromium, Total	6	7	6,761	0.1	50	Inorganic
Benzene	5	6	6,222	0.1	1	VOC[f]
Ethylene dibromide (EDB)	4	6	4,309	0.1	0.05	VOC[f] / Pesticide
Methyl tertiary butyl ether (MTBE)	4	5	7,108	<0.1	13	VOC[f]
Total Trihalomethanes	3	3	5,596	<0.1	80	Disinfection Byproduct
Barium	2	3	6,900	<0.1	1,000	Inorganic
Vinyl chloride	3	3	6,207	<0.1	0.5	VOC[f]
Antimony	2	2	6,882	<0.1	6	inorganic

Table 2.2: Principal Contaminants Detected in Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water (cont.)

Principal Contaminant (PC)	Community Water System Where PC Has Been Detected[a]	Community Water System Wells With Identified PC[b]	Wells Sampled for PC[c]	% of Sampled Wells >MCL[d]	MCL (μg/L)	Contaminant Type[e,f]
Bromate	1	1	9	11.1	10	Disinfection Byproduct
Nitrite (as N)	1	2	7,271	<0.1	1,000	Inorganic
1,1-Dichloroethane (1,1-DCA)	1	1	6,199	<0.1	5	VOC[f]
Asbestos	1	1	779	0.1	7	Inorganic
Cyanide	1	1	4,401	<0.1	150	VOC[f]
Di(2-ethylhexyl) phthalate (DEHP)	1	1	2,504	<0.1	4	VOC[f]
Nickel	1	1	6,906	<0.1	100	Inorganic
Trichlorofluoromethane (Freon 11)	1	1	6,208	<0.1	150	VOC[f]

Notes (gray shading indicates anthropogenic contaminant):

a. The number of community water systems in which a principal contaminant was detected, on two or more occasions, at a concentration above an MCL during the most recent CDPH compliance cycle (2002-2010).
b. Number of active community water system wells in which a principal contaminant was detected, on two or more occasions, at a concentration above an MCL during the most recent CDPH compliance cycle (2002-2010). A well is considered active if it was being used to provide drinking water to a community water system at the time that this report was being drafted (October 2011),
c. The total number of active community water system wells that were sampled two or more times for the listed principal contaminant during the most recent CDPH compliance cycle (2002-2010).
d. The percentage of active community water system wells sampled two or more times for the listed principal contaminant and have had two or more detections of a principal contaminant at a concentration above the MCL, during the most recent CDPH compliance cycle (2002-2010).
e. General category of contaminant.
f. VOC – Includes both volatile organic compounds (VOC) and semi-volatile organic compounds (SVOC).
g. Includes both California MCL and USEPA MCL data.
h. In units of pCi/L, or picocuries per liter

2.2 Types of Contaminants

There are two types of contaminants that can be detected in groundwater: naturally occurring and anthropogenic. Distinguishing between naturally occurring and anthropogenic compounds is useful in addressing groundwater cleanup and alternative water supply options. For the remainder of this report, the naturally occurring contaminants are distinguished from those that are caused by human activities.

- Naturally Occurring Contaminants: Groundwater contains chemical constituents not from human activities. The types and concentrations of these chemical constituents depend on the geologic material through which the groundwater moves.

  Some naturally occurring chemicals can occur at high concentrations due to human activities. For example, nitrate can occur naturally at low concentrations in groundwater. However, nitrate concentrations greater than approximately 15 milligrams per liter (mg/L) as NO_3 are associated with agricultural activity (fertilizer, irrigation, feedlots) or sewage.

- Anthropogenic Contaminants: Groundwater can be contaminated as a result of human activities such as municipal and industrial wastewater disposal, industrial and commercial chemical use, spills, fuel releases from aboveground and underground storage tanks, pesticide and fertilizer application, and septic tank discharges. Anthropogenic principal contaminants as identified in this report include nitrate, perchlorate, PCE, TCE, DBCP and carbon tetrachloride.

Twenty-one of the 31 principal contaminants detected in community water system wells are anthropogenic in origin. Anthropogenic and naturally occurring principal contaminants are distinguished by shading for easy identification in Table 2.2, Figure 2.3, and Figure 2.4.

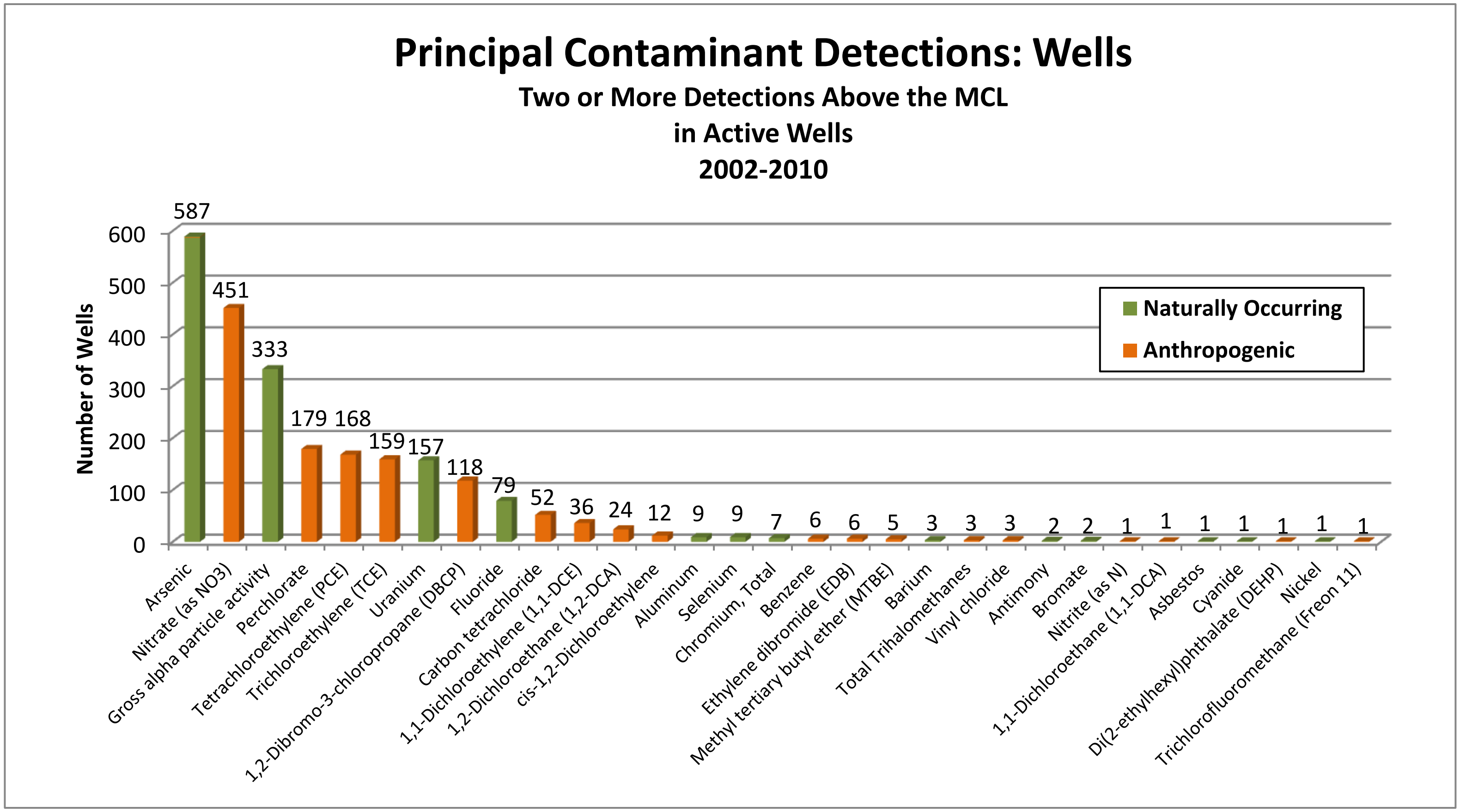


Figure 2.3: Number of Active Community Water System Wells in which a Principal Contaminant was Detected (on Two or More Occasions above the MCL, 2002-2010)

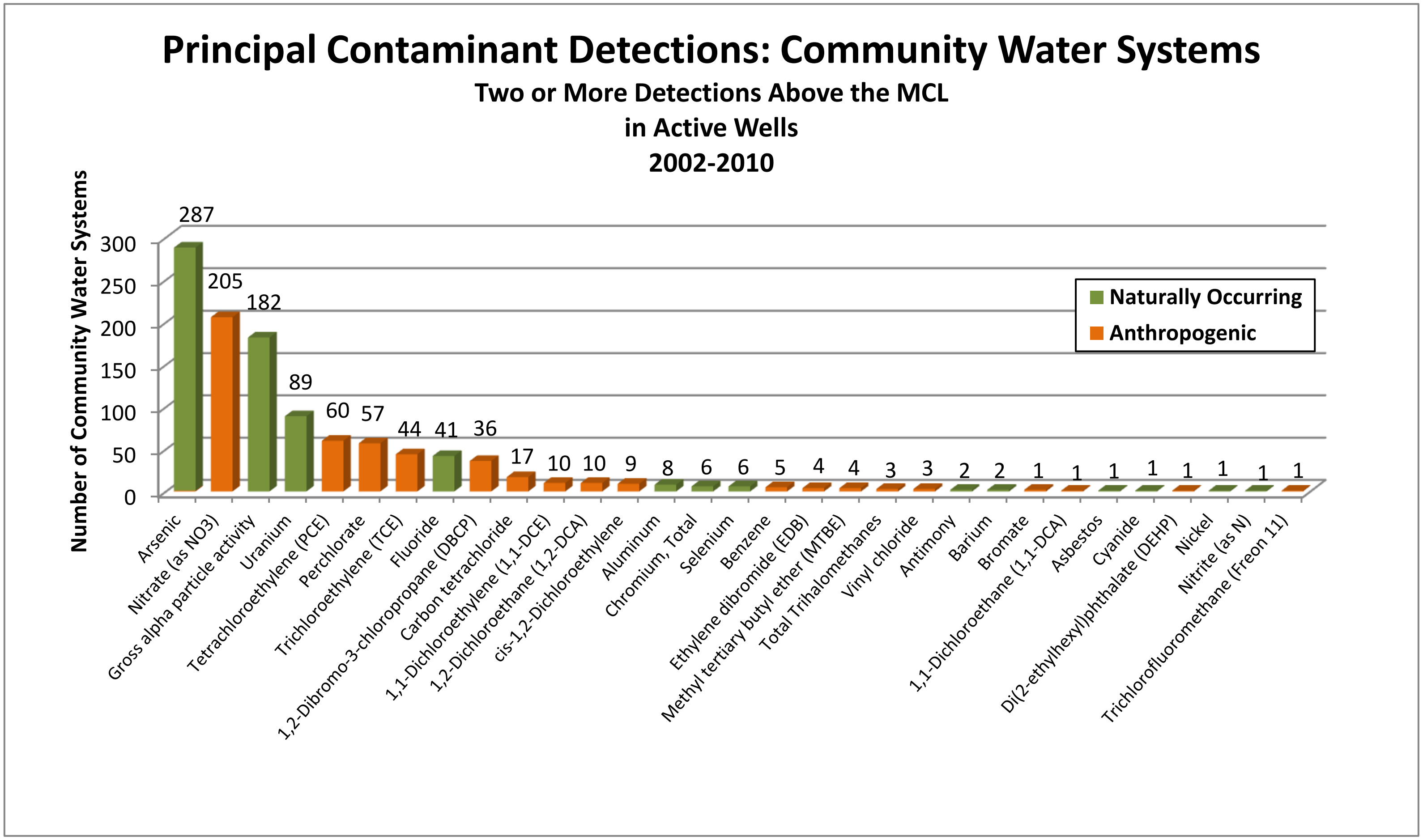


Figure 2.4: Number of Active Community Water Systems in which a Principal Contaminant was Detected (on Two or More Occasions above the MCL, 2002-2010)

2.3 Private Domestic Wells

A significant portion of California's population does not get its drinking water from public water supplies. Approximately 2 million Californians rely on groundwater from either a private domestic well or a smaller groundwater-reliant system that is not regulated by the state. Many of these well owners are unaware of the quality of their well water, since the state does not require them to test their water quality. Private domestic wells and small non-community water systems typically tap into shallow groundwater, which is more susceptible to contamination. However, the state does not regulate the quality, enforce drinking water standards, or require water quality monitoring from private domestic wells. As a result, private domestic well users may not know the quality of their drinking water, and the lack of domestic well water quality data is a significant data gap in terms of evaluating California's drinking water quality.

The State Water Board's Groundwater Ambient Monitoring and Assessment (GAMA) Domestic Well Project was developed in order to address the lack of domestic well water quality data. The Domestic Well Project samples domestic wells for commonly detected chemicals in specific county focus areas across the state. Results are used by the GAMA Program to evaluate the quality of groundwater in these county focus areas. Since 2002, the Domestic Well Project has sampled 1,067 private domestic wells in five county focus areas (Yuba, El Dorado, Tehama, Tulare, and San Diego). In addition, Monterey County was sampled in the spring of 2011; however, the data were not final at the time of this report's preparation, and as a result were not used in this study.

Results from sampled domestic wells highlight the variability of groundwater quality throughout the state (see Table 2.3). For example, Tehama and Yuba counties had few domestic wells with nitrate concentrations above the MCL (less than 1 percent and 2 percent, respectively). However, 40 percent of the domestic wells sampled in Tulare County detected nitrate above the MCL. Some counties had unique constituents of concern. In San Diego County, radionuclides were detected above the MCL in roughly 35 percent of the domestic wells sampled. In Tehama County, arsenic was detected above the MCL in 13 percent of the domestic wells sampled. In general, approximately 10 percent of the domestic wells sampled had at least one constituent above a drinking water standard. Detailed results for each of the county focus areas are included on the Domestic Well Project website at:
http://www.waterboards.ca.gov/water_issues/programs/gama/domestic_well.shtml

To date, the GAMA Domestic Well Project has sampled only a small percentage of the estimated 200,000 to 600,000 private domestic wells in the state. Groundwater contamination can affect owners of domestic wells (e.g., nitrate in Tulare County), and this contamination represents a health risk to communities that rely on private domestic wells for their drinking water. The quality of drinking water supplied by domestic wells is largely unknown in California. Continued domestic well sampling will help identify local and regional groundwater quality issues that may affect well owners.

Table 2.3: Summary of Detections Above a Drinking Water Standard GAMA Domestic Well Project – All County Focus Areas

Constituent of Concern	Drinking Water Standard	Yuba (2002) 128 Wells	El Dorado (2003-04) 398 Wells	Tehama (2005) 223 Wells	Tulare (2006) 181 Wells	San Diego (2008-09) 137 Wells	Total 1067 wells
Bacteria Indicators							
Total Coliform	Present[1]	31 (24 %)	111 (28%)	56 (25%)	60 (33%)	36 (26%)	294 (28%)
Fecal Coliform	Present[1]	4 (3%)	14 (4%)	3 (1%)	13 (7%)	NAS	34 (3%)
Major Ions & General Chemistry							
Nitrate	45 mg/L[1]	2 (2%)	7 (2%)	2 (<1%)	72 (40%)	25 (18%)	108 (10%)
Perchlorate	6 µg/L[1]	Not Tested	Not Tested	Not Tested	2 (6%)	4(3%)	6 (4%)
Chloride	500 mg/L[2]	NAS	NAS	NAS	NAS	3 (1%)	3 (<1%)
Fluoride	2 mg/L[1]	NAS	NAS	NAS	NAS	1 (<1%)	1 (<1%)
Sulfate	500 mg/L[2]	NAS	NAS	NAS	NAS	1 (<1%)	1 (<1%)
Total Dissolved Solids	1,000 mg/L[2]	2 (2%)	NAS	NAS	4 (2%)	21 (15%)	27 (3%)
Specific Conductance	1,600 µmhos/cm[2]	NAS	NAS	NAS	4 (2%)	19 (14%)	23 (2%)
Metals							
Aluminum	1,000 µg/L[1]	3 (2%)	1 (<1%)	NAS	NAS	NAS	4 (<3%)
Antimony	6 µg/L[1]	1 (1%)	2 (<1%)	NAS	NAS	NAS	3 (<1%)
Arsenic	10 µg/L[1]	7 (5%)	14 (4%)	28 (13%)	2 (1%)	3 (2%)	54 (5%)
Barium	1 mg/L[1]	NAS	NAS	NAS	NAS	1(<1%)	1 (<1%)
Beryllium	4 µg/L[1]	NAS	NAS	NAS	1 (<1%)	NAS	1 (<1%)
Boron	1 mg/L[3]	NAS	NAS	NAS	1 (<1%)	4(3%)	5 (<1%)
Cadmium	5 µg/L[1]	NAS	NAS	NAS	NAS	2 (1%)	2 (<1%)

Table 2.3: Summary of Detections Above a Drinking Water Standard GAMA Domestic Well Project – All County Focus Areas (cont.)

Constituent of Concern	Drinking Water Standard	Yuba (2002) 128 Wells	El Dorado (2003-04) 398 Wells	Tehama (2005) 223 Wells	Tulare (2006) 181 Wells	San Diego (2008-09) 137 Wells	Total 1067 wells
Metals (continued)							
Chromium	50 µg/L[1]	NAS	NAS	1 (<1%)	2 (1%)	NAS	3 (<1%)
Iron	300 µg/L[2]	21 (17%)	80 (20%)	31 (14%)	2 (1%)	21 (15%)	155 (15%)
Lead	15 µg/L[3]	2 (2%)	3 (<1%)	2 (1%)	NAS	2 (1%)	9 (1%)
Manganese	50 µg/L[2]	39 (30%)	97 (24%)	19 (9%)	2 (1%)	45 (33%)	202 (19%)
Nickel	100 µg/L[1]	1 (<1%)	1 (<1%)	NAS	3 (2%)	NAS	5 (<1%)
Thallium	2 µg/L[1]	1 (<1%)	NAS	NAS	6 (3%)	NAS	7 (1%)
Vanadium	50 µg/L[3]	NAS	NAS	NAS	14 (8%)	2 (1%)	16 (1%)
Zinc	5,000 µg/L[2]	NAS	1 (<1%)	NAS	1 (<1%)	2 (1%)	4 (<1%)
Organics (Pesticides & VOCs)							
Volatile Organic Compounds	Varies by compound	2 (2%)	2 (<1%)	NAS	9 (5%)	1 (<1%)	14 (1%)
Radionuclides							
Gross Alpha	15 pCi/L[1]	Radionuclides not routinely sampled in these Focus Areas			3 of 13 wells tested	19 of 54 wells tested	22 (33%)
Radium 226+228	5 pCi/L[1]				1 of 13 wells tested	2 of 54 wells tested	3 (4%)
Uranium	20 pCi/L[1]				1 of 13 wells tested	16 of 54 wells tested	17 (25%)

Notes: California Department of Public Health (CDPH) Public Drinking Water Standards used for comparison purposes only. Domestic well water quality in California is not regulated.

NAS = None Above Standard. No samples were detected above a drinking water standard, VOCs = volatile organic compounds, (%) indicates percentage of wells tested with concentrations above a drinking water standard

Drinking Water Standards: 1 = CDPH Primary Maximum Contaminant Level (MCL); 2 = CDPH Secondary Maximum Contaminant Level (SMCL); 3 = CDPH Notification Level (NL)

µg/L = micrograms per liter; mg/L = milligrams per liter; µmhos/cm = micromhos per centimeter; pCi/L = picocuries per liter
Coliform are evaluated on a presence/absence criteria. No range can be determined.

Refer to each individual county summary of detections table for list of detected VOCs and pesticides and corresponding drinking water standards.
http://www.waterboards.ca.gov/water_issues/programs/gama/domestic_well.shtml

2.4 Maps Showing Distribution of Principal Contaminants

The distribution of naturally occurring principal contaminants, anthropogenic principal contaminants, and all 31 identified principal contaminants, are shown on the following pages. These maps reflect the condition of the raw groundwater quality used by community water systems that rely on groundwater for their drinking water supply during the most recent CDPH compliance cycle (2002-2010). The concentrations of the identified principal contaminants may differ significantly in shallow groundwater and in portions of the drinking water aquifer where wells have been destroyed or abandoned due to contamination.

2.5 Regional Patterns

Regional patterns can be inferred from the groundwater quality data used in this report. These patterns reflect the available data, and may not be representative of groundwater quality conditions across the state, particularly in areas or in portions of an aquifer that are not sampled or used by community water systems.

Active community water system wells with two or more detections above an MCL of naturally occurring contaminants are generally detected statewide (see Figure 2.5). Anthropogenic contaminants are also detected statewide; however, most contaminated wells are located in the Southern California Inland Empire, the east side of the San Joaquin Valley, the Salinas Valley and the Santa Maria Valley (see Figure 2.6). The regional distribution of the ten most frequently detected principal contaminants is discussed below.

<u>Arsenic</u>: A total of 587 active community water system wells have had two or more detections of arsenic above the MCL (see Table 2.1). These 587 wells are located in 287 community water systems throughout the state. The highest concentration (377 µg/L) was detected in Madera County. Wells that detect arsenic at the highest concentrations (more than 5 times the MCL) are located throughout the state (see Figure 2.7). Arsenic, in general, is a naturally occurring contaminant. California changed the arsenic MCL from 50 µg/L to 10 µg/L (equivalent to 10 micrograms per liter, µg/L) in 2008. Data used in this report represent an MCL of 10 µg/L.

<u>Nitrate</u>: A total of 451 active community water system wells have had two or more detections of nitrate above the MCL (see Table 2.1). These 451 wells are located in 205 community water systems. The highest concentration (720 µg/L) was detected in San Bernardino County. Most of the wells with the highest concentrations (more than three times the MCL) are located in the southeastern San Joaquin Valley, the Southern California Inland Empire area, and Ventura County (see Figure 18). Nitrate is considered an anthropogenic contaminant when concentrations exceed its MCL (45 µg/L).

Radionuclides (Gross Alpha): A total of 333 active community water system wells have had two or more detections of radionuclides (gross alpha) above the MCL (see Table 2.1). These 333 wells are located in 182 community water systems throughout the state. The highest concentration (920 µg/L) was detected in San Diego County. Most of the wells with the highest concentrations (more than three times the MCL, used as a benchmark) are located in the southeastern San Joaquin Valley, the Southern California Inland Empire, Ventura, and San Bonito areas (see Figure 2.9). Gross alpha radionuclides are a naturally occurring contaminant. Note: The gross alpha data evaluated in this report were not adjusted with respect to uranium or radon. The MCL for gross alpha is only used as a benchmark value and does not represent a compliance level.

Perchlorate: A total of 179 active community water system wells have had two or more detections of perchlorate above the MCL (see Table 2.1). These 179 wells are located in 57 community water systems, primarily in the Southern California Inland Empire area, San Bernardino County, and Tulare County (see Figure 2.10). The highest concentration (120 µg/L) was detected in San Bernardino County. Perchlorate is an anthropogenic contaminant when concentrations exceed the MCL.

Tetrachloroethylene (PCE): A total of 168 active community water system wells have had two or more detections of PCE above the MCL (see Table 2.1). These 168 wells are located in 60 community water systems across the state. The highest concentration (1,630 µg/L) was detected in Los Angeles County. Most of the wells with the highest concentrations (more than three times the MCL) are located in the Southern California Inland Empire, Sacramento County, and Butte County (see Figure 2.11). PCE is an anthropogenic contaminant.

Trichlororethylene (TCE): A total of 159 active community water system wells have had two or more detections of TCE above the MCL (see Table 2.1). These 159 wells are located in 44 community water systems across the state. The highest concentration (1,300 µg/L) was detected in Los Angeles County. Most of the wells with the highest concentrations (more than three times the MCL) are located in the Southern California Inland Empire and Fresno County (see Figure 2.12). TCE is an anthropogenic contaminant.

Uranium: A total of 157 active community water system wells have had two or more detections of uranium above the MCL (see Table 2.1). These 157 wells are located in 89 community water systems across the state. The highest concentration (1,000 µg/L) was detected in Madera County. Most of the wells with the highest concentrations (more than three times the MCL) are located in Madera, San Bernardino, and San Diego Counties (see Figure 2.13). Uranium is a naturally-occurring contaminant.

1,2-Dibromo-3-chloropropane (DBCP): A total of 118 active community water system wells have had two or more detections of DBCP above the MCL (see Table 2.1). These 118 wells are located in 36 community water systems across the state. The highest concentration (3.3 μg/L) was detected in Fresno County. Most of the wells with the highest concentrations (more than three times the MCL) are located in Fresno, San Joaquin, San Bernardino, and Stanislaus Counties (see Figure 2.14). DBCP is an anthropogenic contaminant.

Fluoride (natural): A total of 79 active community water system wells have had two or more detections of fluoride above the MCL (see Table 2.1). These 79 wells are located in 41 community water systems across the state. The highest concentration (29 μg/L) was detected in Kern County. Most of the wells with the highest concentrations (more than three times the MCL) are located in southern California, specifically in San Bernardino, Kern, and Riverside Counties (see Figure 2.15). Fluoride is a naturally-occurring contaminant.

Carbon Tetrachloride: A total of 52 active community water system wells have had two or more detections of carbon tetrachloride above the MCL (see Table 2.1). These 52 wells are located in 17 community water systems across the state. The highest concentration (27 μg/L) was detected in Madera County. Most of the wells with the highest concentrations (more than three times the MCL) are located in Los Angeles County (see Figure 2.16). Carbon tetrachloride is an anthropogenic contaminant.

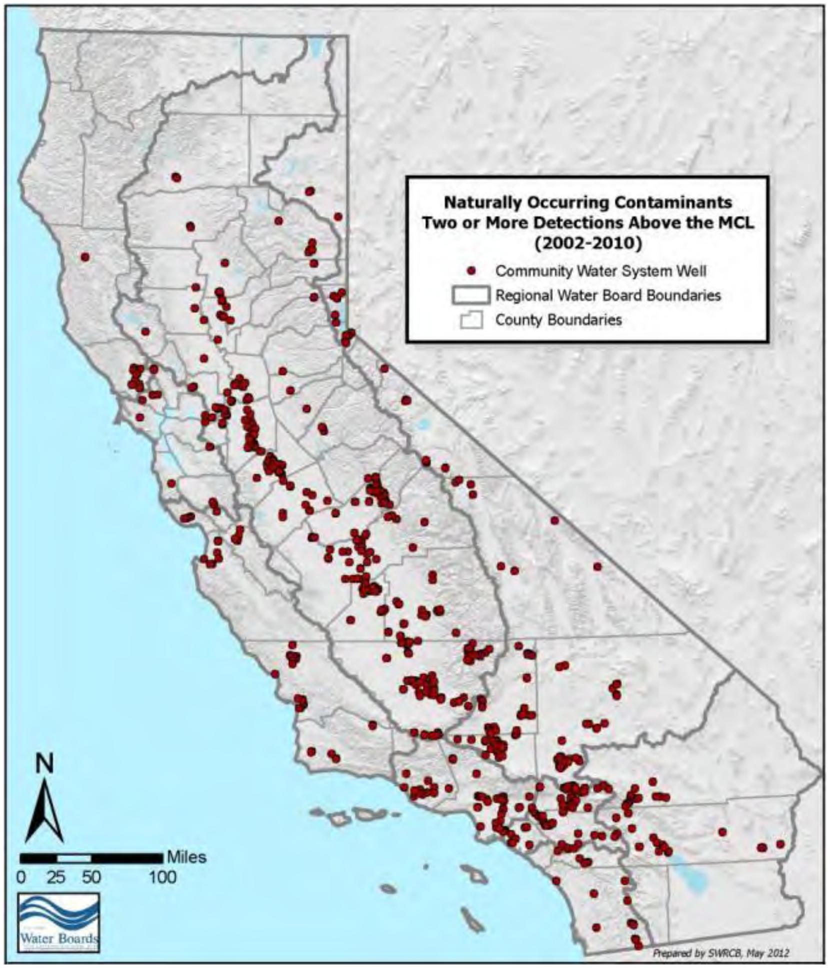


Figure 2.5: Naturally Occurring Principal Contaminants in Active Community Water System Wells (Two or More Detections above the MCL 2002-2010)

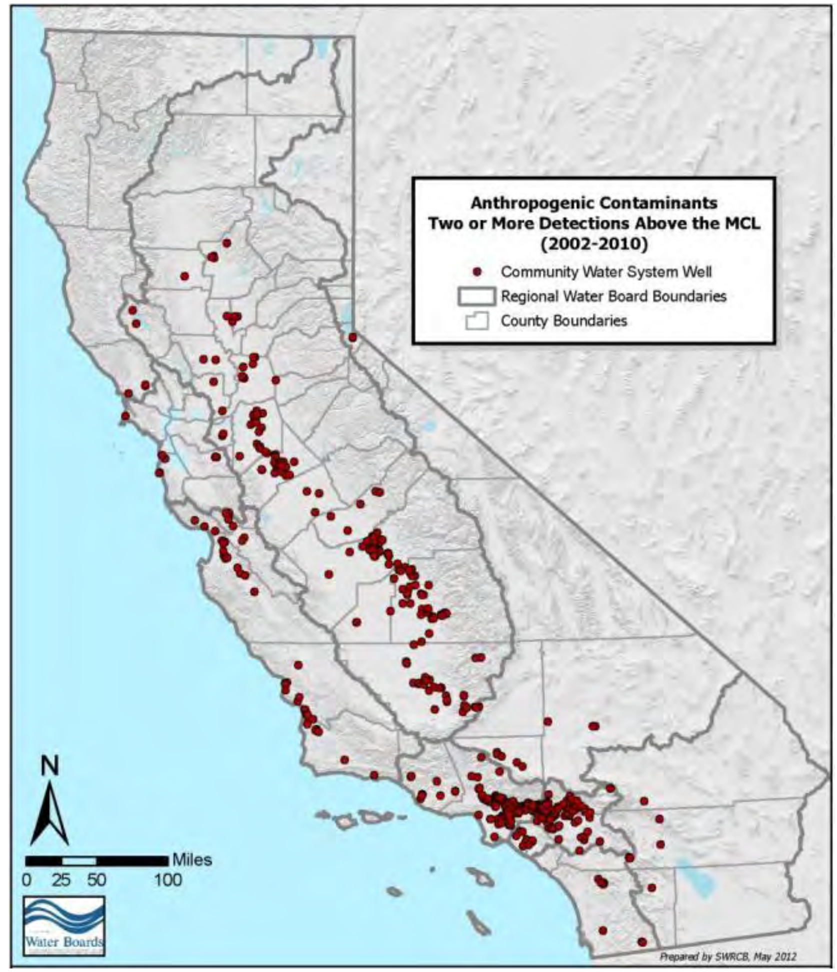


Figure 2.6: Anthropogenic Principal Contaminants in Active Community Water System Wells (Two or More Detections above the MCL 2002-2010)

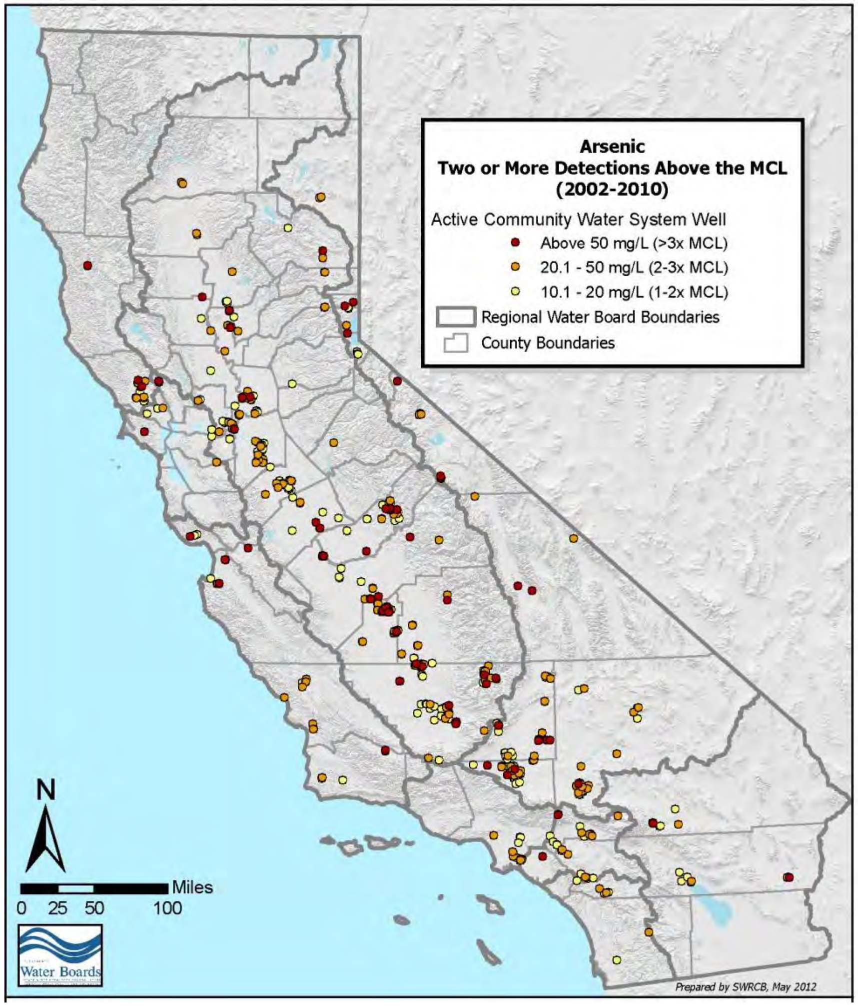


Figure 2.7: Arsenic in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

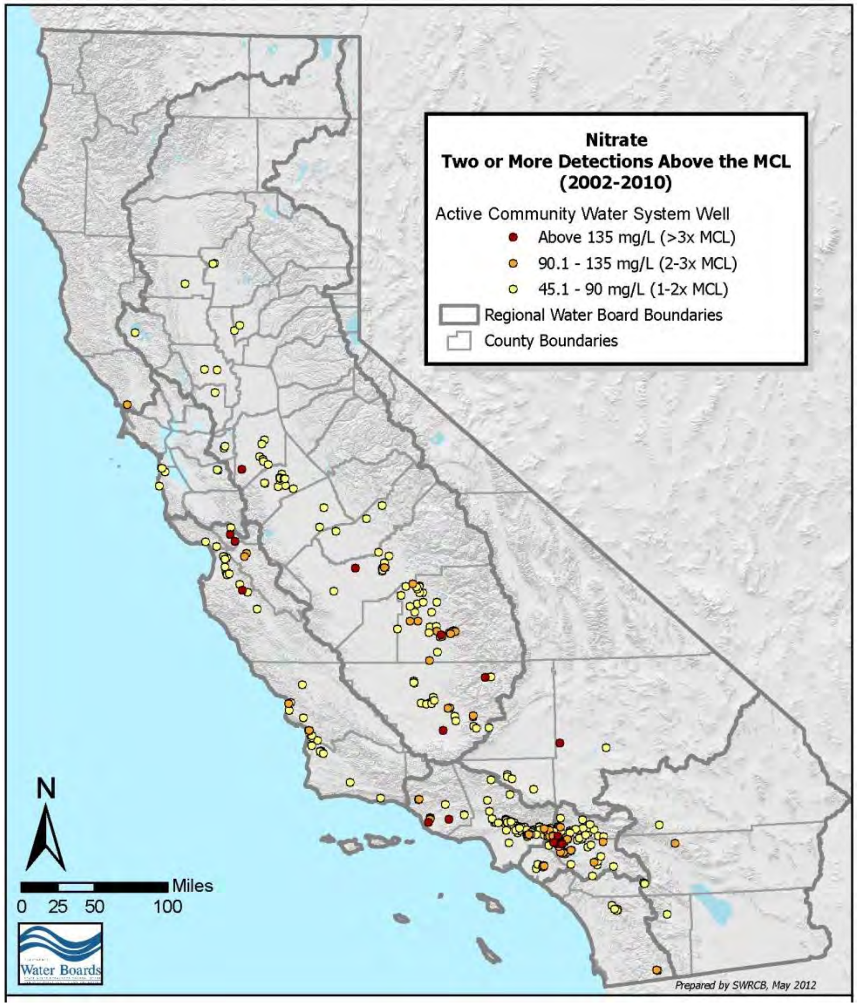


Figure 2.8: Nitrate in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

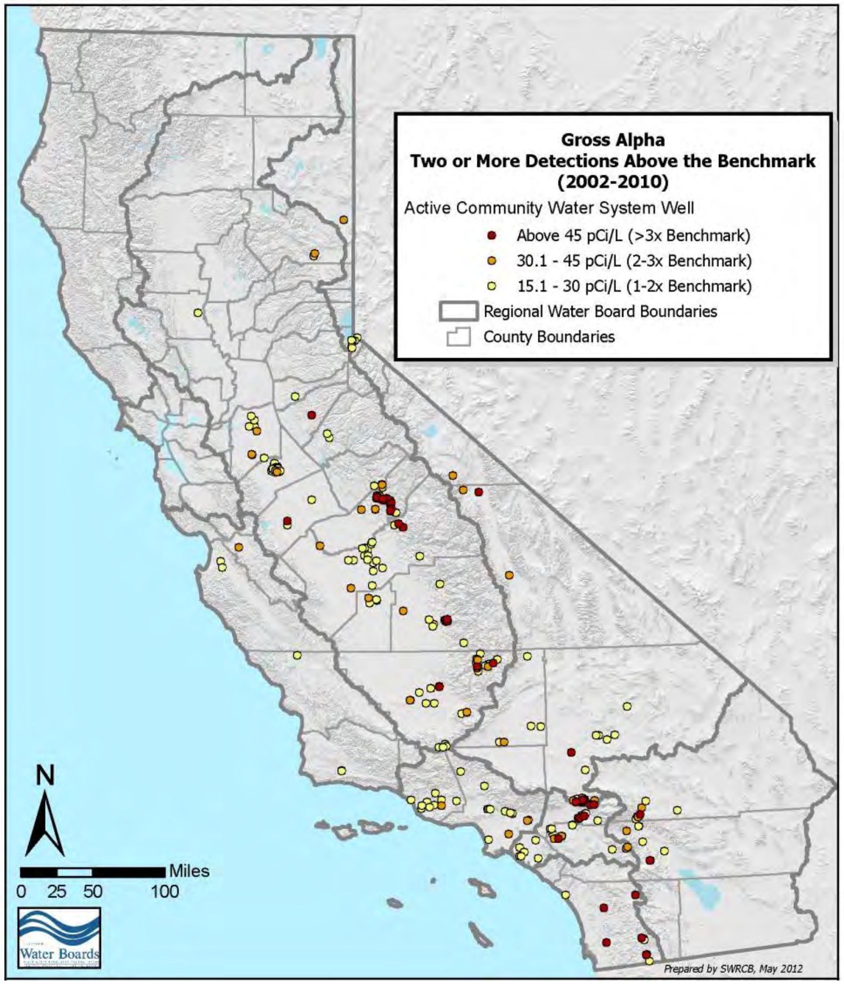


Figure 2.9: Radionuclides (Gross Alpha) in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

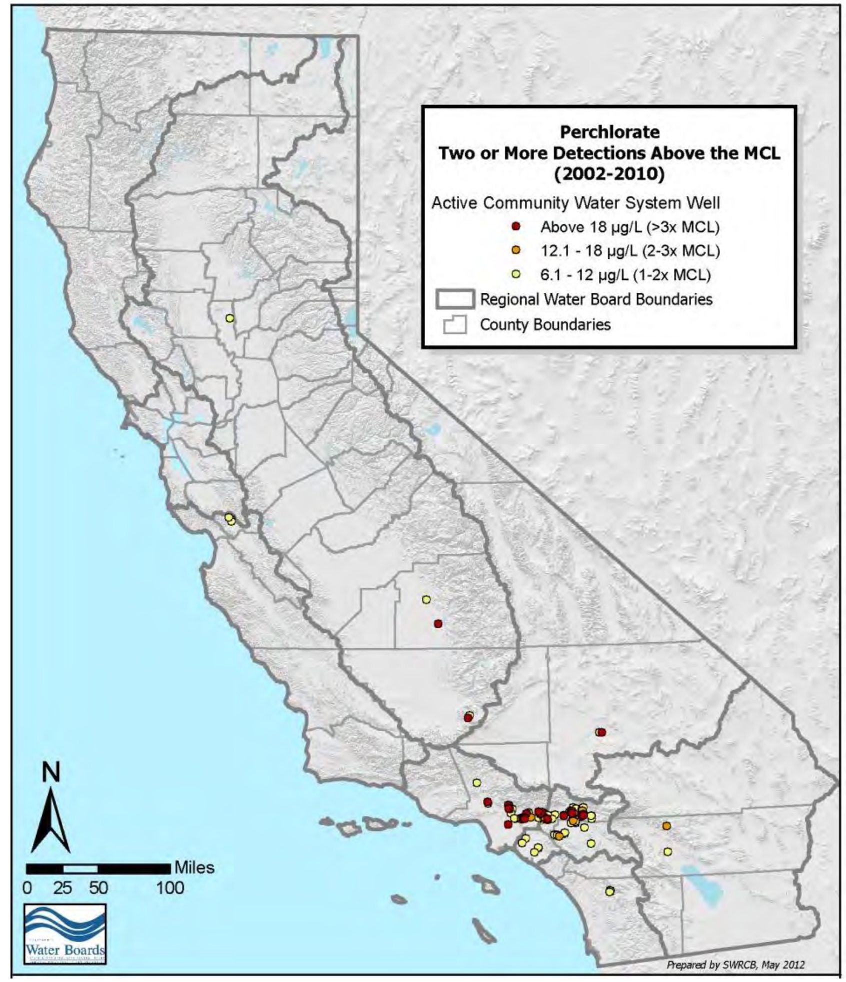


Figure 2.10: Perchlorate in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

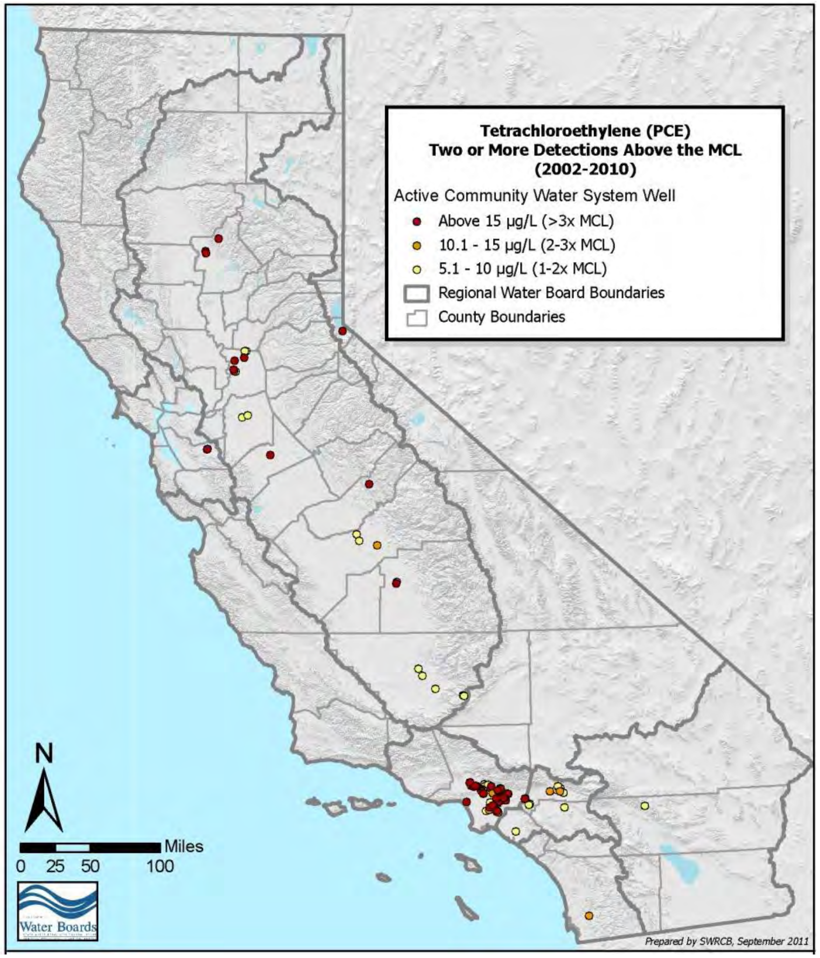


Figure 2.11: Tetrachloroethylene (PCE) in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

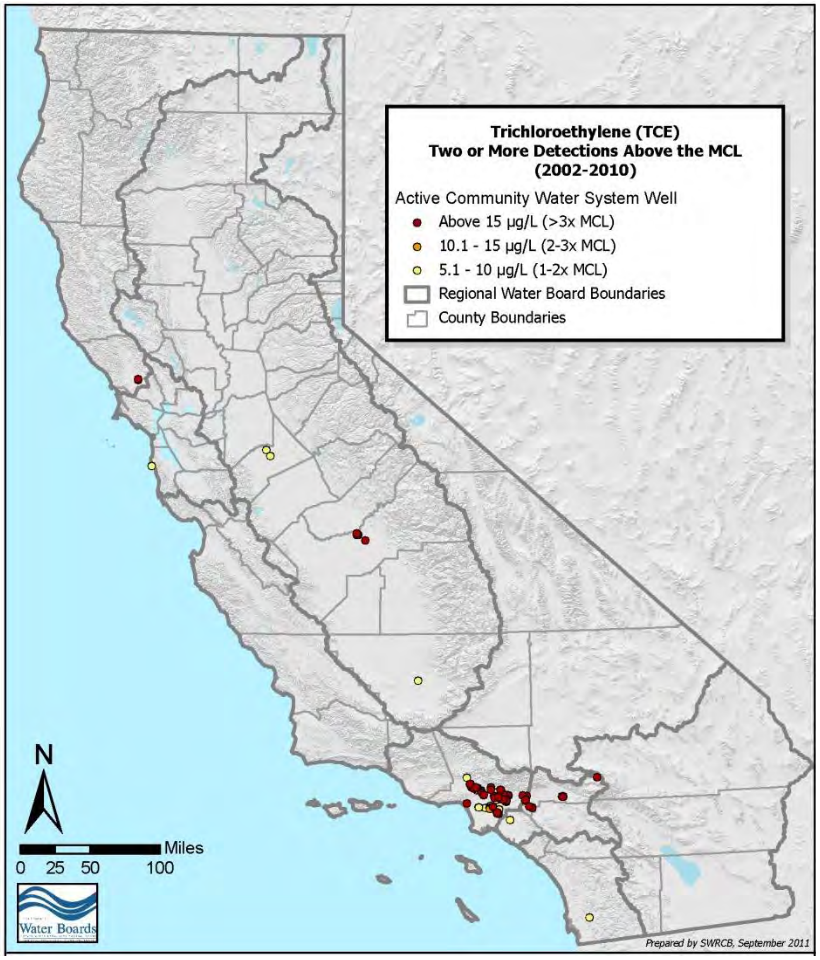


Figure 2.12: Trichloroethylene (TCE) in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

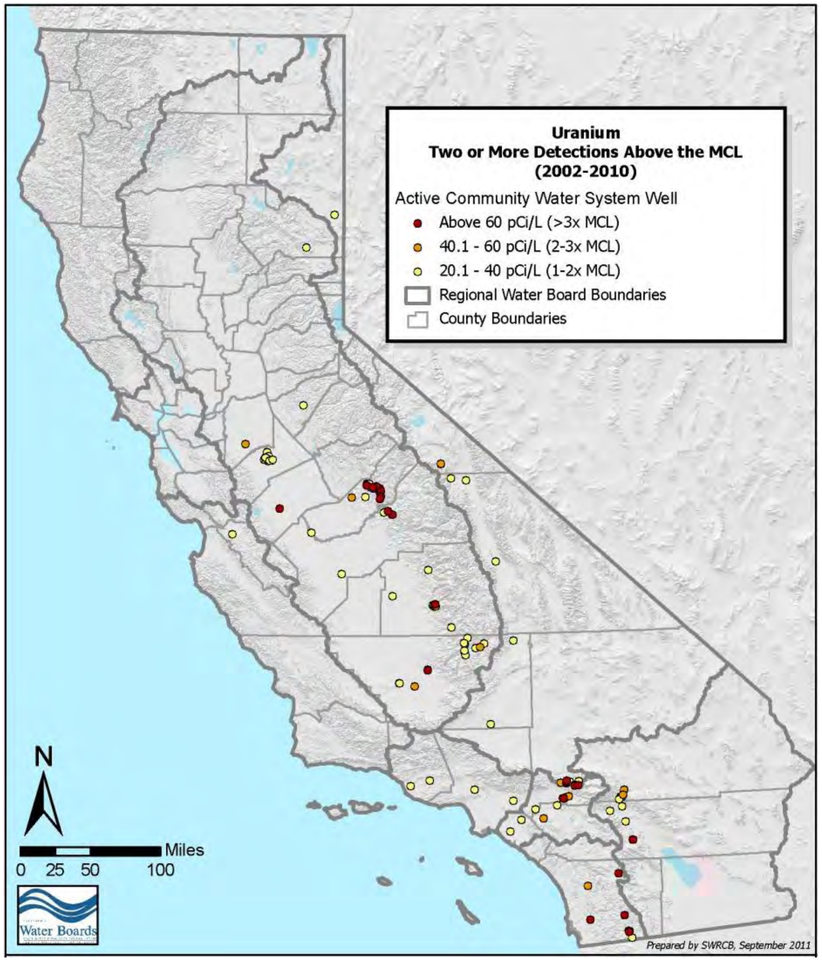


Figure 2.13: Uranium in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

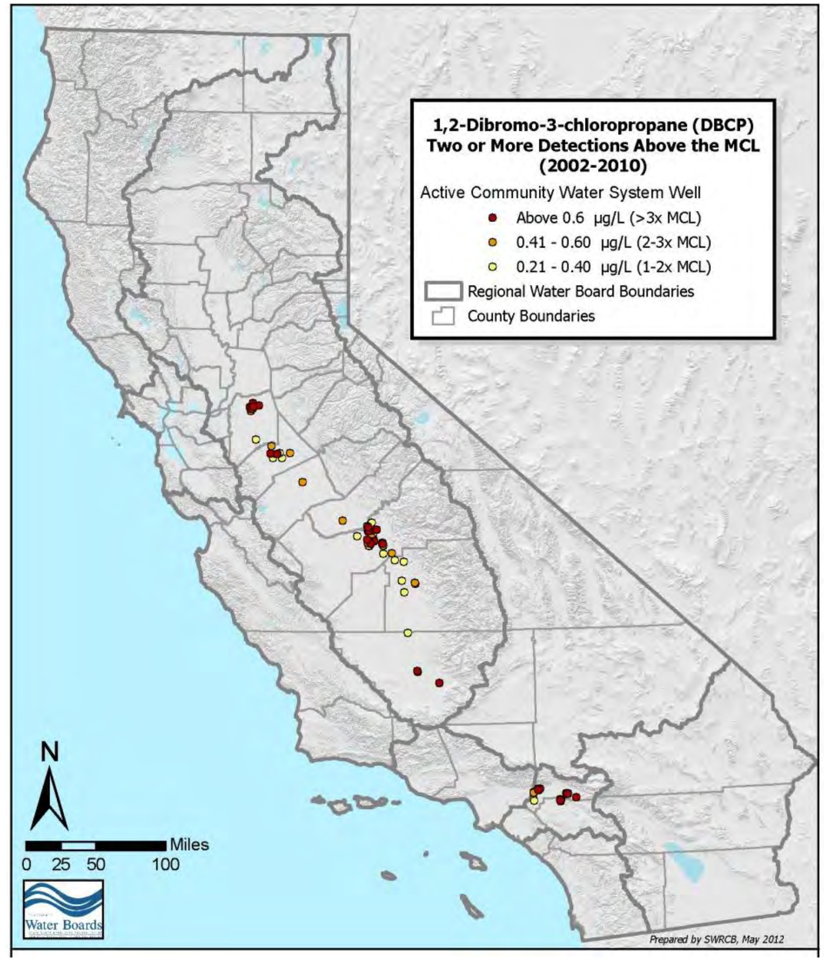


Figure 2.14: DBCP in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

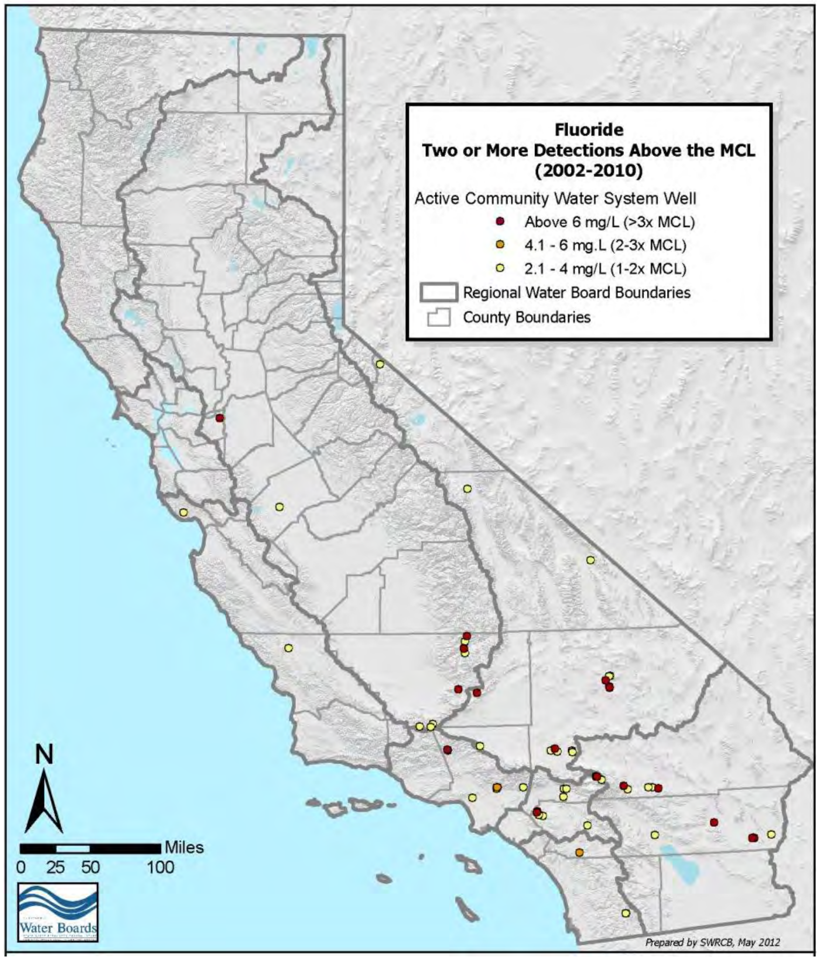


Figure 2.15: Fluoride (Naturally Occurring) in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

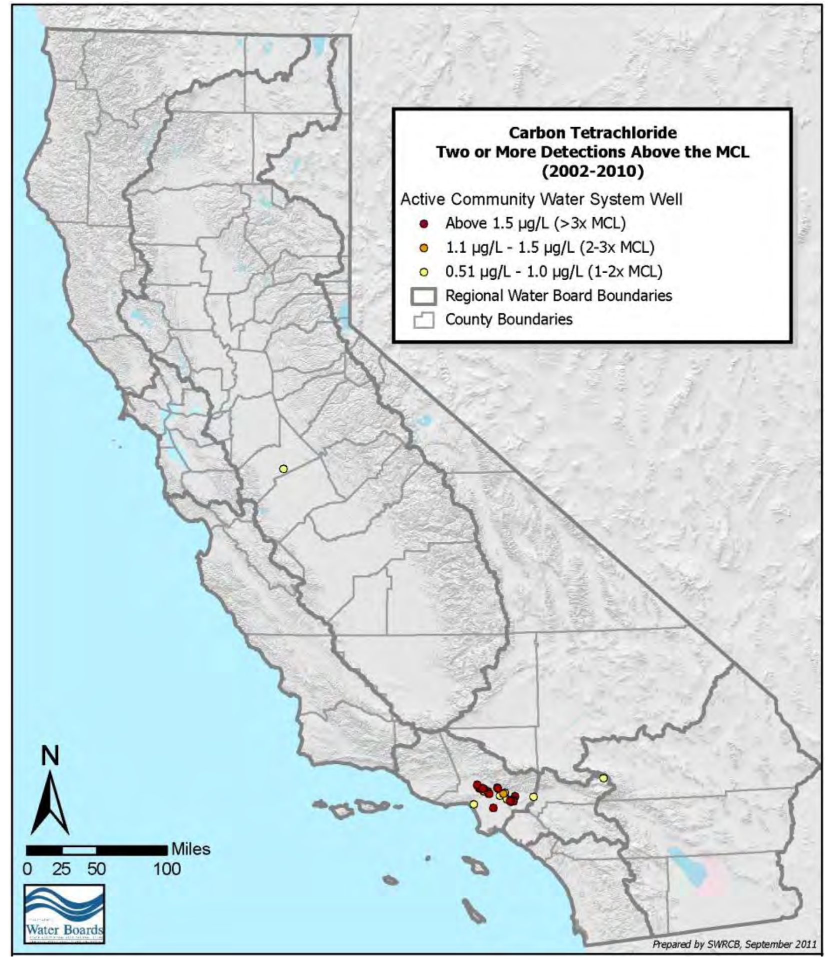


Figure 2.16: Carbon Tetrachloride in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

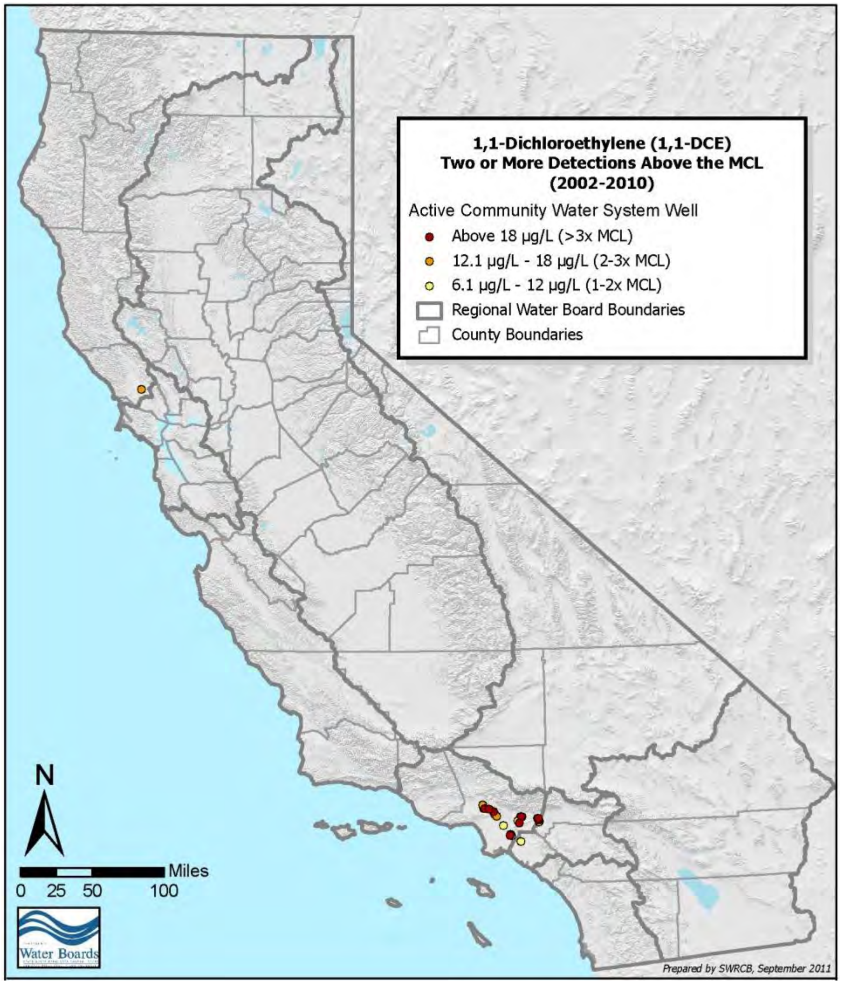


Figure 2.17: 1,1-Dichloroethylene in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

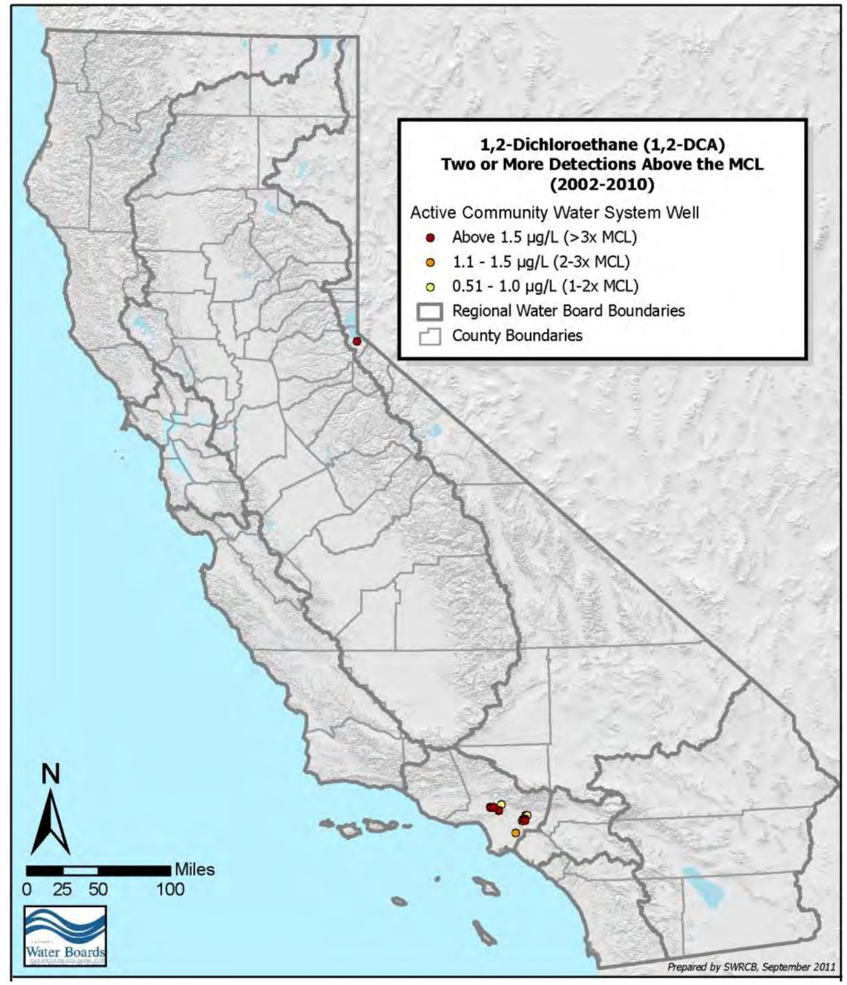


Figure 2.18: 1,2-Dichloroethane in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

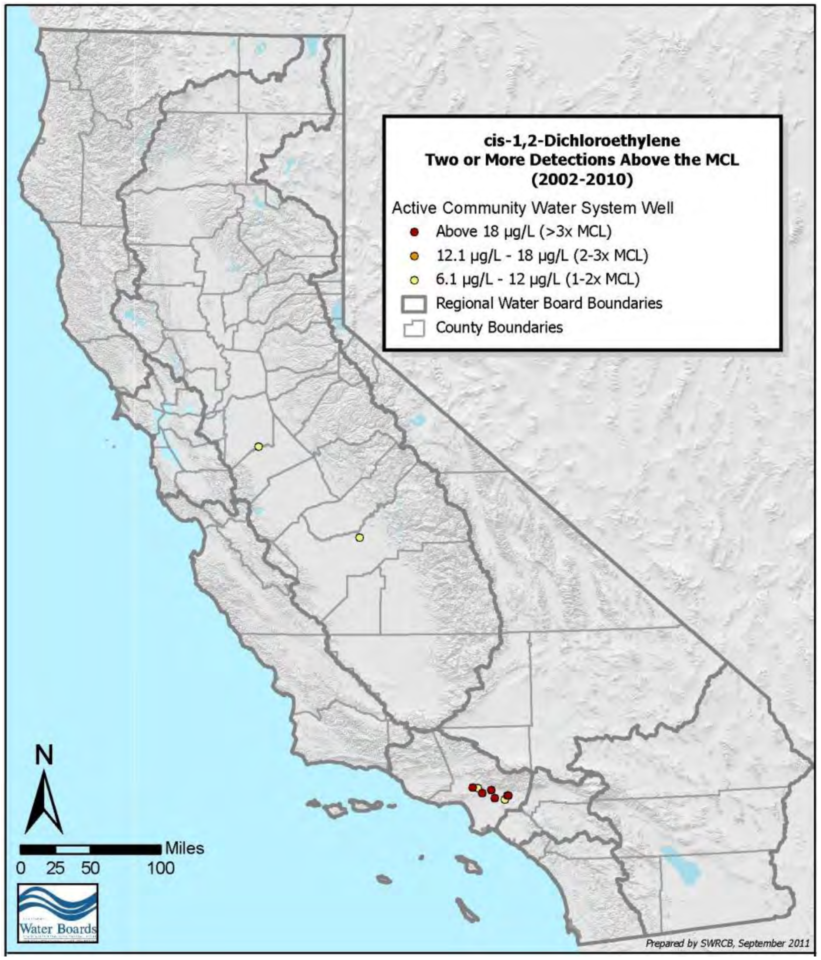


Figure 2.19: cis-1,2-Dichloroethylene in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

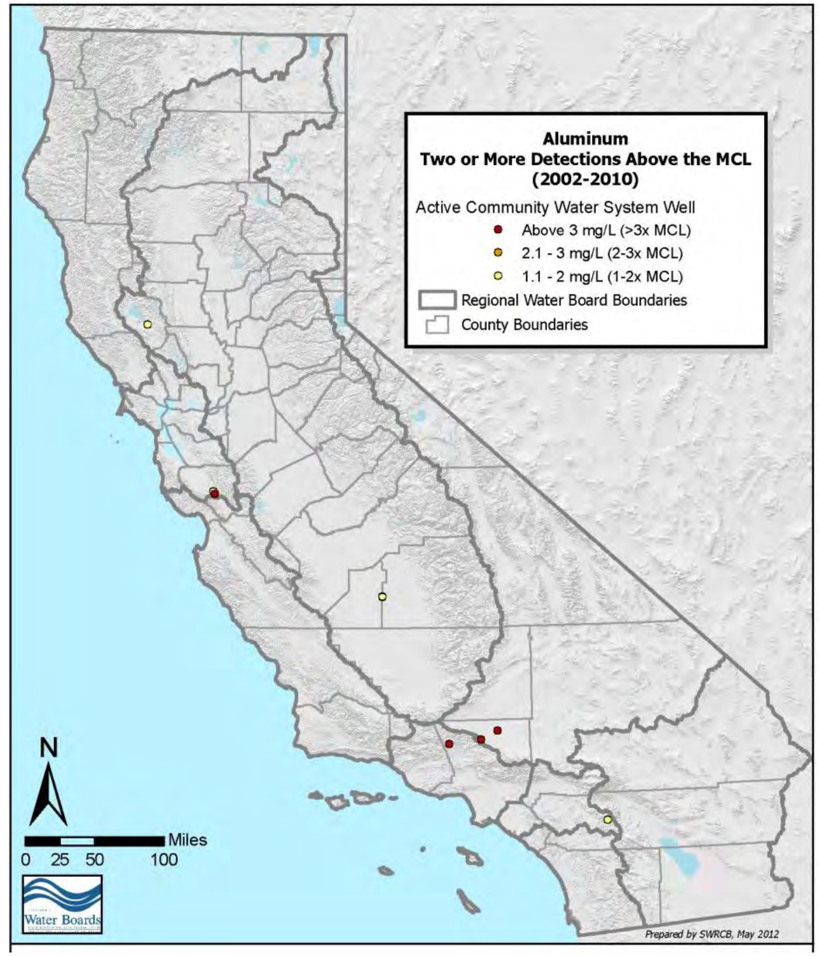


Figure 2.20: Aluminum in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

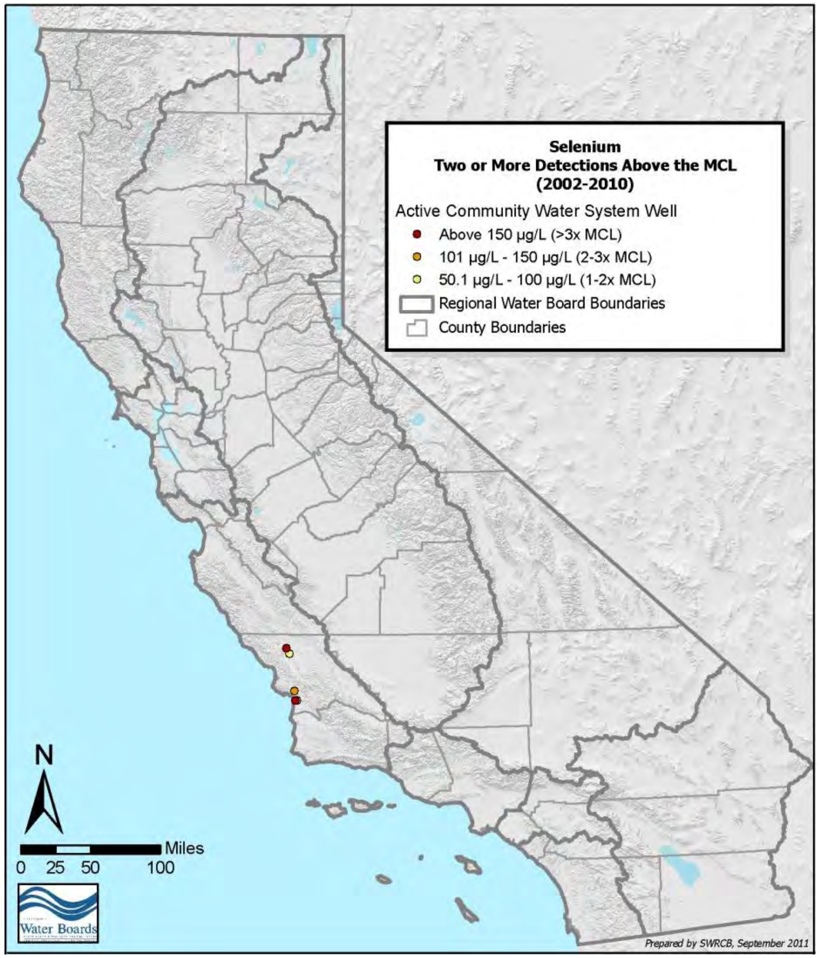


Figure 2.21: Selenium in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

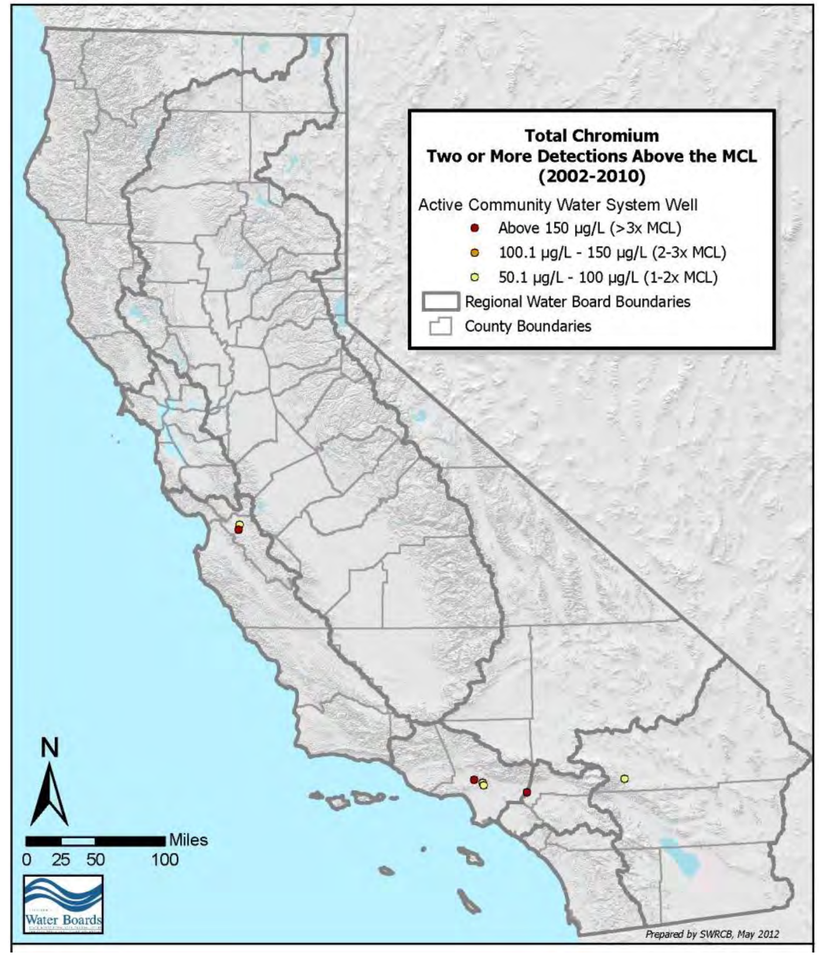


Figure 2.22: Total Chromium in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

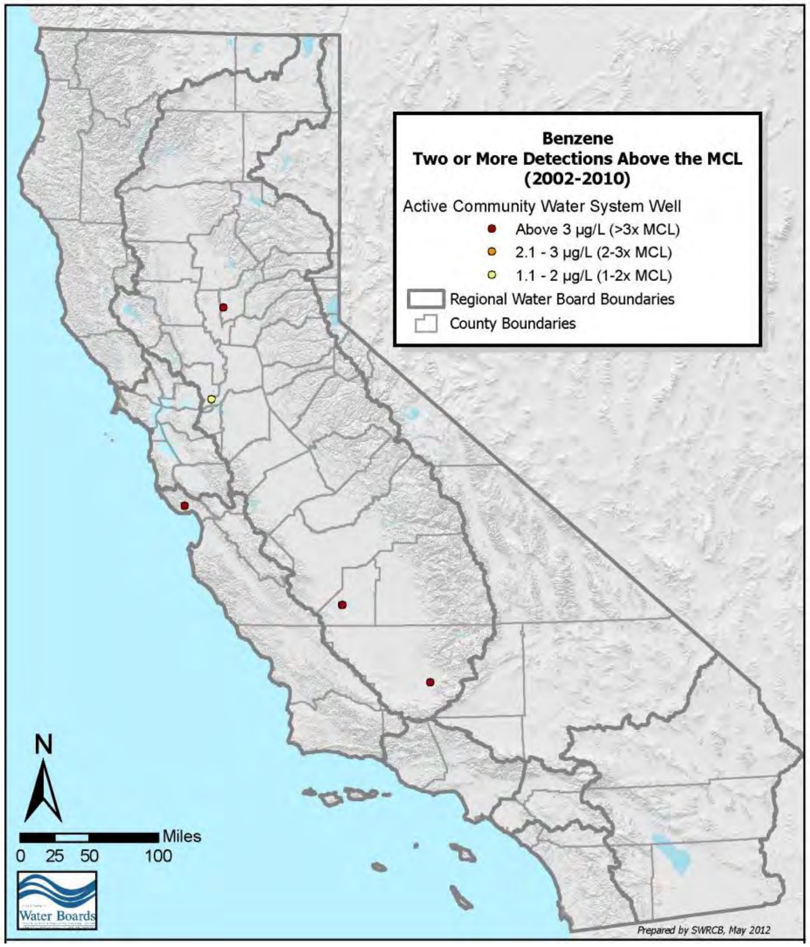


Figure 2.23: Benzene in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

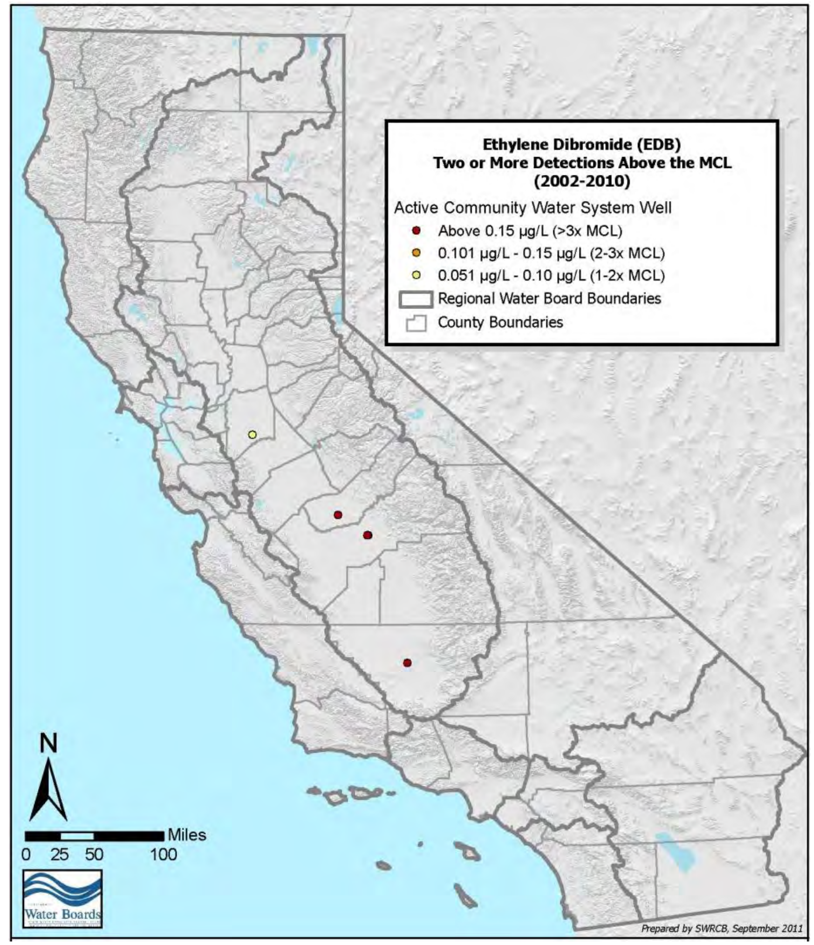


Figure 2.24: Ethylene Dibromide in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

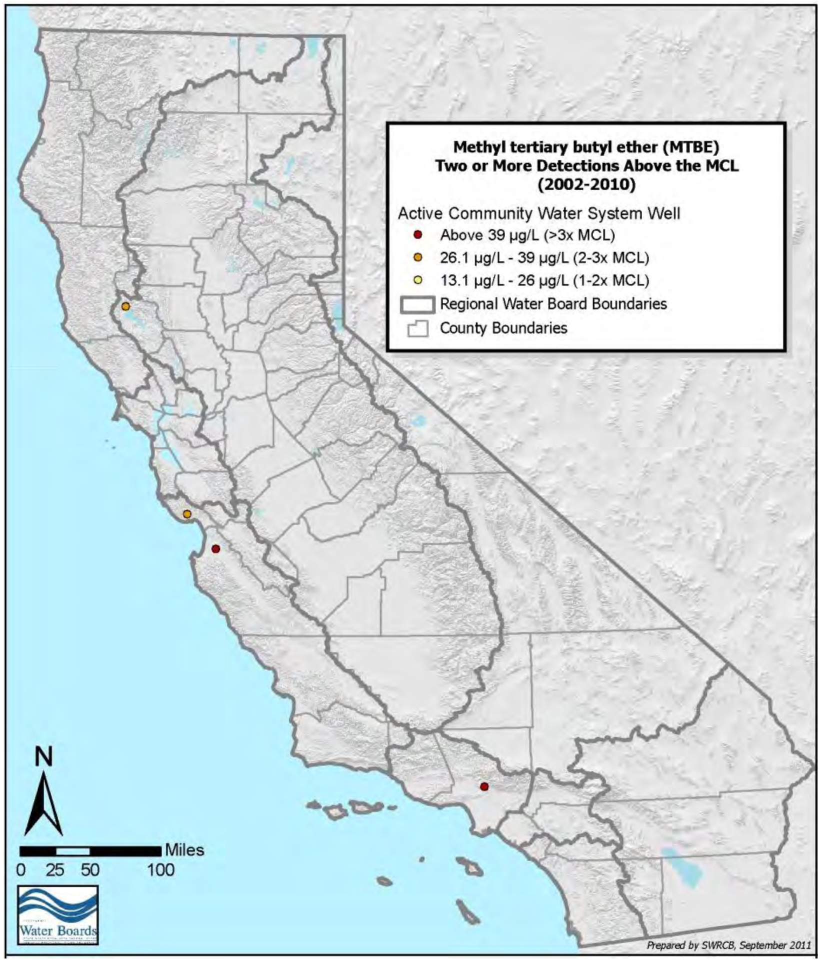


Figure 2.25: Methyl Tertiary Butyl Ether (MTBE) in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

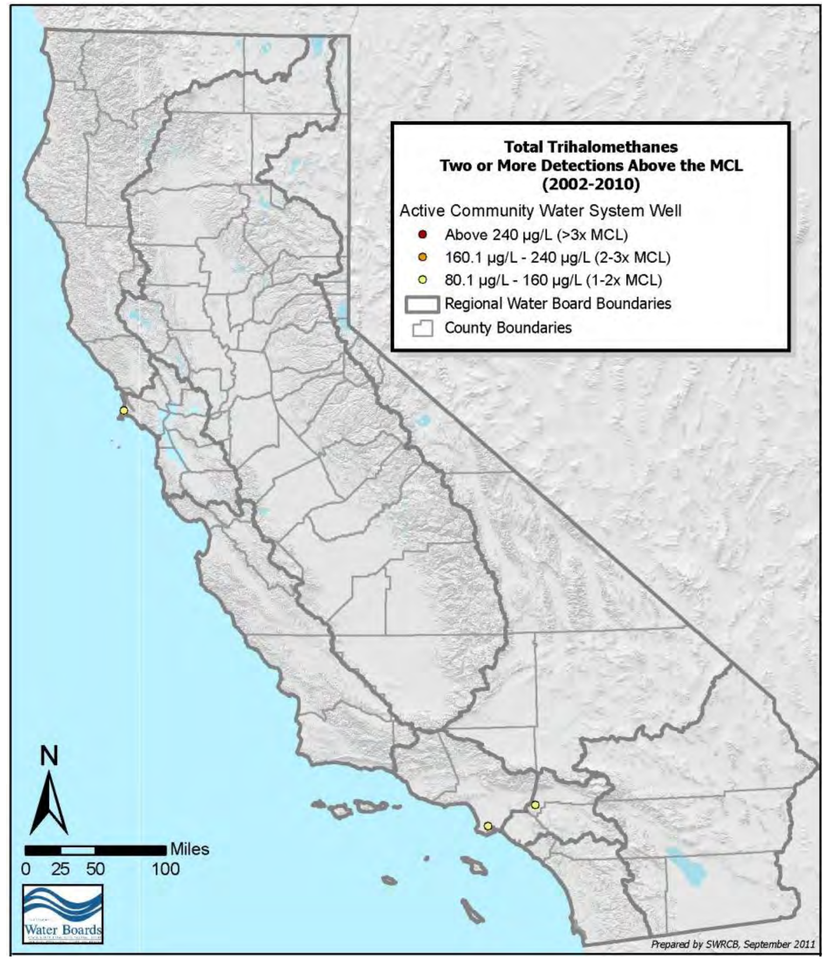


Figure 2.26: Total Trihalomethanes in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

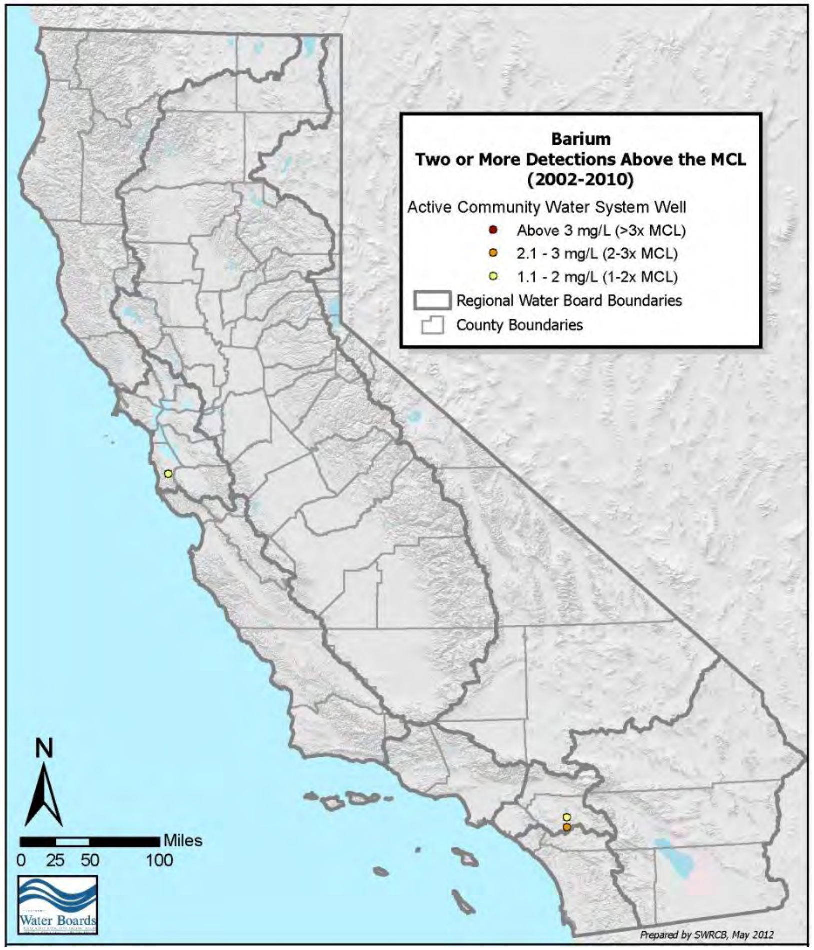


Figure 2.27: Barium in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

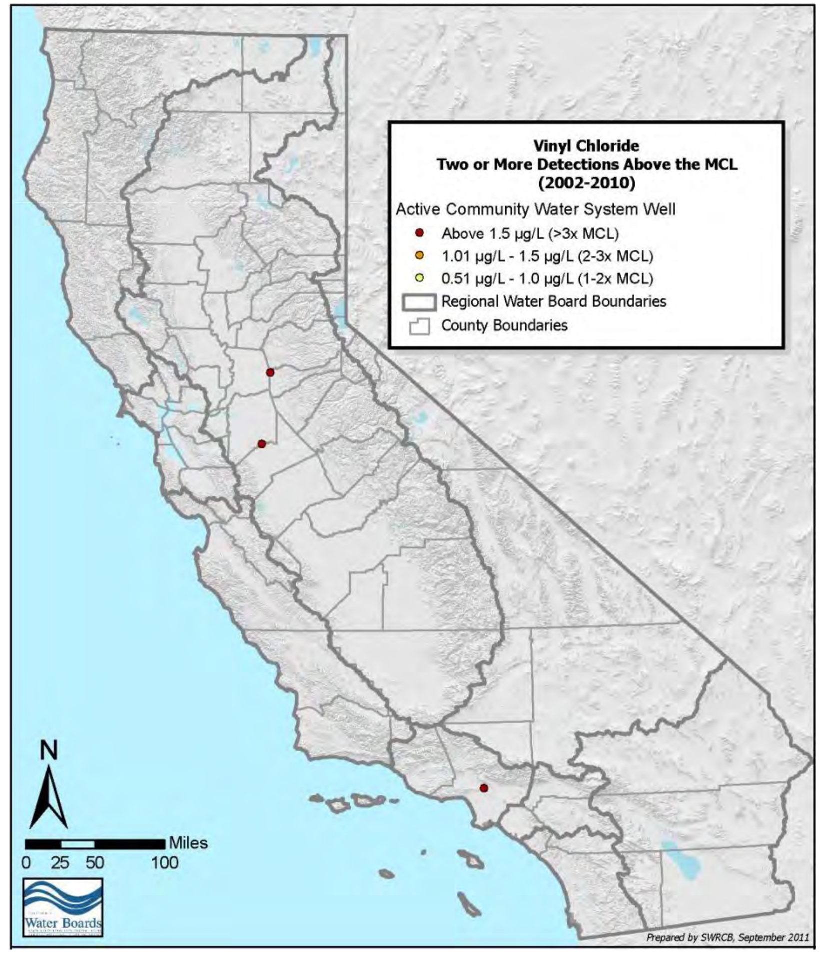


Figure 2.28: Vinyl Chloride in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

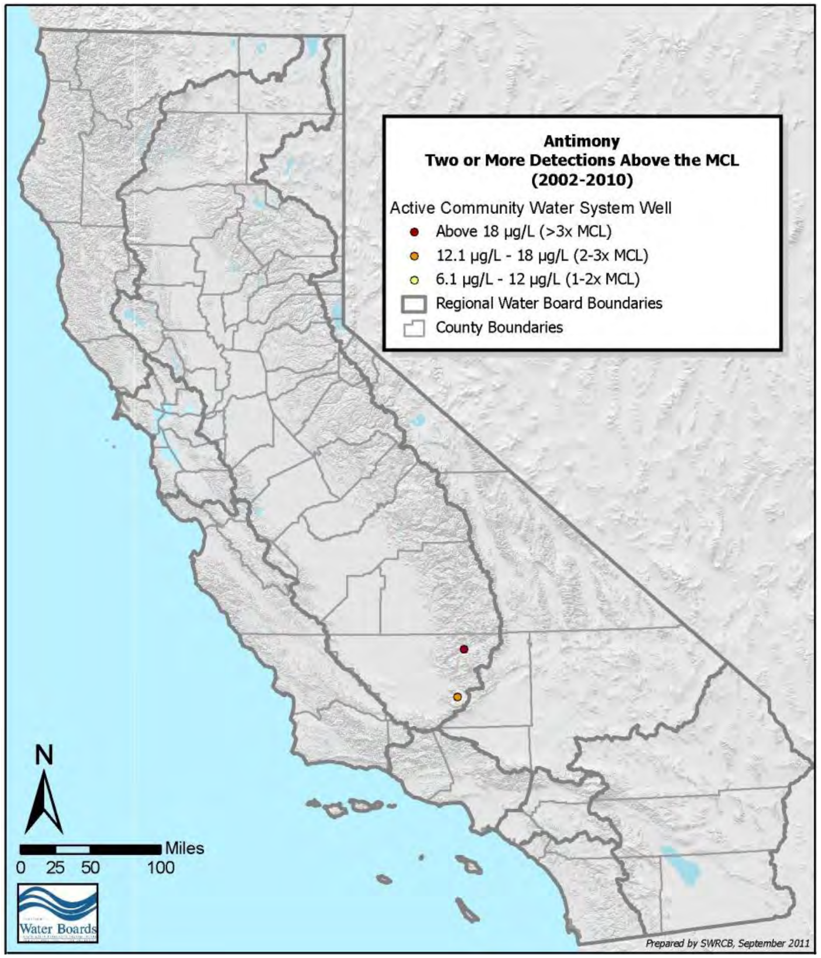


Figure 2.29: Antimony in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

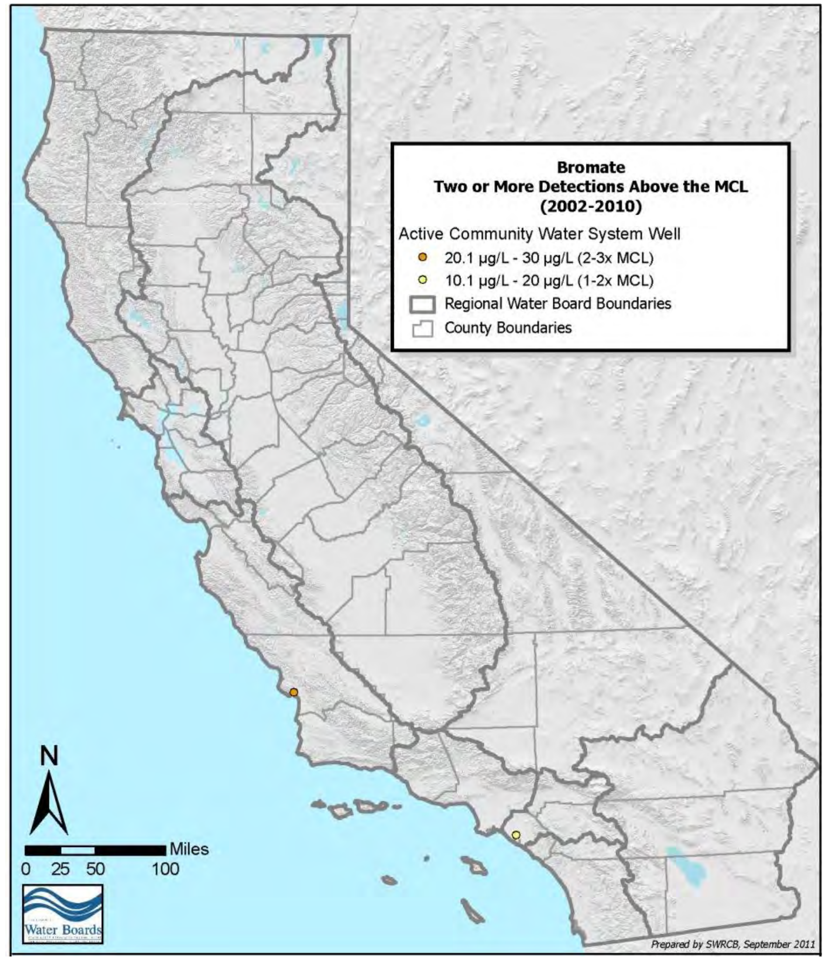


Figure 2.30: Bromate in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

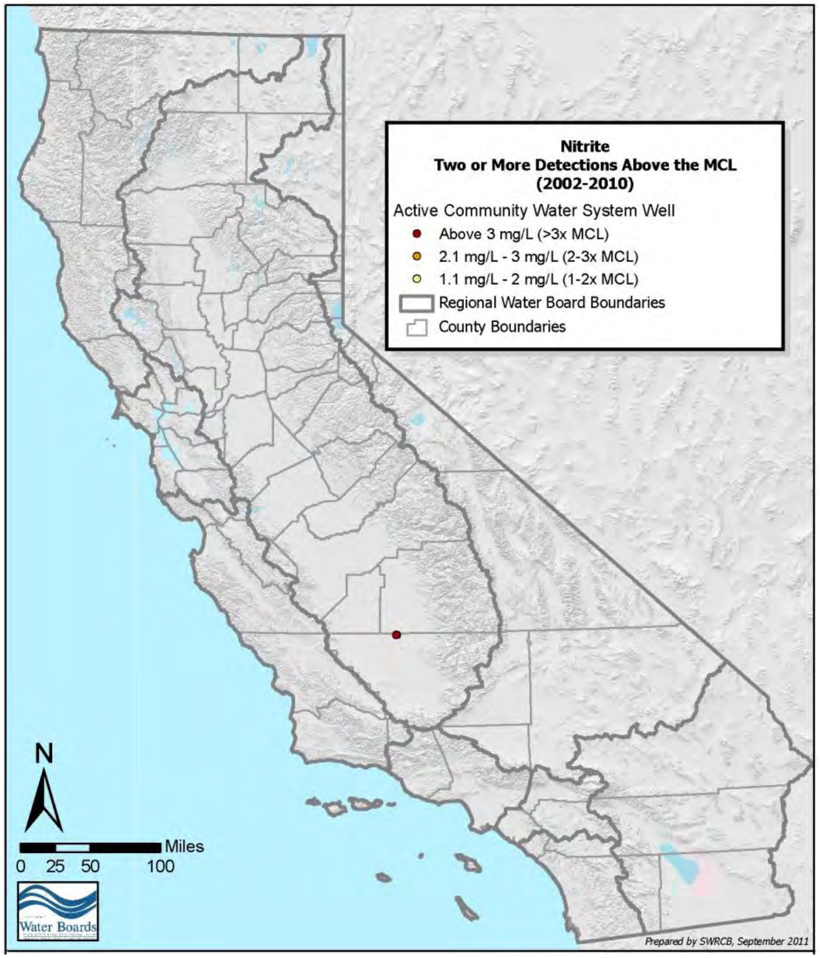


Figure 2.31: Nitrite (as N) in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

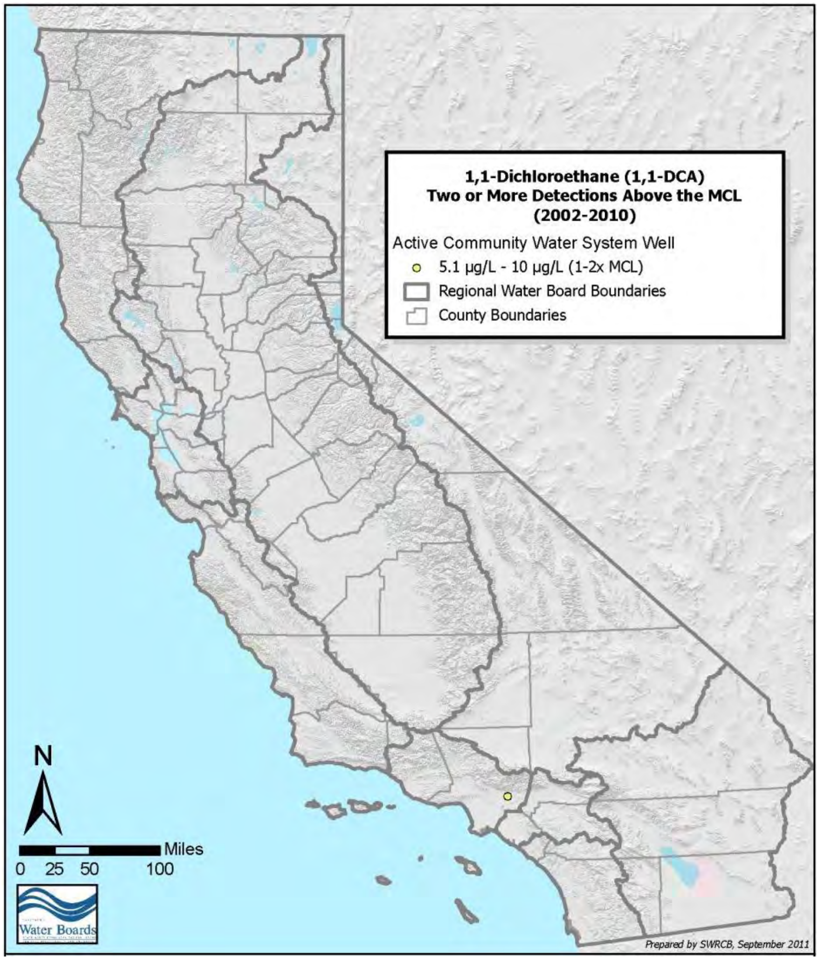


Figure 2.32: 1,1-Dichloroethane in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

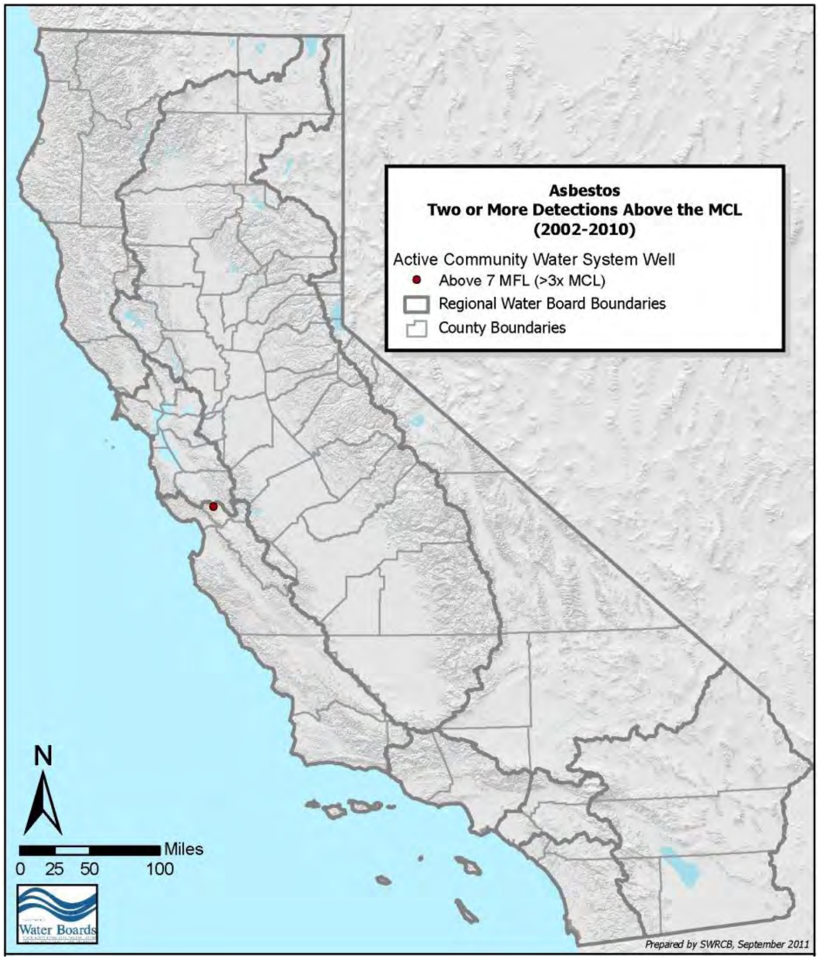


Figure 2.33: Asbestos in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

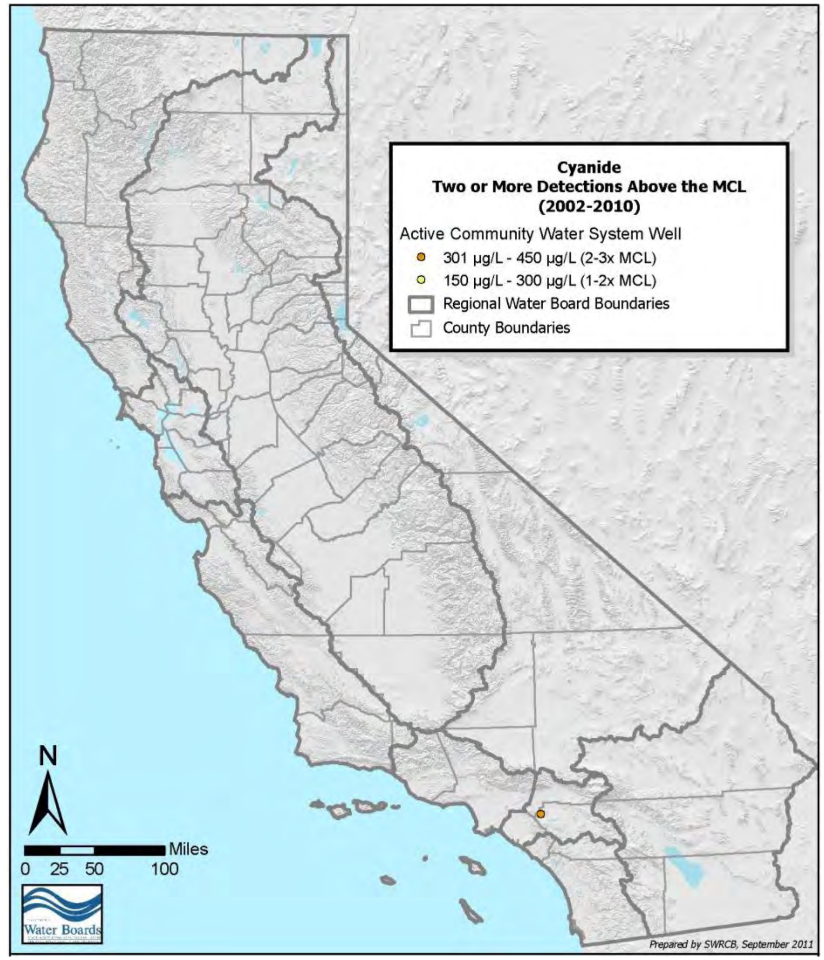


Figure 2.34: Cyanide in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

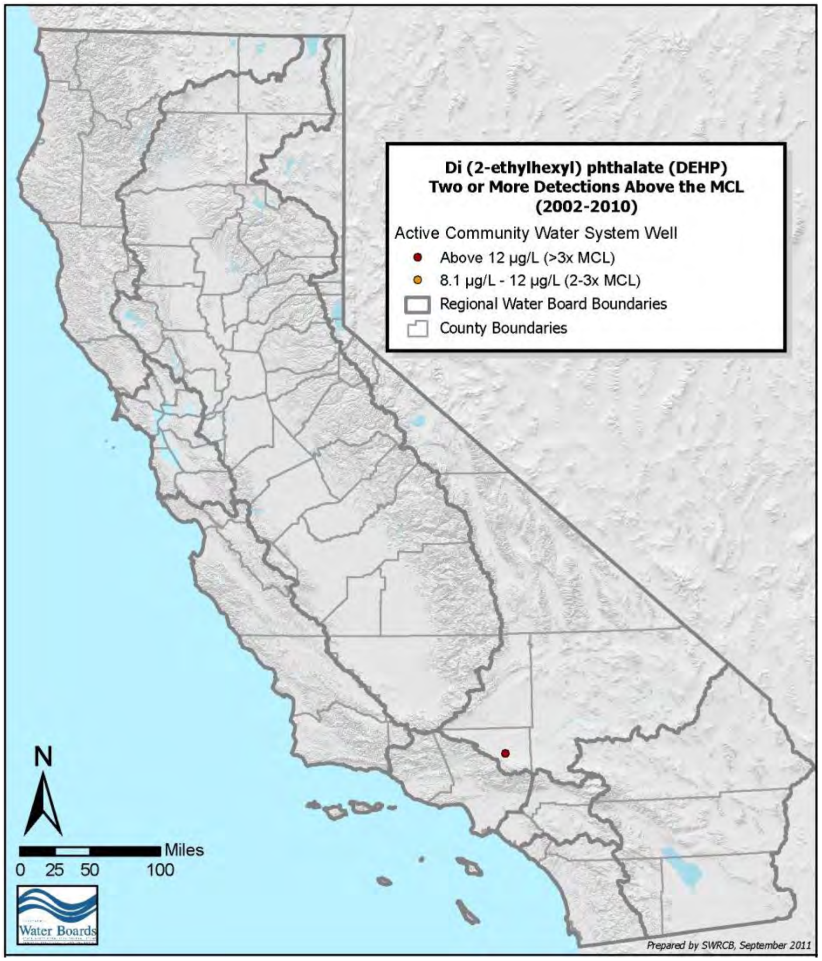


Figure 2.35: Di(2-ethylhexyl) phthalate (DEHP) in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

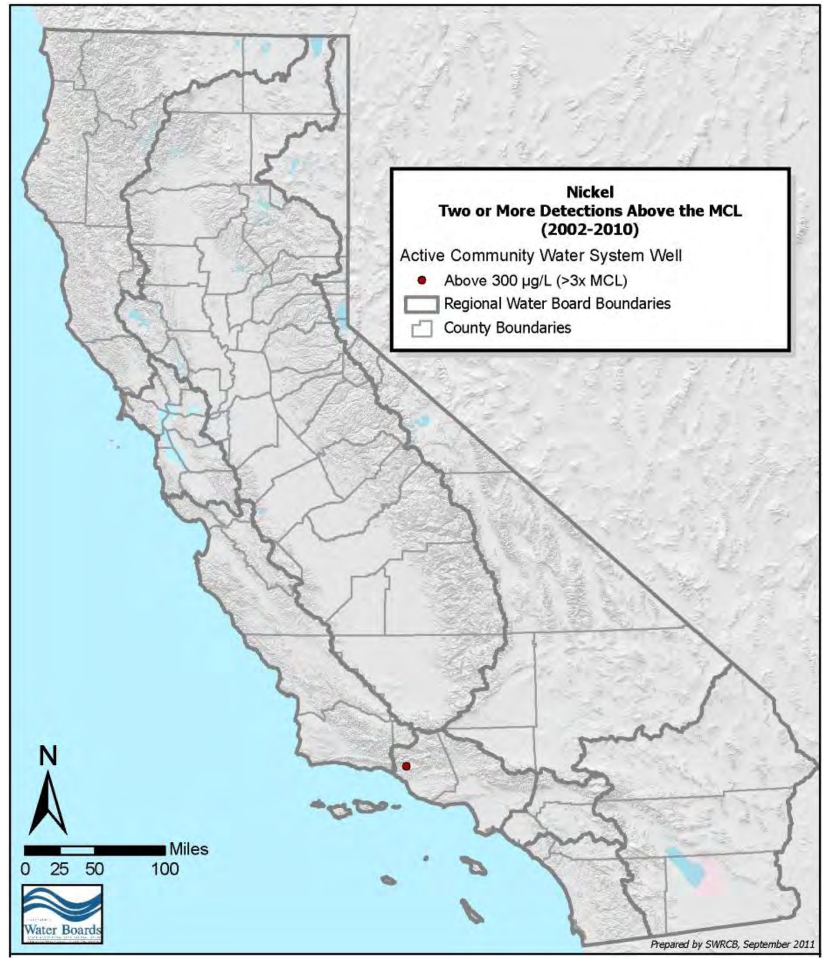


Figure 2.36: Nickel in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

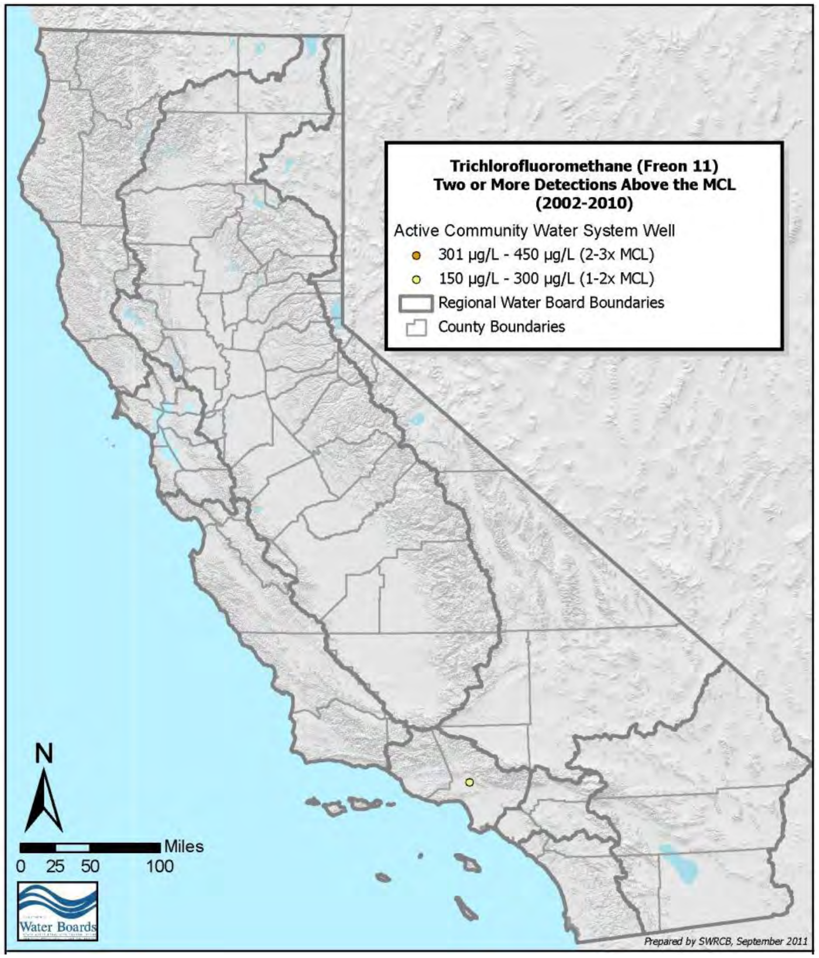


Figure 2.37: Trichlorofluoromethane (Freon 11) in Active Community Water System Wells, Two or More Detections above the MCL (Maximum Concentration Observed, 2002-2010)

APPENDIX 3 – CONSTITUENTS OF CONCERN

Appendix 3: Constituents of Concern

AB 2222 (Caballero, Chapter 670, Statutes of 2008) required that the State Water Board identify "constituents of concern" that are detected in communities that rely on a contaminated groundwater source for drinking water. This appendix outlines the definition used for a constituent of concern (COC), and lists the COCs that have been identified.

3.1 Definition of "Constituent of Concern"

COCs are defined as chemicals that were detected above a CDPH Notification Level (NL) two or more times during the most recent CDPH compliance cycle (2002-2010). NLs are health-based advisory levels established by CDPH for chemicals in drinking water that lack or do not yet have a Maximum Contaminant Level (MCL).

It is important to note that not every community public water system (community water system) collects samples for constituents with an NL, and as a result, the findings here may not capture the full distribution of these contaminants in California's groundwater. For example, 1,2,3-Trichloropropane (1,2,3-TCP) was sampled as part of CDPH's unregulated contaminants monitoring from 2000 through 2004. The Office of Environmental Health Hazard Assessment (OEHHA) established a public health goal (PHG) for 1,2,3-TCP in 2009, and CDPH is currently working toward establishing an MCL.

Hexavalent chromium (Cr-6) was also included as a COC, even though it does not have an NL. Chromium is a metallic chemical that is widely found in natural metal deposits, soils, and plants. Chromium generally occurs in the environment as trivalent chromium (Cr-3). However, under certain environmental conditions, Cr-3 will oxidize to Cr-6, which is a suspected human carcinogen. Groundwater can contain both naturally occurring and anthropogenic Cr-6. Naturally occurring Cr-6 may be associated with serpentinite-containing rock or chromium containing geologic formations, and can also indicate oxidation of natural Cr-3 from chrome-iron ore deposits. Anthropogenic sources of Cr-6 include discharges of dye and paint pigments, wood preservatives, metal-plating liquid wastes, and leaching from hazardous waste sites.

In July of 2011, OEHHA published a PHG of 0.02 micrograms per liter (µg/L) (or parts per billion, ppb) for Cr-6 in community water systems. Although a PHG has been established at 0.02 µg/L, the Cr-6 data in the CDPH database pre-dates the establishment of the PHG, and was predominantly measured using a Detection Limit for purposes of Reporting (DLR) of 1 µg/L. Therefore, Cr-6 was evaluated using the DLR of 1 µg/L in this report. CDPH is currently working toward establishing an MCL.

3.2 Findings: Constituents of Concern

Nine COCs were identified (see Table 3.1):

- Hexavalent Chromium (Cr-6) – detected in 1,378 wells; 314 community water systems
- 1,2,3-Trichloropropane (1,2,3-TCP) – detected in 251 wells; 64 community water systems
- Boron – detected in 137 wells; 62 community water systems
- Manganese – detected in 140 wells; 96 community water systems
- Vanadium – detected in 66 wells; 27 community water systems
- 1,4-Dioxane – detected in 41 wells; 18 community water systems
- N-Nitrosodimethylamine (NDMA) – detected in 22 wells; 10 community water systems
- Lead – detected in 9 wells; 8 community water systems
- Tertiary butyl alcohol (TBA) – detected in 1 well; 1 community water systems

The COC most frequently detected above an NL is 1,2,3-TCP. A total of 251 active community water system wells had two or more detections of 1,2,3-TCP above the NL of 0.005 µg/L. These 251 wells were found in 64 community water systems located throughout the state (see Table 3.1 and Figure 3.1), primarily within the San Joaquin Valley and the Southern California Inland Empire. The highest 1,2,3-TCP concentration (270 µg/L) was detected in Kern County.

The COC most frequently detected was Cr-6 (see Table 3.1). This COC was evaluated using the DLR of 1 µg/L. A total of 1,378 active community water system wells had two or more detections of Cr-6 above 1 µg/L (see Figure 3.2). These 1,378 wells were found in 314 community water systems located throughout the state. The highest Cr-6 concentration (407 µg/L) was detected in Los Angeles County. San Bernardino (249 wells), Los Angeles (184 wells), and Sacramento (165 wells) Counties had the greatest number of wells where Cr-6 was detected on two or more occasions above 1 µg/L.

TABLE 3.1: Constituents of Concern in Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

Constituent of Concern (COC)	Community Water Systems Where a COC Was Detected[a]	Community Water System Wells With Identified COC[b]	Community Water System Wells Sampled for COC[c]	% Total Wells Above NL[d]	NL (µg/L)	PHG (µg/L)	DLR (µg/L)	Contaminant Type[e]
Hexavalent Chromium (Cr-6)[g]	314	1,378	2,803	53	n/a	n/a	1	Inorganic
1,2,3-Trichloropropane (1,2,3-TCP)	64	251	5,964	4	0.005	0.0007	0.005	VOC[f]
Boron	62	137	4,387	3	1,000		100	Inorganic
Manganese	96	140	7,876	2	500		20	Inorganic
Vanadium	27	66	4,314	1.5	50		3	Inorganic
1,4-Dioxane	18	41	291	14	1		1	VOC[f]
N-Nitroso-dimethylamine (NDMA)	10	22	158	14	0.01	0.003		Disinfection Byproduct
Lead	8	9	7,168	0.1	15	0.2	5	Inorganic
Tertiary butyl alcohol (TBA)	1	1	4,000	<0.1	12		2	VOC[f]

Notes (gray shading indicates a naturally-occurring chemical):

a. The number of community water systems in which a contaminant was detected, on two or more occasions, at a concentration above an NL during the most recent CDPH compliance cycle (2002-2010).
b. Active community water system wells in which a COC was detected on at least two occasions at a concentration above a notification level (NL) during the most recent CDPH compliance cycle (2002-2010). A well is considered active if it was being used to provide drinking water to a community water system at the time that this report was being drafted (October 2011),
c. Total number of active community water system wells that were sampled two or more times for the constituent during the most recent CDPH compliance cycle (2002-2010).
d. Percentage of all active community water system wells, sampled two or more times for a COC, that have had two or more detections of a contaminant at a concentration above the NL, during the most recent CDPH compliance cycle (2002-2010).
e. General category of contaminant.
f. Includes both volatile organic compounds (VOC) and semi-volatile organic compounds (SVOC).
g. Cr-6 was evaluated using the DLR of 1 µg/L. No Notification Level exists.

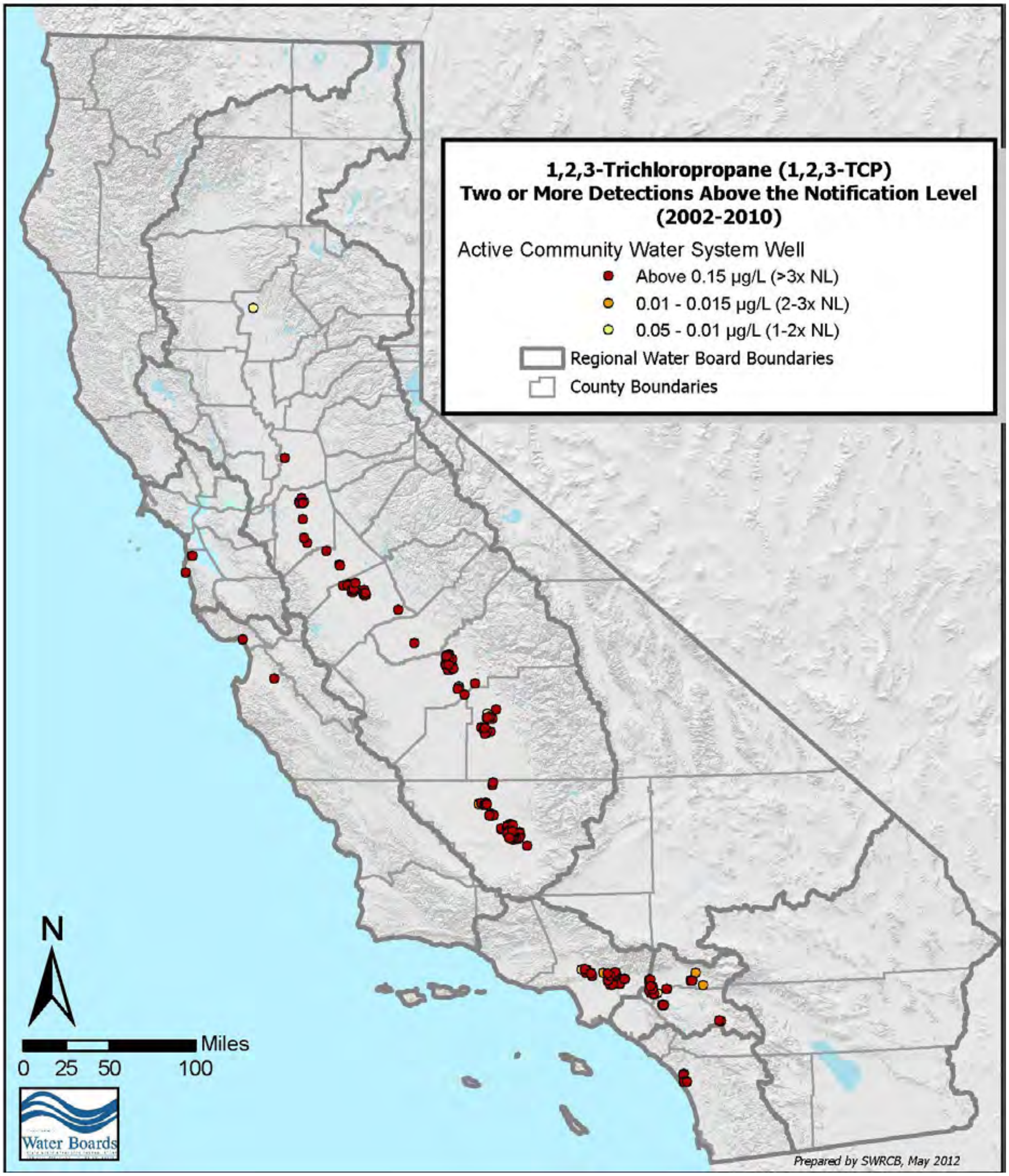


Figure 3.1: 1,2,3-Trichloropropane in Active Community Water System Wells (251) with Two or More Detections above the Notification Level of 0.005 µg/L (Maximum Concentration Observed, 2002-2010)

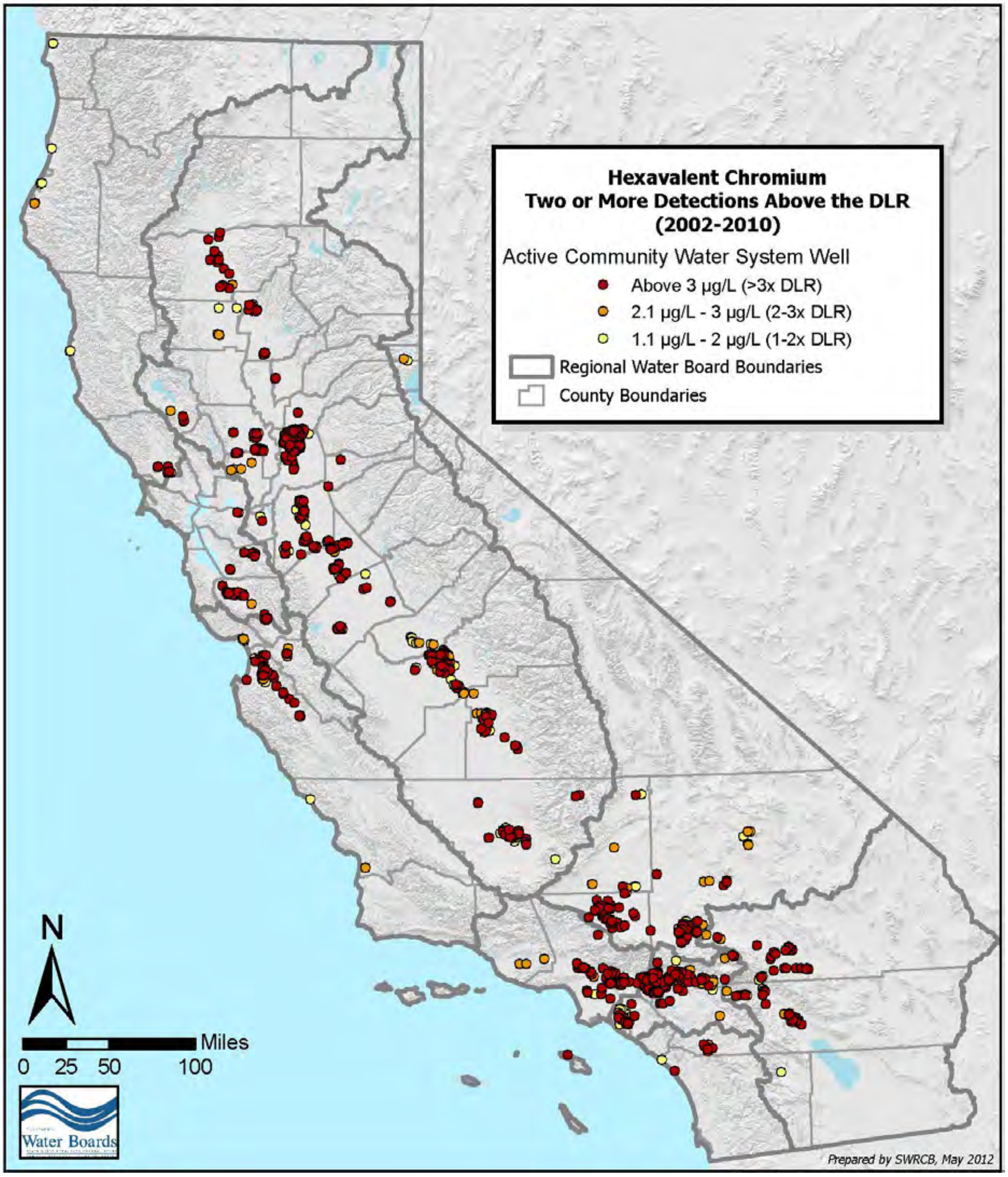


Figure 3.2: Hexavalent Chromium in Active Community Water System Wells (1,378) with Two or More Detections above the DLR of 1 µg/L (Maximum Concentration Observed, 2002-2010)

APPENDIX 4 – COMMUNITY WATER SYSTEMS THAT RELY ON A CONTAMINATED GROUNDWATER SOURCE AND HAVE A DRINKING WATER QUALITY VIOLATION

Appendix 4: Community Water Systems that Rely on a Contaminated Groundwater Source and Have a Drinking Water Quality Violation

Many community public water systems (community water systems) that rely on a contaminated groundwater source treat their water in order to ensure that safe drinking water is served to its customers. However, some community water systems cannot afford treatment, and may deliver unsafe drinking water directly to the public. AB 2222 (Caballero, Chapter 670, Statutes of 2008) required that the State Water Resources Control Board (State Water Board) identify potential solutions and funding sources to ensure the provision of safe drinking water to identified communities. Identifying community water systems that may have delivered unsafe drinking water highlights the areas that may be most in need of financial or other types of assistance.

This report is not to be used to assess public water system compliance. Although discussed in this report, compliance is determined by the California Department of Public Health (CDPH). The most recent public water system compliance reports can be found at: http://www.cdph.ca.gov/certlic/drinkingwater/Pages/Publications.aspx

4.1 MCL Violations

CDPH is responsible for regulating the quality of drinking water delivered to consumers, and issues an "MCL Violation" when the concentrations of specific chemicals in drinking water supplied to consumers exceeds levels established in the California Health and Safety Code.

CDPH provided State Water Board staff with a list of community water systems that have received a Maximum Contaminant Level (MCL) violation within the most recent compliance cycle (2002-2010) using the Permits, Inspections, Compliance, Monitoring, and Enforcement (PICME) System information database. The list of systems with MCL violations was compared to the list of 680 community water systems that rely on contaminated groundwater. A total of 265 community water systems that rely on contaminated groundwater have had at least one MCL violation during the most recent CDPH compliance cycle (2002-2010). Table 4.1 shows the number of community water systems per county that rely on contaminated groundwater and have received a drinking water quality violation.

4.2 Locations of Community Water Systems that Rely on Contaminated Groundwater and have MCL Violations

The locations of the 265 community water systems that rely on a contaminated groundwater source for drinking water and have received a drinking water quality violation are shown on Figure 4.1. Most of the community water systems with MCL violations are located in the Southern California Inland Empire, the east side of the San Joaquin Valley, the Salinas Valley, and the Santa Maria Valley. The three counties with the most community water systems of this type are Kern, Tulare, and Madera (see Figure 4.2). Many of these community water systems are 100% reliant on groundwater for drinking and predominantly serve fewer than 200 people (see Figures 4.3 and 4.4). Arsenic, nitrate, gross alpha radioactivity, uranium, and fluoride were the top five principal contaminants for which MCL violations were issued (see Figure 4.5).

Table 4.1: Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water and have received a CDPH MCL Violation, 2002-2010 (by County and Population)

County	Number of Systems with MCL Violations Grouped by Population				Population Served by Systems with MCL Violations				Number of Systems with MCL Violations and 100% Reliant on Groundwater	Population Served by Systems with MCL Violations and 100% Reliant on Groundwater
	Total	Population			Total	Population				
		<3,300	3,300-9,999	≥10,000		<3,300	3,300-9,999	≥10,000		
BUTTE	1	0	1	0	6,403	0	6,403	0	1	6,403
COLUSA	3	3	0	0	1,038	1,038	0	0	3	1,038
CONTRA COSTA	2	2	0	0	75	75	0	0	2	75
EL DORADO	2	1	0	1	63,004	3,004	0	60,000	2	63,004
FRESNO	15	13	1	1	470,685	6,674	6,500	457,511	13	12,944
GLENN	1	1	0	0	40	40	0	0	1	40
INYO	5	5	0	0	670	670	0	0	5	670
KERN COUNTY	55	45	4	6	183,085	15,436	21,546	146,103	49	138,480
KINGS	8	6	0	2	84804	6,984	0	77,820	8	84,804
LAKE	1	1	0	0	45	45	0	0	1	45
LASSEN	2	1	0	1	12,450	1,500	0	10,950	2	12,450
LOS ANGELES	7	3	1	3	258,656	2,800	7,880	247,976	4	10,680
MADERA	22	21	1	0	14,115	10,115	4,000	0	20	11,165
MENDOCINO	1	1	0	0	1,301	1,301	0	0	1	1,301
MONO	1	1	0	0	300	300	0	0	1	300
MONTEREY	10	8	1	1	123,663	2,238	6,585	114,840	10	123,663
NEVADA	2	2	0	0	348	348	0	0	2	348
ORANGE	2	2	0	0	350	350	0	0	2	350
PLACER	1	1	0	0	50	50	0	0	0	0
PLUMAS	2	2	0	0	3,157	3,157	0	0	2	3,157
RIVERSIDE	9	4	1	5	252,074	3,033	3,335	245,706	2	508
SACRAMENTO	8	6	0	2	59,073	524	0	58,549	8	59,073
SAN BENITO	3	3	0	0	183	183	0	0	3	183
SAN BERNARDINO	10	6	1	3	120,101	5,955	8,646	105,500	8	48,821
SAN DIEGO	5	5	0	0	2,100	2,100	0	0	5	2,100
SAN JOAQUIN	9	7	0	2	80,968	2,090	0	78,878	8	68,541
SAN LUIS OBISPO	2	1	0	1	12,210	1,940	0	10,270	1	1,940

Table 4.1(cont.): Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water and have received a CDPH MCL Violation, 2002-2010 (by County and Population)

County	Number of Systems with MCL Violations Grouped by Population				Population Served by Systems with MCL Violations				Number of Systems with MCL Violations and 100% Reliant on Groundwater	Population Served by Systems with MCL Violations and 100% Reliant on Groundwater
	Total	Population			Total	Population				
		<3,300	3,300-9,999	≥10,000		<3,300	3,300-9,999	≥10,000		
SAN MATEO	1	0	1	0	5,412	0	5,412	0	0	0
SANTA BARBARA	2	2	0	0	940	940	0	0	2	940
SANTA CLARA	4	4	0	0	278	278	0	0	4	278
SANTA CRUZ	1	1	0	0	1,145	1,145	0	0	1	1,145
SHASTA	1	0	0	1	85,703	0	0	85,703	0	0
SIERRA	1	1	0	0	225	225	0	0	1	225
SONOMA	10	9	1	0	8,834	1,084	7,750	0	10	8,834
STANISLAUS	14	10	2	2	265,574	1,974	10,675	252,943	13	53,574
SUTTER	5	3	1	1	18,299	624	7,475	10,200	5	18,299
TEHAMA	2	2	0	0	1,553	1,553	0	0	2	1,553
TULARE	31	28	2	1	32,389	12,129	9,530	10,730	31	32,389
VENTURA	2	2	0	0	1,595	1,595	0	0	1	1,500
YOLO	2	2	0	0	2,063	2,063	0	0	2	2,063
TOTALS	**265**	**215**	**18**	**33**	**2,174,958**	**95,560**	**105,737**	**1,973,679**	**236**	**772,883**

Notes: Population data from CDPH Permits, Inspections, Compliance, Monitoring, and Enforcement (PICME) System Information Database as reported in GeoTracker GAMA.

AB 2222 (Caballero, Chapter 670, Statutes of 2008) identified 680 community water systems in California that rely on a contaminated groundwater source for drinking water; a principal contaminant was detected on two or more occasions above a maximum contaminant level (MCL) in a active supply well during the most recent CDPH compliance cycle (2002-2010). A well is considered active if it was being used to provide drinking water to a community water system at the time that this report was being drafted (October 2011),

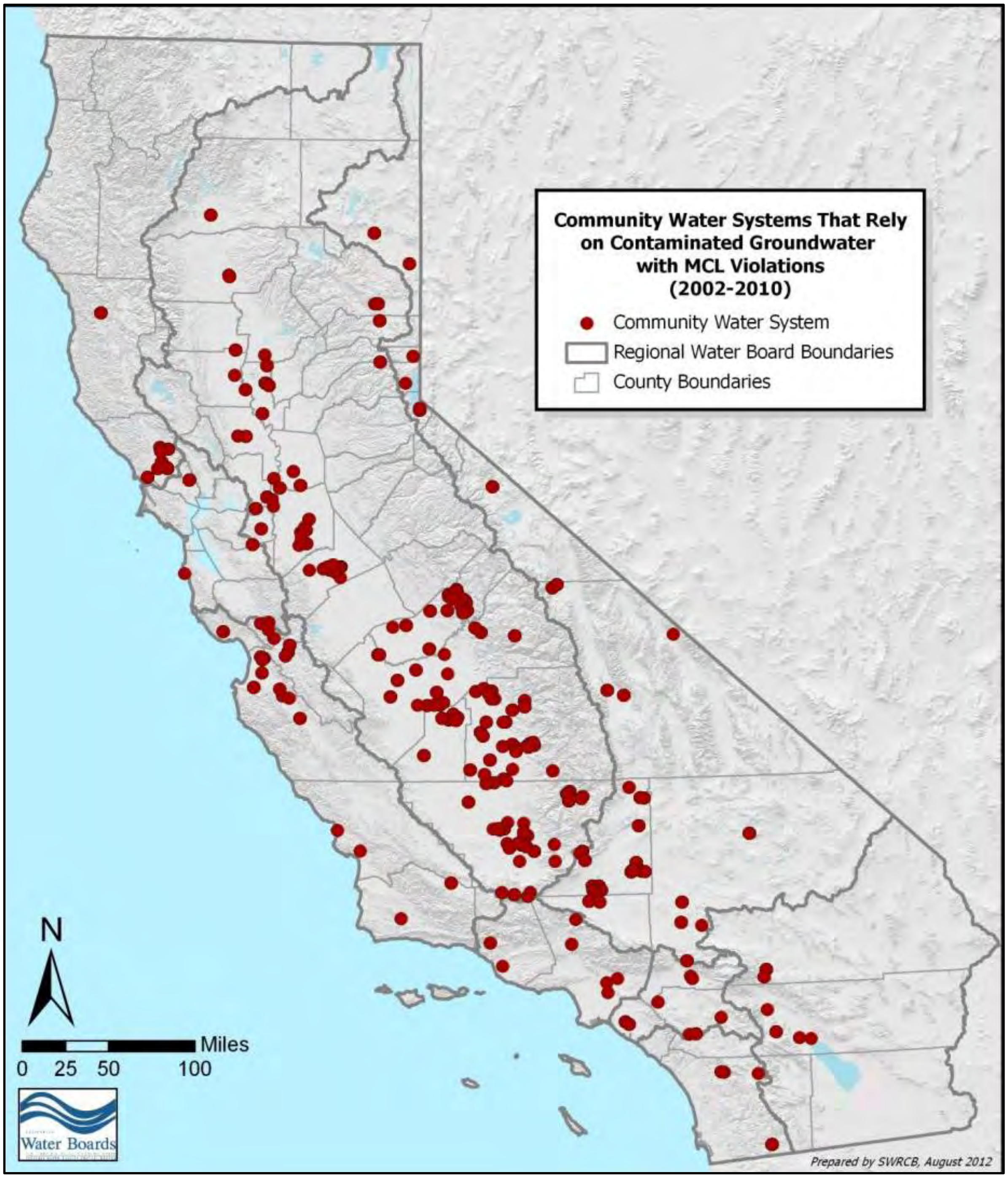


Figure 4.1: Location of 265 Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water <u>and</u> have Received a Notice of an MCL Violation (2002-2010)

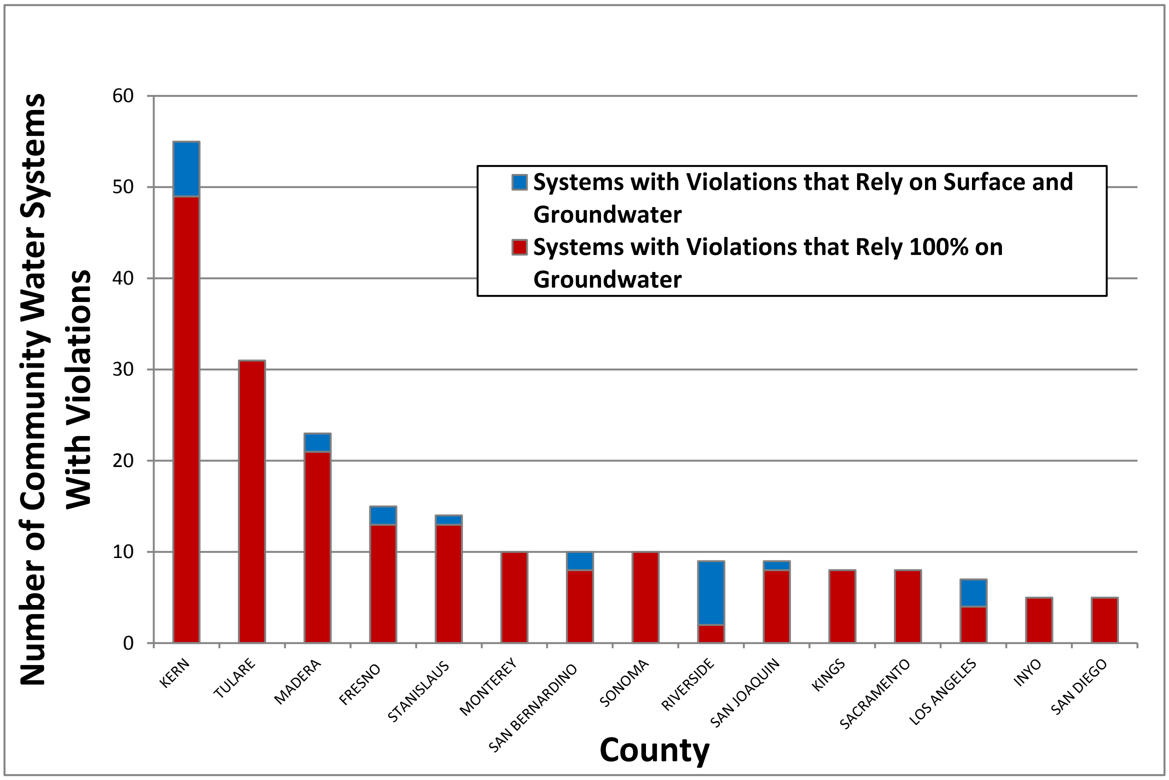


Figure 4.2: Top 15 Counties, Number of Community Water Systems that Rely on a Contaminated Groundwater Source and have Received a Notice of an MCL Violation – Groundwater Reliance (2002-2010)

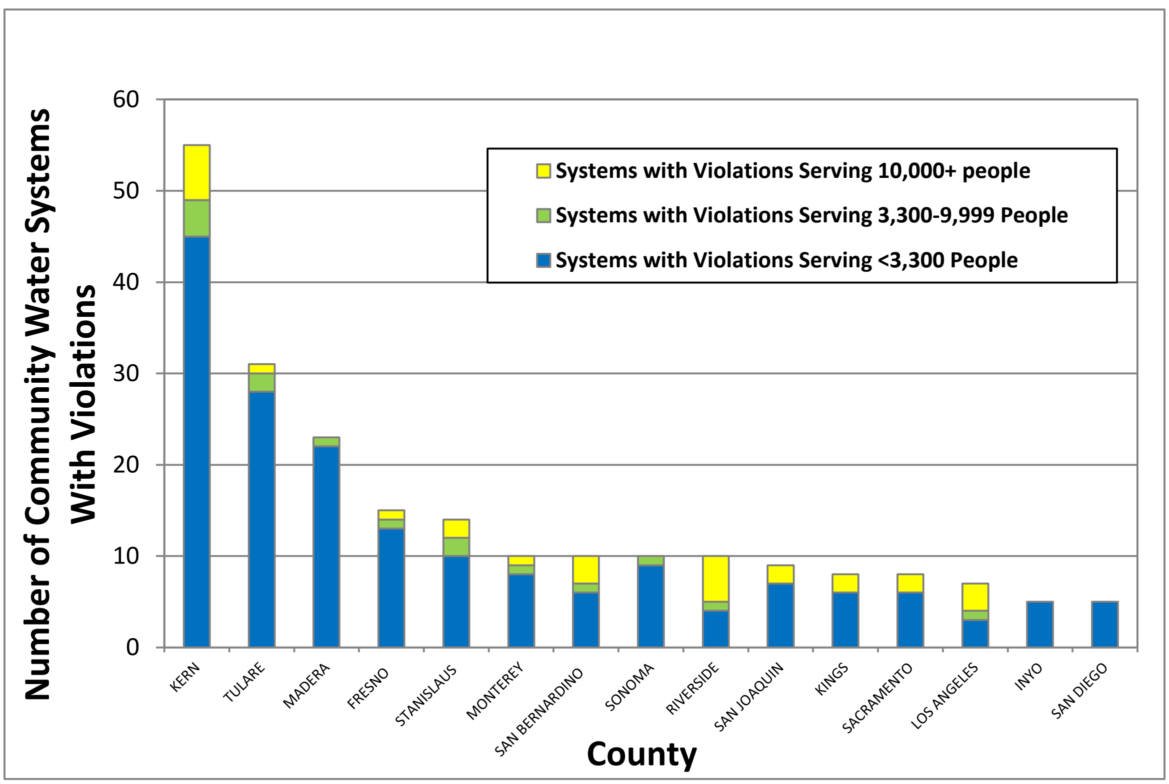


Figure 4.3: Top 15 Counties, Number of Community Water Systems that Rely on a Contaminated Groundwater Source and have Received a Notice of an MCL Violation- Population Served (2002-2010)

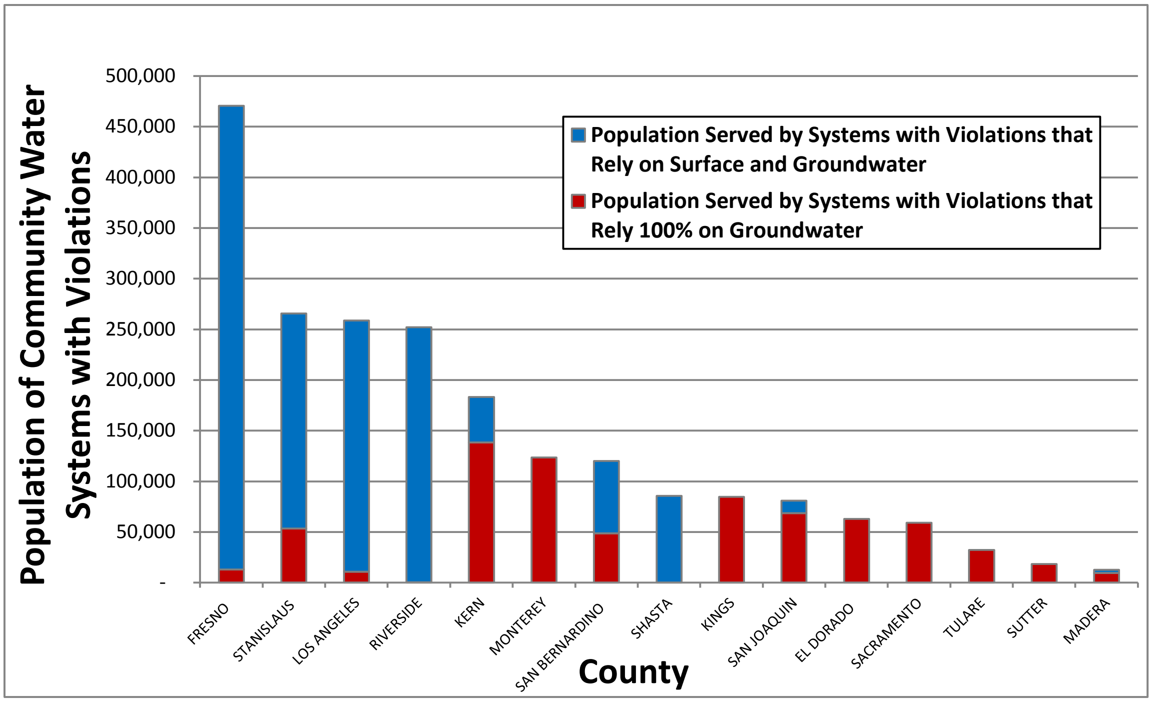


Figure 4.4: Top 15 Counties, Population of Community Water Systems that Rely on a Contaminated Groundwater Source <u>and</u> have Received a Notice of an MCL Violation (2002-2010)

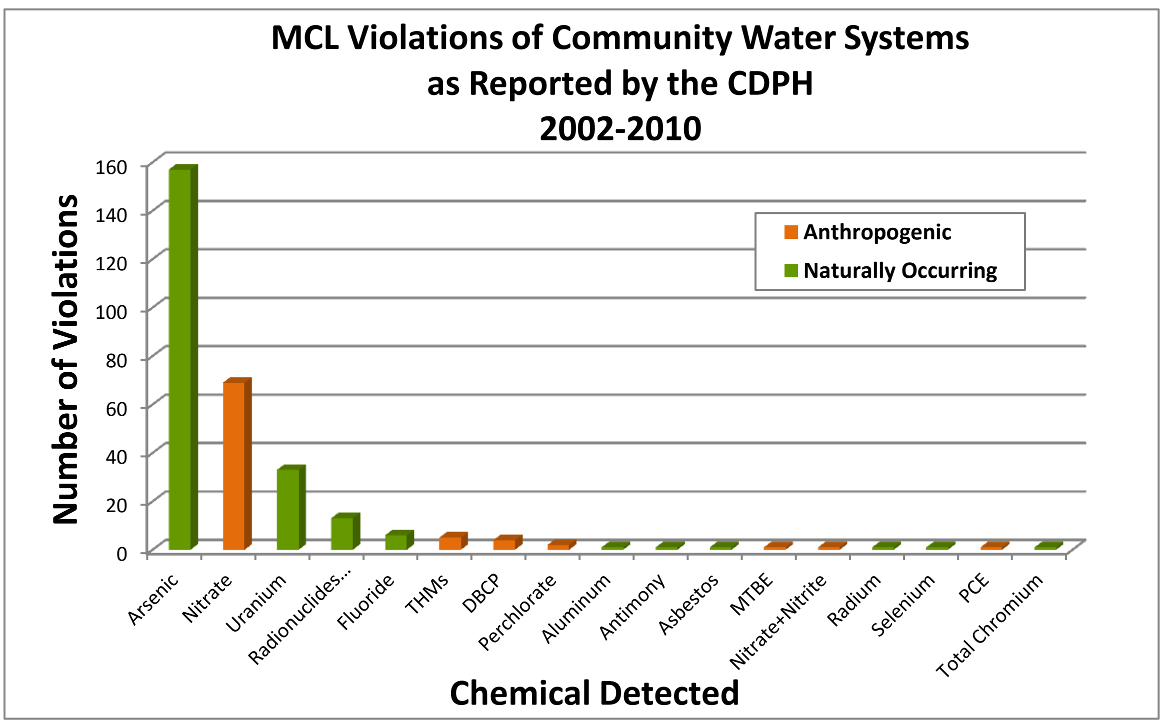


Figure 4.5: Number of Community Water Systems that Rely on a Contaminated Groundwater Source <u>and</u> have Received a Notice of an MCL Violation, by Principal Contaminant (2002-2010)

APPENDIX 5 – POTENTIAL SOLUTIONS TO CLEANUP, TREAT, OR PROVIDE ALTERNATIVE WATER SUPPLIES

APPENDIX 5: POTENTIAL SOLUTIONS TO CLEANUP, TREAT, OR PROVIDE ALTERNATIVE WATER SUPPLIES

This appendix summarizes potential solutions to cleanup, treat, or provide alternative water supplies for community public water systems (community water systems) that rely on a contaminated groundwater source for drinking water.

5.1 Overview of Solutions to Address Groundwater Contamination

Solutions to address groundwater contamination affecting drinking water supplies are well known and well established, and fall into three general broad categories:

1) Provide safe drinking water through treatment or use of an alternative supply
2) Cleanup contaminated groundwater
3) Implement a pollution prevention and source water protection program to prevent re-contamination

Each of these categories are discussed in greater detail below. A summary of typical activities used to address contamination problems, potential obstacles, and options for addressing those obstacles is included (see Table 5.1).

Table 5.1: Cleanup, Treat, or Provide Alternative Sources of Water Supply - Potential Obstacles and Options to Address Obstacles			
Goal	**Related Activities for Achieving Goal**	**Potential Obstacles**	**Options to Address Obstacles**
Provide Safe Drinking Water	Consolidation Self-supply New well Treatment Surface water	Costs Fund availability Location/environment, and availability of clean alternative groundwater or surface supplies Planning and infrastructure support may not be available Multiple contaminants in a well may affect treatment options	Highlight benefits of consolidation, provide seed money for consolidation efforts Make public funds available for meeting other existing public funding criteria Increase available funding
Groundwater Cleanup	Groundwater cleanup programs (USTCF, others)	Scale Cost Fund availability Naturally-occurring contaminants	Support programs that help clean up known groundwater contamination Support efforts to identify sources of groundwater contamination Focus on methods to provide clean drinking water
Pollution Prevention	Continue and support existing programs; Regulatory oversight Monitoring	Naturally-occurring contaminants Prevention too late	Continue to develop and strengthen existing regulatory efforts Expand regulation of emerging pollution sources For identified communities, focus on methods to provide clean drinking water

5.2 Background

When contamination is identified in a community water system's well, that system typically must take the following actions:

- Promptly issue a public notification to the customers that the water supply is contaminated. Such a notification is required when the water delivered to customers exceeds a Maximum Contaminant Level (MCL). The notification is required by both the State and Federal Safe Drinking Water Acts. The notification must continue as long as the water supplied to the public exceeds the MCL.

- Temporarily or permanently abandon the water well as a source of supply, especially if the well exceeds the MCL.

- Begin to develop a plan to provide water that meets the MCLs. This may require the community water system to provide treatment, develop a new source, or connect to another public water system.

For some sources, following cleanup of the contamination source, it may be possible to resume using the source as a supply of clean drinking water. However, the success of a groundwater cleanup effort is often dependent on whether the source of the contamination is a point source (e.g., leaking underground fuel tank) or nonpoint source (e.g., agricultural runoff). Other factors that can affect the success of groundwater cleanups include local land use, population density, distribution of the contaminant, and location of the contaminant source. Cleanup time varies.

When MCLs are exceeded, the California Department of Public Health (CDPH) works actively with community water system personnel to help them determine their options and explore solutions. For small communities, impacts to individual ratepayers may be high.

5.3 Provide Safe Drinking Water

Portions of California’s groundwater contain high concentrations of naturally occurring contaminants or have become contaminated due to anthropogenic related activities. For these areas, pollution prevention and/or cleanup may be infeasible, take too long, or lack funding. In these areas, a practical solution to groundwater contamination is to focus on the provision of safe drinking water. The most common types of solutions include:

- Consolidation with a Neighboring Public Water System
- Alternative Sources (Bottled Water)
- Drill a New Well
- Treatment
- Switch to Surface Water Supply

These solutions, as well as associated obstacles and potential options to address those obstacles, are discussed further below.

5.3.1 Consolidation with a Neighboring Public Water System

Consolidation with a sufficient and safe neighboring community water system can be one of the most effective long-term solutions.

Consolidation refers to both the physical interconnection and the regionalization and restructuring of the two water systems. Full consolidation may take years to complete but initial activities could include development of operator agreements (contractual agreements, development of joint-powers agencies) that will lead to the eventual merging of the water systems. A regionalized approach could also result in the consolidation of other systems.

Consolidation of smaller community water systems increases the customer base, which makes treatment more affordable for a group of smaller systems, and may also increase management efficiency and oversight of system resources. A report funded by the US Environmental Protection Agency summarizing the benefits and drawbacks of consolidation made the following findings (Manning et al., 2005).

Potential Benefits:

- Can increase economies of scale, spreading capital, operation, and maintenance costs over a larger population thereby lowering the per customer base ratepayer costs.
- Greater access to capital. Borrowing is easier, so necessary improvements can be made, including improvements required to meet existing water quality health standards and testing requirements.
- With a fewer number of overall systems, it is easier for state or federal agencies to fund improvement efforts.
- State regulators can focus on fewer systems, and can spend time assisting a greater percentage of overall systems (and a greater percentage of the overall state population).
- Creating a more diverse customer base can lead to greater access to grant and public funding.
- Duplicated services can be reduced or eliminated, saving money in terms of costs associated with equipment, maintenance, billing, and other management issues.
- Can create a more reliable water source, and an affordable means of complying with state and federal regulations.
- Can access more skilled employees.

Potential Obstacles:

- Consolidation may result in loss of identity for a local community. However, loss of perceived independence or identity may not outweigh desire for clean, affordable drinking water.
- Systems that merge or acquire other systems may absorb those acquired systems' debts.
- May result in loss of jobs.
- Customers may be confused as to who provides their drinking water.
- Initial costs may be a barrier.
- Local political barriers can be significant.
- Management goals of multiple systems may conflict.

5.3.2 Alternative Sources (Bottled Water)

When a community water system cannot reliably provide a clean source of drinking water, residents may have to rely upon self-supplied alternative sources. In most cases, the self-supplied alternative source is bottled water, purchased at an additional cost by the consumer, used for cooking and consumption.

Use of bottled water as an alternative source effectively causes consumers to pay twice for their drinking water – for the contaminated water supplied by the community water system, and for the purchased bottled water. The costs associated with purchasing bottled water can be a significant financial hardship.

5.3.3 Drill a New Well

When contaminated groundwater is present, a community water system may be able to drill a new well into a portion of an aquifer that is not contaminated. When possible, drilling a new well offers a proven and reliable method of providing clean drinking water. However, costs associated with drilling a new well may be significant, and may prevent some smaller communities from pursuing this action.

There can be significant uncertainties related to a new well. Water quality can change following the transition to a new well. Contaminants can migrate through conduits and fractures or by improperly constructed wells, which can degrade the new well's water quality.

5.3.4 Treatment

Methods used to treat contaminated groundwater have been used in some locations for decades. Treatment can take several forms: blending, large-scale treatment systems, wellhead treatment systems, and point-of-use/point-of-entry (POU/POE) systems that are used in homes or residences.

Although treatment can be very effective in addressing groundwater contamination, there are often significant associated costs. Many of the 680 community water systems that rely on a contaminated groundwater source for drinking water (see Appendix 1) are already treating their groundwater, and likely are absorbing the treatment costs in the form of higher ratepayer fees. Costs associated with treatment include planning, construction of a treatment facility, infrastructure development, operation and maintenance (O&M) and waste disposal. Some communities cannot afford treatment costs. Funding options for communities that need assistance are addressed in Appendix 6.

5.3.5 Switch to Surface Water

Some community water systems may be able to address their contaminated groundwater issues through use of available surface water sources. However, there can be obstacles associated with surface water sources, including costs associated with planning, treatment, and availability (surface water purchases). Surface water treatment is significantly more complex than treatment of groundwater, and will result in much higher O&M costs and water rates. The distance from a surface water source may prohibit delivery of that water to a community. Water rights considerations may also limit the availability of some surface water sources.

5.3.6 Private Domestic Wells and Other Non-Community Systems

In addition to community water systems regulated by CDPH, there are other individuals and groups that rely on groundwater for domestic supply. Private domestic well users, state small systems, and local small systems rely on groundwater, and are not addressed by this report-- primarily due to a lack of data or access to data. In many cases, these systems and groundwater users do not know the quality of their groundwater, because they do not regularly test their water supply.

When contamination is detected in these types of communities, cleanup options are generally very limited. Groundwater cleanup efforts can be very costly and many private domestic well owners may not be able to afford a remediation system. Grants and interest free loans are typically not provided to these groundwater users.

Treatment systems may be a cost effective method of addressing groundwater contamination for very small systems (that serve less than 15 service connections or 25 persons regularly) and private well owners since they have no source of group funding as do the community water systems. These treatment options usually include POU/POE devices. The CDPH maintains a certification program for water treatment devices sold for residential use in California that make a health benefit claim, as required by the Health and Safety Code. A directory of certified water treatment devices can be found on the CDPH website at:
http://www.cdph.ca.gov/certlic/device/Pages/WTDDirectory.aspx.

Wellhead protection strategies are effective in reducing sources of contamination. These strategies include proper maintenance of a well, and enforcing land-use setbacks from the well. The State Water Resources Control Board (State Water Board) has published a guide for private well owners, available at:
http://www.waterboards.ca.gov/gama/docs/wellowner_guide.pdf (also available online in Spanish).

5.4 Cleanup Groundwater

Groundwater cleanup efforts can be very effective in preventing the spread of groundwater pollution and in lowering levels of contamination. There are thousands of groundwater cleanup and remediation sites across the state.

The State Water Board and Regional Water Quality Control Boards (Water Boards) manage and oversee cleanup activities at thousands of former underground storage tank (UST) sites where leaks have impacted groundwater. The State Water Board's GeoTracker Groundwater Ambient Monitoring and Assessment (GAMA) groundwater information system can be used to show the locations of active and past groundwater site cleanups managed by the Water Boards. The database shows that there are over 125,000 groundwater monitoring wells associated with several thousand groundwater cleanup sites throughout the state. The Department of Toxic Substances Control (DTSC) also oversees groundwater cleanup operations at former industrial facilities and other locations where industrial activities and other leaks have impacted local groundwater quality. Monitoring wells provide no cleanup of contamination. Continued oversight and remediation at these sites will result in cleaner groundwater for Californians.

The effectiveness of a groundwater cleanup effort is often dependent on several factors:

- Type of contaminant (naturally occurring or anthropogenic)
- Amount of contamination
- Geology and other site conditions
- Cleanup costs
- Available funding

In general, cleanup of naturally occurring groundwater contamination is not possible. Naturally occurring contaminants enter groundwater as a result of interaction between water and naturally occurring materials. Preventing naturally occurring contaminants from entering groundwater is not feasible.

Groundwater cleanup is expensive, which can be an obstacle for addressing contamination. Funding for large-scale cleanup efforts may not be available, and even small cleanup efforts can be prohibitively expensive. The current funding available through state and federal funding programs cannot address all of the groundwater contamination in California. Furthermore, some types of pollutants are not addressed by current programs that fund groundwater cleanup efforts (e.g., nitrate contamination from agriculture).

In summary:

- **Potential Solutions**: Continue to fund cleanup efforts as much as possible, where feasible. Continue oversight of existing cleanup activities. Continue monitoring efforts to detect new areas of groundwater contamination and to assess the effectiveness of cleanup actions.

- **Obstacles**: Costs associated with groundwater cleanup are high; there are insufficient funds to cleanup all identified contaminated groundwater.

5.5 Pollution Prevention

Pollution prevention is the most effective way to ensure sustainable safe drinking water. Numerous local, state, and federal agencies implement pollution prevention strategies, including:

- Water Boards
- Local Environmental Health Agencies (city and county level)
- County or Regional Special Districts
- Department of Toxic Substances Control
- California Department of Public Health
- California Department of Food and Agriculture
- Department of Pesticide Regulation
- United States Environmental Protection Agency

The State Water Board manages several pollution prevention and monitoring programs, including projects for non-point source pollutants, underground storage tanks, spill and cleanup sites, landfills, and other types of industrial activities. Comprehensive groundwater monitoring is a key component of pollution prevention, helping establish ambient water quality conditions and serving as an early-warning system for emerging contaminants and other pollutants. Continued oversight of existing and potential pollution sources will help to prevent future groundwater contamination.

Pollution prevention is not an effective solution for naturally occurring contaminants. These chemical constituents are found in groundwater not because of pollution, but simply due to natural geologic and environmental conditions (e.g., arsenic). In addition, pollution prevention is most effective where groundwater contamination has not yet occurred. This report has identified hundreds of community water systems where groundwater contamination has already occurred and is an issue for drinking water supplies. While pollution prevention may prevent increases in existing contamination levels, or may prevent contamination by a new principal contaminant, pollution prevention may not result in cleaner groundwater than what is already available. For these areas, pollution prevention may not be an effective solution to ensure safe drinking water.

In summary:

- **Potential Solutions**: Continue funding and support of pollution-prevention and monitoring programs, including those by the Water Boards, DTSC, CDPH, and local environmental health agencies. Continue oversight for identified sources of pollutants (USTs, industrial facilities, waste discharges, others), and strengthen oversight for new and emerging sources of contaminants (fertilizers, pesticides, non-point sources).

- **Obstacles**: Cannot prevent naturally occurring contaminants. Non-point source contaminants are often difficult to regulate and monitor. Groundwater is already contaminated in many areas, and pollution prevention is too late. Unknown contaminants and pollutant sources. Costs.

APPENDIX 6 – FUNDING OPTIONS

APPENDIX 6: FUNDING OPTIONS

This appendix addresses existing or potential future funding options to clean up or treat groundwater, or to provide alternative water supplies, to ensure the provision of safe drinking water to community public water systems (community water systems) that rely on a contaminated groundwater source for drinking water.

6.1 Community Water Systems that Rely on a Contaminated Groundwater Source that Have Received or are Actively Seeking Funding

The California Department of Public Health (CDPH) provided a list of community water systems that were receiving or actively seeking funds to address a water quality issue. The CDPH data was compared to the 680 communities that rely on a contaminated groundwater source for drinking water identified in this report (see Appendix 8). Information on which systems have actually received funding was not available.

As of October 2011, 166 systems (24 percent) were not receiving or actively seeking funding to address their water quality issues. Forty-two of the 166 systems that were not receiving or seeking funding have also received a notice of an MCL violation during the most recent CDPH compliance cycle (see Figure 6.2 and Table 6.1). Of these 42 systems, six are federal or state facilities that are not eligible for public funding from CDPH.

The six counties with the highest number of community water systems with MCL violations that were not receiving or actively seeking funding were Kern, Stanislaus, Fresno, Madera, San Bernardino, San Joaquin, and Tulare. The principal contaminants affecting these communities were arsenic, nitrate, radionuclides (gross alpha), and uranium (see Table 6.2).

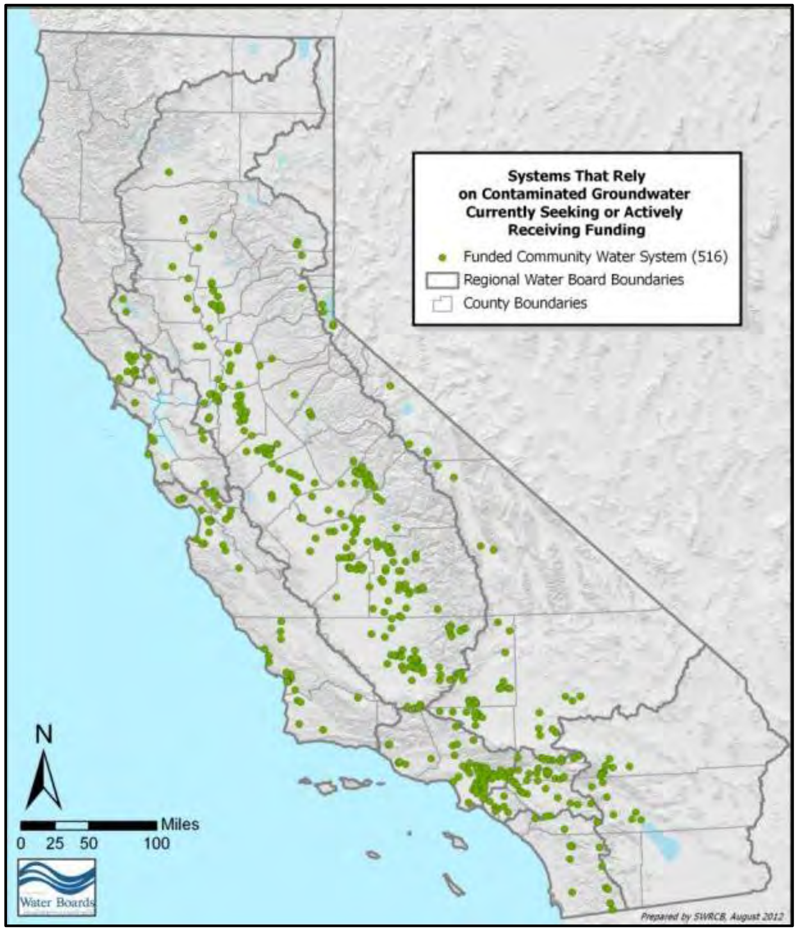


Figure 6.1: Identified Community Water Systems Receiving or Actively Seeking Funding to Address Identified Drinking Water Quality Issues (514 systems as of October 2011)

Source: Safe Drinking Water State Revolving Fund, Proposition 50 & 84, and American Recovery and Reinvestment Act of 2009 (ARRA) priority funding lists maintained by the California Department of Public Health

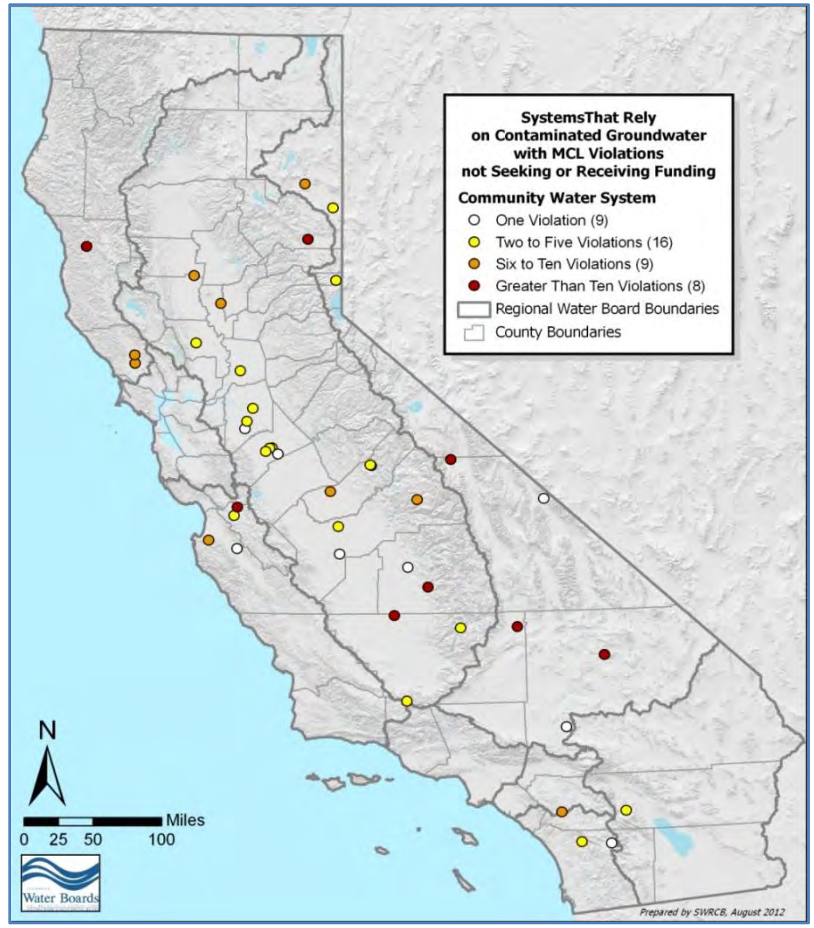


Figure 6.2: Identified Community Water Systems with MCL Violations (2002-2010) That are <u>Not</u> Receiving or Actively Seeking Funding to Address Identified Drinking Water Quality Issues (42 systems, as of October 2011)

Source: Safe Drinking Water State Revolving Fund, Proposition 50 & 84, and American Recovery and Reinvestment Act of 2009 (ARRA) priority funding lists maintained by the California Department of Public Health and the CDPH PICME Database

Table 6.1: Community Water Systems that Rely on a Contaminated Groundwater Source, with MCL Violations, <u>NOT</u> Receiving or Actively Seeking Funding to Address Identified Drinking Water Quality Issues

Public Water System Number	County	System Name	Chemical Violation	Number of Violations	Population Served
1000445	Fresno	LINDA VISTA FARMS	Uranium	1	61
1000472	Fresno	PG&E HELMS SUPPORT FACILITY	Arsenic	8	36
1000585	Fresno	MURRIETA/HERNANDEZ FARMS	Nitrate (as NO_3)	4	4
1400155	Inyo	CONTROL GORGE POWER PLANT	Arsenic	16	36
1410504	Inyo	NPS - DEATH VALLEY, GRAPEVINE RS	Arsenic	1	4
1510028	Kern	MIL POTRERO MWC	Arsenic	2	1,800
1510049	Kern	CWS - LAKELAND	Fluoride (natural), Radionuclides	2	683
1510802	Kern	KERN VALLEY STATE PRISON	Arsenic	13	6,546
1805004	Lassen	HIGH DESERT STATE PRISON	Arsenic	10	10,950
1810700	Lassen	SIERRA ARMY DEPOT-HERLONG	Uranium	3	1,500
2000524	Madera	SKY ACRES MUTUAL WATER CORP	Arsenic	1	90
2000688	Madera	ECCO	Arsenic	2	100
2010801	Madera	VALLEY STATE PRISON FOR WOMEN	Arsenic	8	4,000
2310011	Mendocino	LAYTONVILLE COUNTY WATER DISTRICT	Arsenic	13	1,301
2710021	Monterey	CAL AM WATER COMPANY - TORO	Arsenic	6	1,296
2710851	Monterey	SALINAS VALLEY STATE PRISON	Nitrate (as NO_3)	1	6,585
2910010	Nevada	TRUCKEE-DONNER PUD - HIRSCHDALE	Arsenic	2	48
3210003	Plumas	CITY OF PORTOLA	Arsenic	12	2,500
3310046	Riverside	FARM MUTUAL W.C. (THE)	Total Trihalomethanes	8	3,335
3410008	Sacramento	ELK GROVE WATER SERVICE	Arsenic	3	35,567
3500527	San Benito	VALENZUELA WATER SYSTEM	Nitrate (as NO_3)	2	55
3600012	San Bernardino	APPLE VALLEY VIEW MWC	Fluoride (natural)	1	200
3610705	San Bernardino	US ARMY FORT IRWIN	Arsenic	19	16,000

Table 6.1 (cont.): Community Water Systems that Rely on a Contaminated Groundwater Source, with MCL Violations, NOT Receiving or Actively Seeking Funding to Address Identified Drinking Water Quality Issues

Public Water System Number	County	System Name	Chemical Violation	Number of Violations	Population Served
3610854	San Bernardino	SEARLES VALLEY MINERALS OPERATIONS INC	Arsenic	12	2,100
3900653	San Joaquin	ISLANDER MARINA	Radionuclides	1	150
3910701	San Joaquin	DEFENSE DISTRIB. DEPOT, SHARPE SITE	Arsenic	3	1,650
4900676	Sonoma	SEQUOIA GARDENS MOBILE HOME PARK	Arsenic	7	300
4900723	Sonoma	SHAMROCK MOBILE HOME PARK	Arsenic	9	188
5000051	Stanislaus	MOBILE PLAZA PARK	Arsenic	2	125
5000077	Stanislaus	CERES WEST MHP	Arsenic	4	161
5000316	Stanislaus	CURTIS INVESTMENTS	Arsenic	1	42
5403110	Tulare	SIERRA MUTUAL WATER CO	Nitrate (as NO_3)	13	39
5700571	Yolo	MADISON SERVICE DIST	Nitrate (as NO_3)	2	876
600013	Colusa	PRINCETON WATER DISTRICT	Arsenic	7	356
3301588	Riverside	Royal Carrizo HOA	Uranium	4	25
3500810	San Benito	WHISPERING PINES INN	Arsenic	13	100
3700958	San Diego	LOS TULES MUTUAL WATER COMPANY	Radionuclides	1	140
3710012	San Diego	RANCHO PAUMA MUTUAL WC	Nitrate (as NO_3)	3	500
3900649	San Joaquin	GLENWOOD MOBILE HOME PARK	Nitrate (as NO_3)	3	100
5000389	Stanislaus	MONTEREY PARK TRACT COMMUNITY SERVICE DI	Arsenic, Nitrate (as NO_3)	5	186
5110003	Sutter	YUBA CITY GROUNDWATER-REGION 2-3	Arsenic	8	10,200
5410003	Tulare	EXETER, CITY OF	1,2-Dibromo-3-chloropropane (DBCP)	1	10,730

Source: Safe Drinking Water State Revolving Fund, Proposition 50 & 84, and American Recovery and Reinvestment Act of 2009 (ARRA) priority funding lists maintained by the CDPH. Violation data from the CDPH's Permits, Inspections, Compliance, Monitoring, and Enforcement (PICME) System Information database.

Table 6.2: Principal Contaminants in Community Water Systems that Rely on a Contaminated Groundwater Source, with MCL Violations, NOT Receiving or Actively Seeking Funding to Address Identified Drinking Water Quality Issues

Principal Contaminant	Number of Identified Community Water Systems with MCL Violations	County (Number of MCL Violations)
Arsenic	26	San Bernardino (31), Inyo (17), Sonoma (16), Kern (15), San Benito (13), Mendocino (13), Stanislaus (11), Plumas (12), Lassen (10), Madera (11), Sutter (8), Fresno (8), Monterey (6), Sacramento (3), San Joaquin (3), Nevada(2),
Nitrate	8	Tulare (13), Stanislaus (5), Fresno (4), San Diego (3), San Joaquin (3), San Benito (2), Yolo (2), Monterey (1)
Radionuclides	3	Kern (2), San Joaquin (1), San Diego (1)
Uranium	3	Riverside (4), Lassen (3), Fresno (1)
Fluoride (natural)	2	Kern (2), San Bernardino (1)
Total Trihalomethanes (THMs)	1	Riverside (8)
1,2-Dibromo-3-chloropropane (DBCP)	1	San Bernardino (1)

Note: Some community water systems have MCL violations for multiple contaminants. See Table 6.1
Source: Safe Drinking Water State Revolving Fund, Proposition 50 & 84, and American Recovery and Reinvestment Act of 2009 (ARRA) priority funding lists maintained by the CDPH. Violation data from the CDPH's Permits, Inspections, Compliance, Monitoring, and Enforcement (PICME) System Information database

6.2 Funding Sources and Needs

The identification of systems that are not receiving funding, despite known drinking water quality issues, will help CDPH, the State Water Resources Control Board (State Water Board), and other agencies prioritize available resources to help ensure that those communities serve safe drinking water. These funding sources are described in detail below. The known or anticipated needs of community water systems for infrastructure upgrades, repairs, and construction, are also discussed.

6.2.1 CDPH Funding Sources

CDPH administers and oversees several sources of funds to address drinking water quality issues. The total amount distributed from these sources can be substantial; for fiscal year 2010-2011, CDPH distributed approximately $375 million directly to community water systems in the form of grants and loans to address clean drinking water issues (see Table 6.3). This value includes approximately $190 million for disadvantaged communities (where the median household income was less than 80% of the state average), and approximately $75 million for small water systems with less than 3,300 people. The sources of these funds are summarized below:

1. **The Safe Drinking Water State Revolving Fund (SRF):** CDPH uses the resources of the SRF for low interest loans or grants to enable water systems to fund necessary infrastructure improvements. CDPH manages SRF resources to fund projects that ensure community water systems are able to provide an adequate, reliable supply of safe drinking water that conforms to federal and state drinking water standards. The funds are provided from the federal government, with 20 percent state matching. Interest and loan repayments are re-incorporated into the fund. Over the last three years (2009-2011), the SRF received an additional $160 million as part of the federal American Reinvestment and Recovery Act (ARRA).

   Current Status: Ongoing allocations of approximately $100 million to $150 million per year.

2. **Proposition 50 Bond Funding:** California voters passed Proposition 50 (The Water Security, Clean Drinking Water, Coastal and Beach Protection Act) in 2002. CDPH is responsible for portions of this act that deal with water security, safe drinking water, and treatment technology. It allocated approximately $500 million to CDPH for use as direct grants and loans to community water systems for infrastructure development, construction, and maintenance. Proposition 50 also allocated funds to other agencies including the State Water Board, and Department of Water Resources (DWR).

Current Status: Fully allocated, no longer accepting applications. Funds will likely be exhausted as of 2014.

3. **Proposition 84 Bond Funding:** California voters passed Proposition 84 (The Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Act) in 2006. It allocated approximately $250 million to CDPH for grants and loans to systems for drinking water planning and infrastructure. This $250 million allotment included $60 million specifically earmarked for use as grants to reduce or prevent contamination of groundwater that serves as a source of drinking water. Proposition 84 also allocated funds to DWR for use in Integrated Regional Watershed Management (IRWM) planning and development.

   Current Status: CDPH component is fully allocated, no longer accepting applications. Funds will likely be exhausted as of 2012.

TABLE 6.3: CDPH FUNDING SOURCES SUMMARY, FISCAL YEAR 2010-2011

CDPH Funding Source	Type of Project[1]	Number Funded	Amount[2]
Safe Drinking Water State Revolving Fund (SRF)	**All SRF Projects**	**26**	**$235,099,088**
	Planning Projects	2	$2,665,430
	Construction Projects	18	$232,433,658
	To Disadvantaged Communities[3]	19	$137,823,735
	To Schools and Universities	2	$244,500
	To Small Water Systems (<3,300 people)	10	$9,244,160
Proposition 50	**All Proposition 50 Projects**	**16**	**$87,179,658**
	Planning Projects	0[4]	0
	Construction Projects	16	$87,179,658
	To Disadvantaged Communities[3]	7	$7,022,608
	To Schools and Universities	0	0
	To Small Water Systems (<3,300 people)	6	$25,029,262
Proposition 84 (CDPH)	**All Proposition 84 Projects**	**50**	**$51,806,421**
	Planning Projects	NA[6]	NA[6]
	Construction Projects	NA[6]	NA[6]
	To Disadvantaged Communities[3]	47	$38,959,121
	To Schools and Universities	14	$4,930,703
	To Small Water Systems (<3,300 people)	NA[6]	NA[6]
	Groundwater-Specific Programs[5]	8	$39,344,348
TOTAL OF ALL CDPH SOURCES[1]	**SRF, PROPOSITION 50, & PROPOSITION 84**	**92**	**$374,085,167**

Notes:
1. Includes both surface water and groundwater projects
2. The sum of dollar amounts within each subcategory may not add up to listed total for all projects, because some types of projects overlap. For example, dollar amounts listed under “construction projects” may also be included in dollar amounts for “disadvantaged communities” and/or “small water systems.”
3. CDPH defines “disadvantaged community” as having a median household income of less than 80% of the statewide median household income.
4. CDPH Proposition 50 funding does not fund planning projects
5. CDPH Proposition 84 funding included funds specifically designated for use in groundwater projects.
6. Specific counts and dollar amounts for this category are Not Available (NA).

6.2.2 Additional Sources of Current Funding

Other agencies, in addition to CDPH, have distributed money to community water systems over the past ten years. Both DWR and the State Water Board received bond funds to address water quality. In total, DWR and the State Water Board received approximately $1.7 billion to address water quality and water use over the last decade (see Table 6.4) through Proposition 50 and Proposition 84. However, these funds were not specifically allocated to community water systems to improve drinking water quality. State Water Board funds from Proposition 50 are fully allocated and/or spent; only the $1 billion allocated to DWR for IRWM planning and implementation will have funds remaining (approximately $774 million, as of October 2011).

In summary, while significant public funding has allowed extensive progress in maintaining and fixing California's drinking water infrastructure, the amount of remaining funds that are available for this purpose will decrease over the next few years as the Propositions 50 and 84 bond funds are exhausted. Only SRF allocations funded by CDPH and IRWM projects funded by DWR will continue to provide state grants and loans for drinking water quality infrastructure needs beyond 2012.

TABLE 6.4: SELECTED PUBLIC FUNDING SOURCES THAT MAY BE USED TO ADDRESS DRINKING WATER QUALITY ISSUES, 2002-2012

Funding Source	Type of Project	Total Starting Amount[1]	Status[2]
Proposition 50 (CDPH)	Public Water Systems/Community Water Systems	$50,000,000	Fully allocated beyond 2012
	Small systems: monitoring, treatment, infrastructure	$14,000,000	
	Grants for treatment and contaminant removal	$14,000,000	
	Grants for water quality monitoring	$14,000,000	
	Source water protection	$14,000,000	
	Colorado River Use Reduction	$260,000,000	
	Contaminant Treatment	$25,000,000	
	UV/Ozone to address MCL Violation	$25,000,000	
	CDPH Proposition 50 Total	**$508,000,000**	**Fully Allocated**
State Revolving Fund (CDPH)	**CDPH State Revolving Fund Annual Total**	**$150,000,000 (approx.)[3]**	**$150,000,000[3]**
Proposition 50 (DWR)	Projects consistent with an adopted Integrated Regional Water Management Plan	$250,000,000	Fully allocated beyond 2012
	DWR Proposition 50 Total	**$250,000,000**	**NA**
Proposition 50 (State Water Board)	Pollution prevention, reclamation, water quality improvement, blending and exchange projects, source protection, others	$100,000,000	Fully allocated beyond 2012
	Restore/protect surface and groundwater	$100,000,000	
	Projects consistent with an adopted Integrated Regional Water Management Plan	$250,000,000	
	State Water Board Proposition 50 Total	**$450,000,000**	**Fully Allocated**
American Reinvestment and Recovery Act (ARRA)	For deposit into the Safe Drinking Water State Revolving Fund	$160,000,000	Fully Allocated
	CDPH ARRA Total	**$160,000,000**	**Fully Allocated**
Proposition 84 (CDPH)	Emergency Clean Water Grants	$10,000,000	Fully allocated beyond 2012
	Small community Infrastructure and nitrate	$180,000,000	
	Grants to reduce or prevent contamination of groundwater that serves as a source of drinking water	$60,000,000	
	CDPH Proposition 84 Total	**$250,000,000**	**Fully Allocated**
Proposition 84 (DWR)	Integrated Regional Water Management Planning and Implementation	$1,000,000,000	<$774,000,000[4]
	DWR Proposition 84 Total	**$1,000,000,000**	**<$774,000,000[4]**

(notes for Table 6.4 are on next page)

Notes For table 6.4:

1. Total available funds based upon amounts allocated as found within the California Water Code and original Proposition language, except where as noted otherwise.
2. "Status" refers to the estimated status of funds remaining in each respective funding source.
3. SRF funds vary annually, based upon allocation from federal government, previous year's expenditures, loan and interest repayment, and state matching funds. The value shown here is an approximation based upon previous SRF expenditures and CDPH 2011-2012 Intended Use Plan (CDPH, 2011).
4. As of October 2011. DWR IRWM funding is ongoing; this number will likely change.

6.2.3 Drinking Water Infrastructure Needs

Drinking water infrastructure needs – including water quality monitoring, treatment and contaminant removal, new wells, equipment, and operational needs – far exceed the amount of funds that are available. CDPH estimates of unmet need, based upon applications for financial assistance that is has received, are approximately $2 billion. However, after 2012, only CDPH's SRF and DWR's IRWM will be available for infrastructure and planning projects.

Every four years, the United States Environmental Protection Agency (USEPA) estimates the twenty-year capital improvement necessary for water systems to continue to provide safe drinking water to the public. The USEPA has estimated that the unmet need for transmission/distribution, source development, treatment, storage, and other infrastructure problems is $39 billion over the next twenty years (USEPA Needs Analysis, 2007, http://water.epa.gov/infrastructure/drinkingwater/dwns/upload/2009_03_26_needssurvey_2007_report_needssurvey_2007.pdf).
Of this total, $7.5 billion were estimated as costs associated with treatment.

In summary, the past decade has seen large investments in California's drinking water infrastructure. These investments have significantly improved the ability of communities to deliver safe drinking water that meets all public health standards. However, there is a remaining need. The SRF will address some of the unmet needs, but at the current rate of SRF distribution, it may take decades to address the known and expected drinking water quality issues.

6.3 Potential Funding Options

CDPH, DWR, and the State Water Board have historically provided the bulk of public funds available for drinking water infrastructure improvements. However, there are additional sources of revenue that have been used in the past, and that may be available in the future through legislative action. These additional sources are described below.

- HUD: Housing and Urban Development (HUD). The Community Development Block Grant (CDBG) program is a flexible program that provides communities with resources to address a wide range of development needs. Beginning in 1974, the CDBG program is one of the longest continuously run programs at HUD.

- New Bond Funding: A new bond initiative could provide an additional source of funds for drinking water infrastructure improvements. Bond funds would require legislation and approval by the voters.

- Funding from the Waste Discharge Permit Fund (WDPF): Appropriation would require legislative approval as a part of the state budget process. Additional fee revenue could be generated in a number of ways, including an increase in the current surcharge on the WDPF fee, or imposing a fee on those dischargers that could affect groundwater and are not paying a fee.

- Federal Funds: There are federal agencies that provide loans and grants to communities to address drinking water quality issues. HUD offers financial assistance to some communities. Other types of Federal funds would rely on an appropriation by Congress.

- Fee on Groundwater Use: Funds generated by assessing a new fee on groundwater use would require legislation that permits an assessment made on actual groundwater pumping or a tiered assessment on water purveyors that rely on groundwater.

- General Fund: General Fund appropriation would require an appropriation as part of the state budget process. General Fund is limited at this time and therefore an unlikely alternative.

6.4 MCL Violation and Current Funding Information for Community Water Systems That Rely on a Contaminated Groundwater Source for Drinking Water

This report identified 680 community water systems that rely on a contaminated groundwater source for drinking water where a principal contaminant was detected on two or more occasions above an MCL in an active supply well during the most recent CDPH compliance cycle (2002-2010).

Table 6.5 lists community water systems that rely on a contaminated groundwater source for drinking water and have been issued a CDPH MCL violation during the most recent CDPH compliance cycle (2002-2010). Available funding information provided by CDPH is also included (Source: Safe Drinking Water State Revolving Fund, Proposition 50 & 84, and American Recovery and Reinvestment Act of 2009 (ARRA) priority funding lists maintained by CDPH).

6.4.1 Definitions and Descriptions for Column Headings in Table 6.5

The following lists the column header descriptions for Table 6.5, which begins on the next page.

- **County** – County location of the community water system with the MCL violation, as provided by CDPH.

- **Public Water System Number** – The unique identification number assigned by CDPH to a community water system.

- **Public Water System Name** – The name of the community water system with an identified MCL violation.

- **Type of MCL Violation (2002-2010)** – The principal contaminant for which an MCL violation was issued by CDPH. Compliance data was supplied by CDPH for the most recent compliance cycle (2002-2010).

- **Funding Sources** – Lists community water systems that have applied for or are receiving funding from one or more of four sources, as identified by CDPH. These four sources are listed below. The list does not include information on the amount of funding a community has received, the purpose for which funding was provided or applied for, or information on funding that may have been received from other state agencies. Forty-two community water systems do not have known current funding sources.

  - Safe Drinking Water State Revolving Fund
  - Proposition 84 bond funding
  - Proposition 50 bond funding
  - Rural California Water Association

Table 6.5 Known Funding Sources for Identified Community Water Systems with MCL Violations							
County	Public Water System Number	Public Water System Name	Type of MCL Violation (2002-2010)	Funding Sources			
				Safe Drinking Water State Revolving Fund	Prop. 84	Prop. 50	Rural California Water Association
Butte	410004	CITY OF GRIDLEY	Arsenic	Yes	Yes		
Colusa	600008	COLUSA CO. W.D. #1 - GRIMES	Arsenic	Yes	Yes		
Colusa	600011	DEL ORO WATER CO.-WALNUT RANCH	Arsenic	Yes	Yes		
Colusa	600013	PRINCETON WATER DISTRICT	Arsenic				Yes
Contra Costa	706007	VILLA DE GUADALUPE	Nitrate	Yes	Yes		
Contra Costa	707615	DOUBLETREE RANCH WATER SYSTEM	Arsenic	Yes	Yes		
El Dorado	910002	SOUTH TAHOE PUD - MAIN	Arsenic	Yes	Yes		
El Dorado	910015	TAHOE KEYS WATER COMPANY	Tetrachloroethylene (PCE)	Yes			
Fresno	1000042	FCWWD #40/SHAVER SPRINGS	Gross Alpha, Arsenic, Uranium	Yes	Yes		
Fresno	1000053	LANARE COMMUNITY SERVICES DIST	Arsenic	Yes	Yes		
Fresno	1000056	MEADOW LAKES CLUB	Uranium	Yes	Yes		
Fresno	1000238	CAMDEN TRAILER PARK	Arsenic	Yes	Yes		
Fresno	1000359	FCSA #32/CANTUA CREEK	Total Trihalomethanes	Yes	Yes		
Fresno	1000366	SUNNYSIDE CONVALESCENT HOSP	Nitrate	Yes	Yes		
Fresno	1000369	ZONNEVELD DAIRY	Arsenic	Yes	Yes		
Fresno	1000445	LINDA VISTA FARMS	Uranium	No known current funding			
Fresno	1000472	PG&E HELMS SUPPORT FACILITY	Arsenic	No known current funding			
Fresno	1000585	MURRIETA/HERNANDEZ FARMS	Nitrate	No known current funding			
Fresno	1010005	FIREBAUGH CITY	Arsenic	Yes	Yes		
Fresno	1010007	FRESNO, CITY OF	1,2-Dibromo-3-chloropropane (DBCP)	Yes	Yes		
Fresno	1010028	RIVERDALE PUBLIC UTILITY DISTRICT	Arsenic	Yes	Yes		
Fresno	1010030	TRANQUILLITY IRRIGATION DIST	Arsenic	Yes	Yes		
Fresno	1010039	CARUTHERS COMM SERV DIST	Arsenic	Yes	Yes		
Inyo	1400006	Pine Creek Village	Uranium	Yes	Yes		
Inyo	1400036	Keeler Community Service District	Arsenic	Yes	Yes		
Inyo	1400037	Foothill Lone Pine Mobile Home Park, LLC	Arsenic, Uranium	Yes	Yes		
Inyo	1400155	Control Gorge Power Plant	Arsenic	No known current funding			

Table 6.5 Known Funding Sources for Identified Community Water Systems with MCL Violations (cont.)							
County	Public Water System Number	Public Water System Name	Type of MCL Violation (2002-2010)	Funding Sources			
				Safe Drinking Water State Revolving Fund	Prop. 84	Prop. 50	Rural California Water Association
Inyo	1410504	NPS - DEATH VALLEY, GRAPEVINE RS	Arsenic	No known current funding			
Kern	1500096	OLD RIVER MUTUAL WATER COMPANY	Uranium	Yes	Yes		
Kern	1500290	EDGEMONT ACRES MUTUAL WATER COMPANY	Arsenic	Yes	Yes		
Kern	1500364	KRVWC - KERNVALE MUTUAL WATER CO	Arsenic	Yes	Yes		
Kern	1500373	SEVENTH STANDARD MUTUAL	Nitrate	Yes	Yes		
Kern	1500378	MAHER MUTUAL WATER COMPANY	Arsenic	Yes	Yes		
Kern	1500405	AERIAL ACRES WATER SYSTEM	Arsenic	Yes	Yes		
Kern	1500406	TRADEWIND WATER ASSOC.	Uranium	Yes	Yes		
Kern	1500424	LANDS OF PROMISE MUTUAL WATER ASSOCIATIO	Arsenic	Yes	Yes		
Kern	1500426	ROSE VILLA APARTMENTS	Arsenic	Yes	Yes		
Kern	1500436	HUNGRY GULCH WATER SYSTEM	Arsenic	Yes	Yes		
Kern	1500449	FOURTH STREET WATER SYSTEM	Arsenic	Yes	Yes		
Kern	1500455	WILLIAM FISHER MEMORIAL WATER COMPANY	Arsenic	Yes	Yes		
Kern	1500458	R.S. MUTUAL WATER COMPANY	Arsenic, Uranium	Yes	Yes		
Kern	1500461	FOUNTAIN TRAILER PARK WATER	Arsenic	Yes	Yes		
Kern	1500475	KRISTA MUTUAL WATER COMPANY	Fluoride	Yes	Yes		
Kern	1500493	EL ADOBE POA, INC.	Arsenic	Yes	Yes		
Kern	1500494	WILSON ROAD WATER COMMUNITY	Nitrate	Yes	Yes		
Kern	1500521	BOULDER CANYON WATER ASSOCIATION	Arsenic	Yes	Yes		
Kern	1500525	LAKEVIEW RANCHOS MUTUAL WATER	Arsenic	Yes	Yes		
Kern	1500540	PINON HILL WATER COMPANY	Arsenic	Yes	Yes		
Kern	1500544	ENOS LANE PUBLIC UTILITY DISTRICT	Nitrate	Yes	Yes		
Kern	1500561	ROUND MOUNTAIN WATER COMPANY	Uranium	Yes	Yes		
Kern	1500569	VALLEY VIEW ESTATES MUTUAL WATER CO	Nitrate	Yes	Yes		
Kern	1500571	LUCKY 18 ON ROSAMOND, LLC	Arsenic	Yes	Yes		
Kern	1500584	GOOSELAKE WATER COMPANY	Nitrate	Yes	Yes		
Kern	1500585	OASIS PROPERTY OWNERS ASSOCIATION	Arsenic	Yes	Yes		
Kern	1502017	WHEELER FARMS HEADQUARTERS	Nitrate		Yes		

Table 6.5 Known Funding Sources for Identified Community Water Systems with MCL Violations (cont.)							
County	Public Water System Number	Public Water System Name	Type of MCL Violation (2002-2010)	Funding Sources			
				Safe Drinking Water State Revolving Fund	Prop. 84	Prop. 50	Rural California Water Association
Kern	1502232	ROSAMOND MOBILEHOME PARK	Uranium	Yes	Yes		
Kern	1502383	NORD ROAD WATER ASSOCIATION	Arsenic	Yes	Yes		
Kern	1502465	PANAMA ROAD PROPERTY OWNERS ASSOC	Arsenic	Yes	Yes		
Kern	1502569	FIRST MUTUAL WATER SYSTEM	Arsenic	Yes	Yes		
Kern	1502597	DEL SOL WATER CO-OP	Uranium	Yes	Yes		
Kern	1502622	GOSFORD ROAD WATER COMPANY	Arsenic	Yes	Yes		
Kern	1502670	FAIRVIEW WATER COMPANY, LLC	Perchlorate	Yes	Yes		
Kern	1502724	QUAIL VALLEY WATER DIST-EASTSIDE SYSTEM	Arsenic	Yes	Yes		
Kern	1503226	QUAIL VALLEY WATER DIST-WESTSIDE SYSTEM	Fluoride, Antimony	Yes	Yes		
Kern	1510001	ARVIN COMMUNITY SERVICES DIST	Arsenic, Nitrate	Yes	Yes		
Kern	1510002	BORON CSD	Arsenic	Yes	Yes		
Kern	1510005	DELANO, CITY OF	Arsenic	Yes	Yes		
Kern	1510006	EAST NILES CSD	Arsenic	Yes	Yes		
Kern	1510012	LAMONT PUBLIC UTILITY DIST	Arsenic	Yes	Yes		
Kern	1510014	MOJAVE PUD	Arsenic	Yes	Yes		
Kern	1510016	RAND COMMUNITIES CWD - RANDSBURG	Arsenic	Yes	Yes		
Kern	1510017	INDIAN WELLS VALLEY W.D.	Arsenic	Yes	Yes		
Kern	1510018	ROSAMOND CSD	Arsenic	Yes	Yes		
Kern	1510024	GREENFIELD COUNTY WD	Arsenic	Yes	Yes		
Kern	1510025	STALLION SPRINGS CSD	Nitrate	Yes	Yes		
Kern	1510027	DESERT LAKE COMM SERV DIST	Arsenic	Yes	Yes		
Kern	1510028	MIL POTRERO MWC	Arsenic	No known current funding			
Kern	1510046	LOST HILLS UTILITY DISTRICT	Arsenic	Yes	Yes		
Kern	1510049	CWS - LAKELAND	Fluoride, Radium	No known current funding			
Kern	1510051	LEBEC COUNTY WATER DISTRICT	Fluoride	Yes	Yes		
Kern	1510052	NORTH EDWARDS WD	Arsenic	Yes	Yes		
Kern	1510054	PINON PINES MWC	Fluoride, Arsenic	Yes	Yes		
Kern	1510802	KERN VALLEY STATE PRISON	Arsenic	No known current funding			
Kings	1600004	FOUR SEASONS MOBILE HOME PARK	Arsenic	Yes	Yes		

Table 6.5 Known Funding Sources for Identified Community Water Systems with MCL Violations (cont.)							
County	Public Water System Number	Public Water System Name	Type of MCL Violation (2002-2010)	Funding Sources			
				Safe Drinking Water State Revolving Fund	Prop. 84	Prop. 50	Rural California Water Association
Kings	1600010	LACEY COURTS MHP	Arsenic	Yes	Yes		
Kings	1600504	HAMBLIN MUTUAL WATER CO	Arsenic	Yes	Yes		
Kings	1610001	ARMONA COMMUNITY SERVICES DIST	Arsenic, Total Trihalomethanes	Yes	Yes		
Kings	1610003	HANFORD, CITY OF	Arsenic	Yes	Yes		
Kings	1610005	LEMOORE, CITY OF	Arsenic	Yes	Yes		
Kings	1610007	HOME GARDEN CSD	Arsenic	Yes	Yes		
Kings	1610009	KETTLEMAN CITY CSD	Arsenic	Yes	Yes		
Lake	1700536	SUNRISE SHORE MUTUAL WATER COMPANY	Aluminum	Yes	Yes		
Lassen	1805004	HIGH DESERT STATE PRISON	Arsenic	No known current funding			
Lassen	1810700	SIERRA ARMY DEPOT-HERLONG	Uranium	No known current funding			
Los Angeles	1910001	CITY OF ALHAMBRA	Nitrate	Yes	Yes		
Los Angeles	1910003	CITY OF ARCADIA	Nitrate	Yes	Yes		
Los Angeles	1910017	SANTA CLARITA WATER DIVISION F	Nitrate	Yes	Yes		
Los Angeles	1910066	LEISURE LAKE MOBILE ESTATES	Arsenic	Yes	Yes		
Los Angeles	1910153	SOUTH MONTEBELLO IRRIGATION DIST.	Arsenic	Yes	Yes		
Los Angeles	1910244	GREEN VALLEY CWD	Nitrate	Yes	Yes		
Los Angeles	1910246	LAND PROJECT MUTUAL WATER CO.	Arsenic	Yes	Yes		
Madera	2000293	MD#46 AHWAHNEE RESORTS	Gross Alpha, Arsenic	Yes	Yes		
Madera	2000501	BASS LAKE ANNEX #3	Uranium	Yes	Yes		
Madera	2000502	BASS LAKE HEIGHTS MUTUAL WATER	Arsenic	Yes	Yes		
Madera	2000506	SIERRA LINDA MUTUAL WATER CO	Gross Alpha, Arsenic, Uranium	Yes	Yes		
Madera	2000511	MD#85 VALETA MUTUAL WATER COMPANY	Nitrate	Yes	Yes		
Madera	2000512	EAST ACRES MUTUAL WATER COMPANY	Arsenic	Yes	Yes		
Madera	2000524	SKY ACRES MUTUAL WATER CORP	Arsenic	No known current funding			
Madera	2000526	PIKE RANCH MUTUAL WATER CO	Gross alpha, uranium	Yes	Yes		
Madera	2000527	YOSEMITE FORKS ESTATES MUTUAL WTR	Arsenic	Yes	Yes		
Madera	2000534	LEISURE ACRES MUTUAL WATER CO	Arsenic	Yes	Yes		

Table 6.5 Known Funding Sources for Identified Community Water Systems with MCL Violations (cont.)							
County	Public Water System Number	Public Water System Name	Type of MCL Violation (2002-2010)	Funding Sources			
				Safe Drinking Water State Revolving Fund	Prop. 84	Prop. 50	Rural California Water Association
Madera	2000538	CEDAR VALLEY MUTUAL WATER CO	Arsenic	Yes	Yes		
Madera	2000550	MD#06 LAKE SHORE PARK	Gross Alpha, Arsenic, Uranium	Yes	Yes		
Madera	2000551	MD#07 MARINA VIEW HEIGHTS	Gross Alpha, Arsenic, Uranium	Yes	Yes		
Madera	2000552	MD#24 TEAFORD MEADOW LAKES	Arsenic	Yes	Yes		
Madera	2000561	MD#08 NORTH FORK WATER SYSTEM	Arsenic	Yes	Yes		
Madera	2000688	ECCO	Arsenic	No known current funding			
Madera	2000737	MD#42 STILL MEADOW	Gross Alpha, Arsenic, Uranium	Yes	Yes		
Madera	2000785	VALLEY TEEN RANCH	Arsenic	Yes	Yes		
Madera	2000828	SHADY OAKS MOBILE HOME PARK	Gross alpha, uranium	Yes	Yes		
Madera	2010003	BASS LAKE WATER COMPANY	Uranium	Yes	Yes		
Madera	2010007	HILLVIEW WC-OAKHURST/SIERRA LAKES	Arsenic, Uranium	Yes	Yes	Yes	
Madera	2010012	HILLVIEW WATER CO-RAYMOND	Nitrate	Yes	Yes	Yes	
Madera	2010801	VALLEY STATE PRISON FOR WOMEN	Arsenic	No known current funding			
Mendocino	2310011	LAYTONVILLE COUNTY WATER DISTRICT	Arsenic	No known current funding			
Mono	2610003	BRIDGEPORT PUD	Arsenic	Yes	Yes		
Monterey	2700665	OAK HEIGHTS W & R CO INC	Nitrate	Yes	Yes		
Monterey	2700702	PRUNEDALE MWC	Arsenic	Yes	Yes		
Monterey	2700738	SAN MIGUEL WS #01	Nitrate	Yes	Yes		
Monterey	2701036	APPLE AVE WS #03	Nitrate	Yes	Yes		
Monterey	2701063	RIVER RD WS #25	Nitrate	Yes	Yes		
Monterey	2701068	IVERSON & JACKS APTS WS	Nitrate	Yes	Yes		
Monterey	2701926	MORO RD WS #09	Arsenic, Nitrate	Yes	Yes		
Monterey	2710010	CWSC SALINAS	MTBE, Nitrate	Yes	Yes		
Monterey	2710021	CAL AM WATER COMPANY - TORO	Arsenic	No known current funding			
Monterey	2710851	SALINAS VALLEY STATE PRISON	Nitrate	No known current funding			
Nevada	2910010	TRUCKEE-DONNER PUD - HIRSCHDALE	Arsenic	No known current funding			
Nevada	2910011	PLAVADA COMMUNITY ASSOCIATION	Arsenic	Yes	Yes		
Orange	3000662	CATALINA STREET PUMP OWNERS	Uranium	Yes	Yes		
Orange	3000663	DIAMOND PARK MUTUAL WATER CO.	Nitrate	Yes	Yes		

Table 6.5 Known Funding Sources for Identified Community Water Systems with MCL Violations (cont.)							
County	Public Water System Number	Public Water System Name	Type of MCL Violation (2002-2010)	Funding Sources			
				Safe Drinking Water State Revolving Fund	Prop. 84	Prop. 50	Rural California Water Association
Placer	3110032	LAKE FOREST UTILITY COMPANY	Arsenic	Yes	Yes	Yes	
Plumas	3200104	GRIZZLY LAKE RID-DELLEKER	Uranium	Yes	Yes		
Plumas	3210003	CITY OF PORTOLA	Arsenic	No known current funding			
Riverside	3301380	Saint Anthony Trailer Park	Arsenic	Yes	Yes		
Riverside	3301588	Royal Carrizo HOA	Uranium				Yes
Riverside	3301755	Sunbird Mobile Home Park	Arsenic	Yes	Yes		
Riverside	3310005	DESERT WATER AGENCY	Uranium	Yes	Yes	Yes	
Riverside	3310012	ELSINORE VALLEY MWD	Total Trihalomethanes	Yes	Yes	Yes	
Riverside	3310016	HEMET, CITY OF	Nitrate	Yes	Yes		
Riverside	3310025	NORCO, CITY OF	Arsenic	Yes	Yes		
Riverside	3310040	FERN VALLEY WD	Haloacetic Acids	Yes	Yes		
Riverside	3310046	FARM MUTUAL W.C. (THE)	Total Trihalomethanes	No known current funding			
Sacramento	3400130	GREGG WATER CO	Arsenic	Yes	Yes		
Sacramento	3400135	KORTHS PIRATES LAIR	Arsenic	Yes	Yes		
Sacramento	3400138	LOCKE WATER WORKS CO [SWS]	Arsenic	Yes	Yes		
Sacramento	3400164	VIEIRA S RESORT, INC	Arsenic	Yes	Yes		
Sacramento	3400332	OXBOW MARINA	Arsenic	Yes	Yes		
Sacramento	3400433	EDGEWATER MOBILE HOME PARK	Arsenic	Yes	Yes		
Sacramento	3410008	ELK GROVE WATER SERVICE	Arsenic				
Sacramento	3410011	GALT, CITY OF	Arsenic	Yes	Yes		
San Benito	3500526	ARNOLD PARK (O BANNON S MHP)	Total Chromium, Nitrate	Yes	Yes		
San Benito	3500527	VALENZUELA WATER SYSTEM	Nitrate	No known current funding			
San Benito	3500810	WHISPERING PINES INN	Arsenic				Yes
San Bernardino	3600012	Apple Valley View MWC	Fluoride	No known current funding			
San Bernardino	3600196	CSA 70 W-4	Arsenic	Yes	Yes		
San Bernardino	3600226	CSA 70F, Morongo Valley	Uranium	Yes	Yes		
San Bernardino	3610001	CITY OF ADELANTO	Arsenic	Yes	Yes		

Table 6.5 Known Funding Sources for Identified Community Water Systems with MCL Violations (cont.)							
County	Public Water System Number	Public Water System Name	Type of MCL Violation (2002-2010)	Funding Sources			
				Safe Drinking Water State Revolving Fund	Prop. 84	Prop. 50	Rural California Water Association
San Bernardino	3610007	BASELINE GARDENS MWC	Nitrate	Yes	Yes		
San Bernardino	3610051	VALLEY OF ENCHANTMENT MWC	Gross alpha	Yes	Yes		
San Bernardino	3610064	EAST VALLEY WATER DISTRICT	Gross alpha	Yes	Yes		
San Bernardino	3610112	HELENDALE COMMUNITY SERVICE DISTRICT	Arsenic	Yes	Yes		
San Bernardino	3610705	US ARMY FORT IRWIN	Arsenic	No known current funding			
San Bernardino	3610854	SEARLES VALLEY MINERALS OPERATIONS INC	Arsenic	No known current funding			
San Diego	3700923	LAKE MORENA OAK SHORES MW CO.	Nitrate, Nitrate + Nitrite, Uranium	Yes	Yes		
San Diego	3700924	LAKE MORENA VIEWS MW CO.	Uranium	Yes	Yes		
San Diego	3700938	YUIMA MUNICIPAL WATER DISTRICT IDA	Nitrate, Perchlorate	Yes	Yes		
San Diego	3700958	LOS TULES MUTUAL WATER COMPANY	Gross alpha		Yes		
San Diego	3710012	RANCHO PAUMA MUTUAL WC	Nitrate				Yes
San Joaquin	3900579	CENTURY MOBILE HOME PARK	Arsenic, Nitrate	Yes	Yes		
San Joaquin	3900649	GLENWOOD MOBILE HOME PARK	Nitrate				Yes
San Joaquin	3900653	ISLANDER MARINA	Gross alpha	No known current funding			
San Joaquin	3900711	SIDHU MOBILE PARK WATER SYSTEM	Arsenic	Yes	Yes		
San Joaquin	3900732	V & P TRAILER COURT WATER SYSTEM	Arsenic	Yes	Yes		
San Joaquin	3901213	AVALOS, SILVIA	Arsenic, Nitrate	Yes	Yes		
San Joaquin	3910005	MANTECA, CITY OF	Arsenic	Yes	Yes		
San Joaquin	3910015	CITY OF LATHROP	Arsenic	Yes	Yes		
San Joaquin	3910701	DEFENSE DISTRIB. DEPOT, SHARPE SITE	Arsenic	No known current funding			
San Luis Obispo	4010011	MORRO BAY WATER DEPARTMENT	Nitrate	Yes	Yes		
San Luis Obispo	4010023	GOLDEN STATE WATER COMPANY - EDNA	Selenium	Yes	Yes		
San Mateo	4110010	MONTARA WATER AND SANITARY DIST	Nitrate	Yes	Yes	Yes	
Santa Barbara	4200891	BOBCAT SPRINGS M WC OS	Arsenic	Yes	Yes		

Table 6.5 Known Funding Sources for Identified Community Water Systems with MCL Violations (cont.)							
County	Public Water System Number	Public Water System Name	Type of MCL Violation (2002-2010)	Funding Sources			
				Safe Drinking Water State Revolving Fund	Prop. 84	Prop. 50	Rural California Water Association
Santa Barbara	4210009	CUYAMA COMMUNITY SERVICES DISTRICT	Arsenic	Yes	Yes		
Santa Clara	4300573	GREEN ACRES MUTUAL WATER	Asbestos	Yes	Yes		
Santa Clara	4300630	FOOTHILL MUTUAL WATER	Nitrate	Yes	Yes		
Santa Clara	4300943	FARMERS LABOR EXCHANGE	Nitrate	Yes	Yes		
Santa Clara	4300996	VALLEY VIEW RANCHES	Nitrate	Yes	Yes		
Santa Cruz	4410016	FOREST LAKES MWC	Arsenic	Yes	Yes		
Shasta	4510005	CITY OF REDDING	Arsenic	Yes	Yes		
Sierra	4600019	SIERRA CO. W.W.D #1 CALPINE	Arsenic	Yes	Yes		
Sonoma	4900568	VALLEY FORD WATER ASSOCIATION	Nitrate	Yes	Yes	Yes	
Sonoma	4900575	LOCH HAVEN MUTUAL WATER COMPANY	Arsenic	Yes	Yes		
Sonoma	4900643	MOUNT WESKE ESTATES MUTUAL WATER COMPANY	Arsenic	Yes	Yes		
Sonoma	4900676	SEQUOIA GARDENS MOBILE HOME PARK	Arsenic	No known current funding			
Sonoma	4900723	SHAMROCK MOBILE HOME PARK	Arsenic	No known current funding			
Sonoma	4900786	RANCHO SANTA ROSA MHP	Arsenic	Yes	Yes		
Sonoma	4900845	RANCHO DE SONOMA	Arsenic	Yes	Yes		
Sonoma	4900855	WEST FIELD COMMUNITY	Arsenic	Yes	Yes		
Sonoma	4901195	MOORLAND AVENUE APARTMENTS	Arsenic		Yes		
Sonoma	4910011	SEBASTOPOL, CITY OF	Arsenic	Yes	Yes		
Stanislaus	5000033	COBLES CORNER	Arsenic	Yes	Yes		
Stanislaus	5000051	MOBILE PLAZA PARK	Arsenic	No known current funding			
Stanislaus	5000077	CERES WEST MHP	Arsenic	No known current funding			
Stanislaus	5000080	COUNTRY WESTERN MOBILE HOME PARK	Arsenic	Yes	Yes		
Stanislaus	5000085	GREEN RUN MOBILE ESTATES	Arsenic	Yes	Yes		
Stanislaus	5000086	COUNTRYSIDE MOBILEHOME ESTATES - ADULT P	Arsenic	Yes			
Stanislaus	5000218	COUNTRY VILLA APTS	1,2-Dibromo-3-chloropropane (DBCP)	Yes	Yes		
Stanislaus	5000316	CURTIS INVESTMENTS	Arsenic	No known current funding			
Stanislaus	5000389	MONTEREY PARK TRACT COMMUNITY SERVICE DI	Arsenic				Yes
Stanislaus	5010008	HUGHSON, CITY OF	Arsenic	Yes	Yes		

Table 6.5 Known Funding Sources for Identified Community Water Systems with MCL Violations (cont.)							
County	Public Water System Number	Public Water System Name	Type of MCL Violation (2002-2010)	Funding Sources			
				Safe Drinking Water State Revolving Fund	Prop. 84	Prop. 50	Rural California Water Association
Stanislaus	5010009	KEYES COMMUNITY SERVICES DIST.	Arsenic	Yes	Yes		
Stanislaus	5010010	MODESTO, CITY OF	Nitrate	Yes	Yes		
Stanislaus	5010028	CERES, CITY OF	Nitrate, Uranium	Yes	Yes		
Stanislaus	5010033	CITY OF MODESTO, DE GRAYSON	Nitrate	Yes	Yes		
Sutter	5100107	SUTTER CO. WWD#1 (ROBBINS)	Arsenic	Yes	Yes		
Sutter	5100109	WILDWOOD MUTUAL WATER COMPANY	Arsenic, Nitrate	Yes	Yes		
Sutter	5101006	COUNTRY VILLAGE SOUTH MHP	Nitrate		Yes		
Sutter	5110001	CITY OF LIVE OAK	Arsenic	Yes	Yes		
Sutter	5110003	YUBA CITY GROUNDWATER-REGION 2-3	Arsenic				Yes
Tehama	5201137	MILLSTREAM MOBILE HOME PARK	Arsenic	Yes	Yes		
Tehama	5210003	LOS MOLINOS COMM. SERVICES DIST.	Arsenic	Yes	Yes		
Tulare	5400523	EL MONTE VILLAGE M H P	Nitrate	Yes	Yes		
Tulare	5400542	DUCOR CSD	Nitrate	Yes	Yes	Yes	
Tulare	5400544	ALLENSWORTH C S D	Arsenic	Yes	Yes		
Tulare	5400550	SEVILLE WATER CO	Nitrate	Yes	Yes		
Tulare	5400567	TOOLEVILLE WATER COMPANY	Nitrate	Yes	Yes		
Tulare	5400616	LEMON COVE WATER CO	Nitrate	Yes	Yes		
Tulare	5400629	SEQUOIA RV RANCH	Arsenic	Yes	Yes		
Tulare	5400651	BEVERLY GRAND MUTUAL WATER	Nitrate	Yes	Yes		
Tulare	5400660	LAKE SUCCESS MOBILE LODGE	Nitrate	Yes	Yes		
Tulare	5400663	FAIRWAYS TRACT MUTUAL	Nitrate	Yes	Yes		
Tulare	5400665	DEL ORO RIVER ISLAND SERV TERR #1	Nitrate, Uranium	Yes	Yes		
Tulare	5400670	TRIPLE R MUTUAL WATER CO	Nitrate	Yes	Yes		
Tulare	5400735	RODRIGUEZ LABOR CAMP	Nitrate	Yes	Yes		
Tulare	5400754	SO KAWEAH MUTUAL WATER CO	Arsenic	Yes	Yes		
Tulare	5400792	WOODVILLE FARM LABOR CENTER	Nitrate	Yes	Yes		
Tulare	5400805	SOULTS MUTUAL WATER CO	Nitrate	Yes	Yes		
Tulare	5400966	WESTLAKE VILLAGE M H P	Nitrate	Yes	Yes		
Tulare	5401003	EAST OROSI CSD	Nitrate	Yes	Yes		
Tulare	5401038	AKIN WATER CO	Nitrate	Yes	Yes		
Tulare	5402047	GLEANINGS FOR THE HUNGRY	Nitrate	Yes	Yes		

Table 6.5 Known Funding Sources for Identified Community Water Systems with MCL Violations (cont.)							
County	Public Water System Number	Public Water System Name	Type of MCL Violation (2002-2010)	Funding Sources			
				Safe Drinking Water State Revolving Fund	Prop. 84	Prop. 50	Rural California Water Association
Tulare	5402048	DEL ORO RIVER ISLAND SERV TERR #2	Nitrate	Yes	Yes		
Tulare	5403043	YETTEM WATER SYSTEM	Nitrate		Yes		
Tulare	5403103	TRACT 327 MUTUAL WATER CO	Gross alpha, uranium	Yes	Yes		
Tulare	5403110	SIERRA MUTUAL WATER CO	Nitrate	No known current funding			
Tulare	5410001	CUTLER PUD	1,2-Dibromo-3-chloropropane (DBCP)	Yes	Yes		
Tulare	5410003	EXETER, CITY OF	1,2-Dibromo-3-chloropropane (DBCP)				Yes
Tulare	5410009	PIXLEY PUBLIC UTIL DIST	Arsenic	Yes	Yes		
Tulare	5410024	RICHGROVE COMMUNITY SERVICES DISTRICT	Arsenic	Yes	Yes		
Tulare	5410033	PRATT MUTUAL WATER CO	Arsenic	Yes	Yes		
Tulare	5410034	PINE FLAT WATER COMPANY	Uranium	Yes	Yes		
Tulare	5410050	ALPAUGH JOINT POWERS AUTHORITY	Arsenic		Yes		
Ventura	5601122	TICO MUTUAL WATER CO	Nitrate	Yes	Yes		
Ventura	5610035	RIO MANOR MUTUAL WATER CO	Uranium	Yes	Yes		
Yolo	5700571	MADISON SERVICE DIST	Nitrate	No known current funding			
Yolo	5710011	WILD WINGS GOLF COMMUNITY	Arsenic	Yes	Yes		

APPENDIX 7 – LIST OF REFERENCES

APPENDIX 1: LIST OF REFERENCES

1. State Water Resources Control Board GeoTracker GAMA, http://www.geotracker.waterboards.ca.gov/gama/

2. CDPH Division of Drinking Water and Environmental Management water quality monitoring database

3. CDPH Division of Drinking Water and Environmental Management Permits, Inspections, Compliance, Monitoring and Enforcement (PICME) database

4. California Department of Public Health website http://www.cdph.ca.gov

5. CDPH Drinking Water Branch Drinking Water Watch Public Water Supply Systems Search, drinc.ca.gov:8080/DWW/

6. CDPH. 2009. 1,2,3-Trichloropropane. http://www.cdph.ca.gov/certlic/drinkingwater/Pages/123TCP.aspx

7. CDPH. 2011a. Drinking Water Notification Levels. http://www.cdph.ca.gov/certlic/drinkingwater/Pages/NotificationLevels.aspx

8. USEPA 2007a. Drinking Water Infrastructure Needs Survey and Assessment, Fourth Report to Congress. http://water.epa.gov/infrastructure/drinkingwater/dwns/upload/2009_03_26_needssurvey_2007_report_needssurvey_2007.pdf

9. USEPA. 2007b. Removing Multiple Contaminants from Drinking Water: Issues to Consider. http://water.epa.gov/scitech/drinkingwater/dws/treatment/upload/2007_12_17_treatment_poster_treatment_technologies.pdf

10. USEPA. 2011a. Small Systems Research, Treatment Technologies. http://www.epa.gov/nrmrl/wswrd/dw/smallsystems/treatment.html

11. USEPA. 2011b. Treatment Technologies Poster. http://water.epa.gov/scitech/drinkingwater/dws/treatment/upload/2007_12_17_treatment_poster_treatment_technologies.pdf

12. USEPA. 2011c. Water: Small Systems and Capacity Development. Technical Help. http://water.epa.gov/type/drink/pws/smallsystems/technical_help.cfm

13. USEPA. 2011d. Small Systems Research: Treatment Technologies. Particulate and Turbidity Removal. http://www.epa.gov/nrmrl/wswrd/dw/smallsystems/ptr.html

14. USEPA. 2011e. Small Systems Research: Treatment Technologies. Chemical Contaminant Removal. http://www.epa.gov/nrmrl/wswrd/dw/smallsystems/ccr.html

15. USEPA. 2011f. Small System Research: Treatment Technologies. Biological Contaminant Removal. http://www.epa.gov/nrmrl/wswrd/dw/smallsystems/bcr.html

16. USEPA. 2011g. Drinking Water Treatability Database. http://iaspub.epa.gov/tdb/pages/general/home.do

17. USEPA. 2011h. Water Contaminant Information Tool. http://water.epa.gov/scitech/datait/databases/wcit/index.cfm

18. USEPA. 2011i. Drinking Water Treatability Database, Find a Treatment Process. http://iaspub.epa.gov/tdb/pages/treatment/findTreatment.do

19. California Department of Public Health. 2011a. Certified Residential Water Treatment Devices. http://www.cdph.ca.gov/certlic/device/Documents/WTD%202011/Section1_2011.pdf

20. California Department of Public Health. 2011b. Point of Use Treatment – Emergency Regulations. http://www.cdph.ca.gov/certlic/drinkingwater/Pages/POUTreatment.aspx

21. CDC. 2009a. Drinking Water: Water Treatment. Community Water Treatment. http://www.cdc.gov/healthywater/drinking/public/water_treatment.html

22. NESC. 2011. Tech Brief Fact Sheets. http://www.nesc.wvu.edu/techbrief.cfm

23. NESC. 2009. Treatment Technologies for Small Drinking Water Systems Poster. http://www.nesc.wvu.edu/pdf/dw/publications/ontap/2009_tb/treament_tech_poster_DWFSOM37.pdf

24. United States Geological Survey, 2011. Presentation to the State Water Resources Control Board: GAMA Priority Basins Project Overview and Results.

25. Fram, M.S., and Belitz, K. 2011. Probability of Detecting Perchlorate under Natural Conditions in Deep Groundwater in California and the Southwestern United States. Environmental Science and Technology, v. 45, p. 1271-1277.

26. State Water Board. 2004. Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program. http://www.waterboards.ca.gov/water_issues/programs/nps/docs/oalfinalcopy052604.pdf

27. US Department of Housing and Urban Development. Community Development Block Grants. http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs

28. USEPA Needs Analysis Survey. 2007. http://water.epa.gov/infrastructure/drinkingwater/dwns/upload/2009_03_26_needssurvey_2007_report_needssurvey_2007.pdf

29. CDPH. 2011. Intended Use Plan. http://www.cdph.ca.gov/services/funding/Documents/SRF/FinalSFY2011-2012IUP(FFY2011DWSRFAllotment)081711.pdf

30. Balazs C, Morello-Frosch R, Hubbard A, Ray 2011. Social Disparities in Nitrate-Contaminated Drinking Water in California's San Joaquin Valley. Environ Health Perspect. 119:1272-1278. http://dx.doi.org/10.1289/ehp.1002878

APPENDIX 8 – LIST OF COMMUNITY WATER SYSTEMS THAT RELY ON A CONTAMINATED GROUNDWATER SOURCE FOR DRINKING WATER

APPENDIX 8: List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

The following table lists groundwater sources (wells) used for the drinking water supply by community public water systems (community water systems), where a principal contaminant has been detected on two or more occasions, at a level greater than the Maximum Contaminant Level (MCL). The table lists all active raw and untreated groundwater sources used to supply drinking water to community (class "C") water systems during the most recent California Department of Public Health (CDPH) compliance cycle (2002-2010). A well is considered active if it was being used to provide drinking water to a community water system at the time that this report was being drafted (October 2011),

8.1 DEFINITIONS AND DESCRIPTIONS OF COLUMN HEADINGS

County – Identifies the primary county served by a community water system. The data were provided by CDPH from their www.drinc.ca.gov website.

Primary City – Identifies the primary city or cities served by a community water system. Some systems serve more than one city. The data were generated through several methods. When community water system service area boundaries were available to CDPH, service area boundaries were mapped using Geographic Information System (GIS) software. The intersection of the community water system boundary and city boundaries (or "census designated place," see below) was used by CDPH to identify the primary city served by a community water system. When community water system boundaries were not available to CDPH, the primary city was identified by the State Water Resources Control Board (State Water Board) through a map-based web search.

Some community water systems serve rural concentrations of people that are not legally incorporated and that lack separate municipal governments, but otherwise resemble incorporated places such as cities or towns. Such areas are referred to as "*Census-designated places*" by the United States Census Bureau. Census-designated places may not strictly reflect the local definition of where a community is located, but are the most accurate way of representing areas served by community water systems that deliver water to rural or unincorporated areas. Where community water system service area boundaries were shown to serve areas outside an incorporated area, the area served is referred to as a census designated place in the primary city column, and is denoted by the abbreviation "CDP" at the end of the identified city.

Public Water System Name – The name of the community water system that delivers water from the identified wells.

PWS (Public Water System) Number – The unique identification number assigned by CDPH to a community water system.

Source of PWS Supply – The primary source of a community water system's drinking water supply. There are four identified categories:

- 100% GW: 100 percent of the drinking water source is from groundwater.
- >50% GW Mixed: The community water system relies on both surface water and groundwater sources for its public drinking water supply, but more than 50 percent of that supply is groundwater. The relative percentage of groundwater was determined by querying the system on publicly available internet databases including CDPH's Drinking Water Watch website, part of drinc.ca.gov.
- Mixed <50% GW: The community water system relies on both surface water and groundwater sources for its public drinking water supply, but less than 50 percent of the supply comes from groundwater sources. The relative percentage of groundwater was determined by querying the system on publicly available internet databases including CDPH's Drinking Water Watch website, part of drinc.ca.gov.
- Undetermined: The community water system relies on both surface water and groundwater sources for its public drinking water supply, but the relative contribution from groundwater could not be determined based upon the available resources.

Population Served – The population served by a specific community water system, as reported by that system to CDPH.

System Wells – The number of groundwater public drinking water supply sources operated by a community water system. (In nearly all cases, a groundwater source is a well.)

Wells with Princ. Cont. – The number of groundwater sources with a principal contaminant detection above the MCL in two or more sampling events during the most recent CDPH compliance cycle (2002-2010). The contaminants were detected in raw groundwater, prior to any blending or treatment, and do not represent the quality of water that is ultimately delivered to the public.

Well Number – The PWS Number, extended to identify the specific well(s) in a community water system. The number preceding the dash is the system number and the number after the dash indicates the specific well. Together, this makes up the CDPH "well number."

Princ. Contaminant – Principal Contaminant; chemical detected on two or more sampling events during the most recent CDPH compliance cycle (2002-2010).

MCL – Maximum Contaminant Level

Most Recent Det. > MCL – The date of the most recent detection above the MCL for that source and principal contaminant.

Det. > MCL– The number of evaluated samples collected during the most recent CDPH compliance cycle (2002-2010) with a detection above the MCL.

Max Conc. – The maximum evaluated detection of the contaminant in the groundwater source during the most recent CDPH compliance cycle (2002-2010).

Avg. Conc. – The average evaluated detection of the contaminant in the groundwater source during the most recent CDPH compliance cycle (2002-2010).

Sampling Events– The number of samples collected and evaluated from the source during the most recent CDPH compliance cycle (2002-2010).

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
ALAMEDA	Livermore	CALIFORNIA WATER SERVICE - LIVERMORE	110003	Mixed <50%GW	54496	12	5	0110003-009	Nitrate (as NO3)	45	mg/L	9/7/2010	147	56	45.8059519	147
								0110003-012	Nitrate (as NO3)	45	mg/L	10/21/2008	2	56	53	2
								0110003-013	Nitrate (as NO3)	45	mg/L	7/28/2010	132	62	47.5907143	130
								0110003-008	Tetrachloroethylene (PCE)	5	ug/L	11/9/2010	80	36	8.39082353	78
								0110003-010	Tetrachloroethylene (PCE)	5	ug/L	9/18/2008	2	8.1	1.37682927	2
AMADOR	Jackson	MELODY OAKS TRAILER PARK	300011	100% GW	40	1	1	0300011-001	Gross alpha particle activity	15	pCi/L	7/23/2010	3	30	12.46	10
AMADOR	Plymouth	HOPE FOUNDATION/ MORIAH HEIGHTS	300062	100% GW	30	2	1	0300062-002	Vinyl chloride	0.5	ug/L	11/29/2006	2	9.1	1.43	8
BUTTE	Chico	CAL-WATER SERVICE CO.-CHICO	410002	100% GW	100086	63	3	0410002-073	Nitrate (as NO3)	45	mg/L	7/7/2010	2	51.032	25.61	95
								0410002-021	Tetrachloroethylene (PCE)	5	ug/L	10/13/2010	100	16.38	11.90	101
								0410002-045	Tetrachloroethylene (PCE)	5	ug/L	11/2/2010	106	30.2	12.17	106
BUTTE	Gridley	CITY OF GRIDLEY	410004	100% GW	6403	6	2	0410004-002	Arsenic	10	ug/L	12/14/2004	6	16.6	12.55	8
								0410004-003	Arsenic	10	ug/L	7/17/2007	5	11.2	9.63	12
BUTTE	Butte Valley CDP	FOOTHILL MOBILE HOME PARK	400027	100% GW	180	2	1	0400027-001	Arsenic	10	ug/L	4/15/2009	2	21	10.36	8
BUTTE	Chico	HARMONY MOBILE HOME PARK	400037	100% GW	55	1	1	0400037-001	Nitrate (as NO3)	45	mg/L	7/3/2007	3	73	39.18	21
BUTTE	Forest Ranch CDP	FOREST RANCH MUTUAL WATER SYS	400004	100% GW	92	2	1	0400004-001	Tetrachloroethylene (PCE)	5	ug/L	2/22/2005	5	56	18.64	7
BUTTE	Gridley	RANCHO VILLA MOBILE ACRES	400058	100% GW	32	1	1	0400058-001	Arsenic	10	ug/L	10/27/2010	10	12.2	10.38	12
CALAVERAS	San Andreas	RITE OF PASSAGE/SIERRA RIDGE	500091	Mixed <50%GW	150	4	2	0500091-001	Gross alpha particle activity	15	pCi/L	11/26/2003	4	16	7.99214286	4
								0500091-002	Gross alpha particle activity	15	pCi/L	4/13/2010	3	46.81	16.1122222	3
								0500091-002	Uranium	20	pCi/L	6/22/2009	2	23.72	9.21142857	2
COLUSA	Grimes CDP	COLUSA CO. W.D. #1 - GRIMES	600008	100% GW	500	1	1	0600008-001	Arsenic	10	ug/L	10/11/2010	9	30.2	24.40	10
COLUSA	Princeton CDP	PRINCETON WATER DISTRICT	600013	100% GW	356	2	1	0600013-001	Arsenic	10	ug/L	3/17/2010	8	70	16.69	11
COLUSA	Walnut Ranch	DEL ORO WATER CO.- WALNUT RANCH	600011	100% GW	182	2	2	0600011-001	Arsenic	10	ug/L	11/24/2010	7	16	12.70	8
								0600011-002	Gross alpha particle activity	15	pCi/L	12/13/2005	4	19.2	19.20	4
CONTRA COSTA	Brentwood	CITY OF BRENTWOOD	710004	Mixed <50%GW	45892	9	1	0710004-010	Nitrate (as NO3)	45	mg/L	11/3/2010	29	49	41.0347826	28
CONTRA COSTA	Pittsburg	CITY OF PITTSBURG	710008	Mixed <50%GW	62000	2	1	0710008-005	Arsenic	10	ug/L	7/7/2010	2	14	11.5	2
CONTRA COSTA	Bethel Island CDP	SANDMOUND MUTUAL	707556	100% GW	160	2	1	0707556-002	Arsenic	10	ug/L	9/1/2009	2	15	9.50	4
CONTRA COSTA	Bethel Island CDP	SANTIAGO ISLAND VILLAGE	707574	100% GW	422	1	1	0707574-001	Fluoride	2	mg/L	7/8/2010	2	8	2.68	4
CONTRA COSTA	Brentwood	VILLA DE GUADALUPE	706007	100% GW	26	1	1	0706007-001	Nitrate (as NO3)	45	mg/L	2/3/2010	31	69	49.72	50
CONTRA COSTA	Concord	DOUBLETREE RANCH WATER SYSTEM	707615	100% GW	49	2	2	0707615-001	Arsenic	10	ug/L	9/2/2010	16	42	27.56	16
								0707615-002	Arsenic	10	ug/L	6/1/2009	9	23	19.00	9
CONTRA COSTA	Oakley	DELTA MUTUAL WATER COMPANY	707573	100% GW	180	2	1	0707573-002	Arsenic	10	ug/L	8/18/2010	2	11	9.65	6
EL DORADO	South Lake Tahoe	SOUTH TAHOE PUD - MAIN	910002	100% GW	60000	19	6	0910002-016	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	11/24/2010	37	3.4	1.70	38
								0910002-028	Arsenic	10	ug/L	9/5/2007	6	14.9	9.32	20
								0910002-050	Arsenic	10	ug/L	12/6/2006	14	17.9	9.69	27
								0910002-054	Arsenic	10	ug/L	2/9/2010	31	18	12.16	43
								0910002-006	Gross alpha particle activity	15	pCi/L	8/18/2010	7	25.03	16.34	11
								0910002-007	Gross alpha particle activity	15	pCi/L	7/21/2010	2	15.73	11.20	12
								0910002-050	Gross alpha particle activity	15	pCi/L	6/24/2009	3	21.18	13.08	12
								0910002-054	Gross alpha particle activity	15	pCi/L	7/21/2010	4	18.83	13.18	11
EL DORADO	Plymouth	GOLD BEACH PARK	900102	100% GW	100	1	1	0900102-004	Arsenic	10	ug/L	10/18/2010	8	20	14.52	9
EL DORADO	South Lake Tahoe city	TAHOE KEYS WATER COMPANY	910015	100% GW	3004	4	2	0910015-002	Gross alpha particle activity	15	pCi/L	7/10/2007	2	23.6	16.63	4
								0910015-003	Gross alpha particle activity	15	pCi/L	1/16/2007	2	25.4	17.53	4

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								0910015-002	Tetrachloroethylene (PCE)	5	ug/L	8/17/2010	6	19	9.39	8
FRESNO	Calwa CDP, Clovis city, Fort Washington CDP, Fresno city, Mayfair CDP, Old Fig Garden CDP, Sunnyside CDP	FRESNO, CITY OF	1010007	>50% GW Mixed	457511	253	47	1010007-010	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	11/3/2010	94	0.52	0.35	95
								1010007-035	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	11/5/2008	48	0.3	0.21	83
								1010007-036	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	10/4/2010	103	0.36	0.27	104
								1010007-090	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	9/8/2010	20	0.44	0.29	20
								1010007-091	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	11/8/2010	85	3.3	1.14	85
								1010007-093	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	11/2/2010	109	0.59	0.36	110
								1010007-113	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	10/13/2009	14	0.3	0.25	15
								1010007-130	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	7/3/2002	4	0.51	0.10	76
								1010007-189	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	8/4/2003	27	0.31	0.20	68
								1010007-219	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	2/5/2009	44	0.32	0.22	68
								1010007-223	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	9/5/2003	2	0.24	0.11	65
								1010007-236	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	7/18/2005	5	0.22	0.14	99
								1010007-264	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	4/8/2008	6	0.23	0.13	100
								1010007-293	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	11/5/2008	46	0.59	0.22	79
								1010007-297	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	11/14/2006	2	0.23	0.14	72
								1010007-310	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	5/9/2008	33	0.32	0.17	111
								1010007-312	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	5/12/2008	52	0.28	0.20	117
								1010007-319	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	10/4/2010	99	0.75	0.52	99
								1010007-324	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	6/24/2008	12	0.25	0.15	71
								1010007-325	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	11/7/2008	16	0.34	0.20	37
								1010007-339	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	11/2/2010	95	0.63	0.32	97
								1010007-340	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	11/8/2010	103	0.63	0.33	105
								1010007-349	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	11/9/2010	75	0.94	0.39	76
								1010007-359	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	10/13/2010	119	0.6	0.33	123
								1010007-380	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	11/12/2008	47	0.68	0.32	59
								1010007-392	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	12/3/2009	20	0.28	0.18	69
								1010007-699	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	11/9/2010	11	0.72	0.53	11
								1010007-064	cis-1,2-Dichloroethylene	6	ug/L	7/6/2005	2	6.4	3.14	60
								1010007-091	Ethylene dibromide (EDB)	0.05	ug/L	11/8/2010	83	0.46	0.17	85
								1010007-113	Ethylene dibromide (EDB)	0.05	ug/L	6/23/2010	15	0.24	0.15	15
								1010007-312	Ethylene dibromide (EDB)	0.05	ug/L	11/8/2010	106	0.84	0.09	117
								1010007-079	Gross alpha particle activity	15	pCi/L	1/4/2008	5	21.2	17.47	6
								1010007-156	Gross alpha particle activity	15	pCi/L	3/16/2007	2	23.5	18.40	3
								1010007-178	Gross alpha particle activity	15	pCi/L	5/25/2007	3	15.8	12.15	8
								1010007-213	Gross alpha particle activity	15	pCi/L	5/24/2007	5	25.3	18.26	7
								1010007-217	Gross alpha particle activity	15	pCi/L	9/18/2006	2	17.2	12.18	7
								1010007-263	Gross alpha particle activity	15	pCi/L	6/1/2007	3	20.6	15.57	6
								1010007-305	Gross alpha particle activity	15	pCi/L	6/12/2007	4	19.4	15.99	8
								1010007-349	Gross alpha particle activity	15	pCi/L	1/14/2008	2	22	20.30	2
								1010007-386	Gross alpha particle activity	15	pCi/L	5/22/2007	7	23.8	19.31	8
								1010007-090	Nitrate (as NO3)	45	mg/L	9/8/2010	26	48	44.07	58
								1010007-189	Nitrate (as NO3)	45	mg/L	8/7/2009	3	46	36.41	121
								1010007-281	Nitrate (as NO3)	45	mg/L	8/15/2002	3	47	22.59	145
								1010007-293	Nitrate (as NO3)	45	mg/L	4/16/2007	2	46	37.46	275
								1010007-297	Nitrate (as NO3)	45	mg/L	10/20/2010	3	58	36.02	54
								1010007-312	Nitrate (as NO3)	45	mg/L	8/27/2007	7	104	32.63	364
								1010007-349	Nitrate (as NO3)	45	mg/L	11/18/2010	250	67	57.42	252
								1010007-089	Tetrachloroethylene (PCE)	5	ug/L	3/2/2004	4	8.6	0.31	105
								1010007-394	Tetrachloroethylene (PCE)	5	ug/L	11/9/2010	36	7	5.26	50
								1010007-095	Trichloroethylene (TCE)	5	ug/L	11/9/2010	96	62	28.64	98
								1010007-099	Trichloroethylene (TCE)	5	ug/L	11/9/2010	184	56	30.64	184

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								1010007-102	Trichloroethylene (TCE)	5	ug/L	7/7/2008	2	40	2.15	128
								1010007-103	Trichloroethylene (TCE)	5	ug/L	11/9/2010	36	32	3.94	113
								1010007-204	Trichloroethylene (TCE)	5	ug/L	11/9/2010	109	36	19.53	111
								1010007-314	Trichloroethylene (TCE)	5	ug/L	6/3/2009	104	50	17.09	131
FRESNO	City of Fowler	ALICE MANOR	1000199	100% GW	46	1	1	1000199-001	Gross alpha particle activity	15	pCi/L	11/15/2010	3	19.7	16.83	4
FRESNO	Firebaugh city	FIREBAUGH CITY	1010005	100% GW	6500	7	4	1010005-007	Arsenic	10	ug/L	11/2/2010	35	76	51.00	36
								1010005-009	Arsenic	10	ug/L	10/12/2010	22	40	26.05	22
								1010005-010	Arsenic	10	ug/L	8/5/2008	2	52	6.83	34
								1010005-017	Arsenic	10	ug/L	10/12/2010	3	24	7.17	19
FRESNO	Fresno city	BAKMAN WATER COMPANY	1010001	100% GW	8751	11	2	1010001-009	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	4/21/2008	4	0.45	0.39	4
								1010001-010	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	8/23/2005	4	0.34	0.16	9
FRESNO	Kerman city	KERMAN, CITY OF	1010018	100% GW	13878	6	1	1010018-012	Gross alpha particle activity	15	pCi/L	3/26/2010	3	22.3	15.82	4
FRESNO	Malaga CDP	MALAGA COUNTY WATER DISTRICT	1010042	100% GW	900	4	1	1010042-004	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	6/12/2003	2	0.24	0.03	35
FRESNO	Parlier city	PARLIER, CITY OF	1010025	100% GW	12058	4	1	1010025-010	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	1/3/2008	2	0.3	0.16	18
FRESNO	Reedley city	REEDLEY, CITY OF	1010027	100% GW	26227	8	1	1010027-011	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	5/10/2007	67	0.56	0.41	67
FRESNO	Riverdale CDP	RIVERDALE PUBLIC UTILITY DISTRICT	1010028	100% GW	2416	2	2	1010028-004	Arsenic	10	ug/L	10/4/2010	20	68.6	37.77	20
								1010028-005	Arsenic	10	ug/L	10/4/2010	22	46.2	38.00	22
FRESNO	Sanger city	CITY OF SANGER	1010029	100% GW	25417	8	5	1010029-003	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	10/6/2010	55	0.43	0.27	60
								1010029-009	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	6/29/2010	115	0.6	0.16	118
								1010029-010	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	3/17/2009	68	0.63	0.15	101
								1010029-015	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	6/22/2010	55	0.5	0.28	60
								1010029-022	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	10/6/2010	16	0.71	0.56	16
								1010029-003	Tetrachloroethylene (PCE)	5	ug/L	7/17/2007	3	11	2.98	28
FRESNO	Tranquillity CDP	TRANQUILLITY IRRIGATION DIST	1010030	100% GW	820	2	2	1010030-002	Arsenic	10	ug/L	6/8/2010	12	16	13.05	13
								1010030-003	Arsenic	10	ug/L	9/16/2010	15	16.1	13.97	15
FRESNO	Cantua Creek	FCSA #32/CANTUA CREEK	1000359	Mixed <50%GW	230	1	1	1000359-003	Nitrate (as NO3)	45	mg/L	3/3/2009	4	65	43.9083333	4
FRESNO	Clovis city, Tarpey Village CDP	CLOVIS, CITY OF	1010003	Undetermined	98950	38	13	1010003-010	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	11/12/2008	31	0.34	0.18	66
								1010003-013	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	12/10/2003	5	0.49	0.14	63
								1010003-023	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	9/13/2010	37	0.77	0.49	37
								1010003-029	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	9/25/2007	6	0.29	0.12	39
								1010003-032	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	9/28/2004	6	0.3	0.12	86
								1010003-034	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	6/2/2010	12	0.28	0.18	42
								1010003-036	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	5/29/2003	4	0.36	0.14	80
								1010003-037	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	9/15/2010	37	0.86	0.54	37
								1010003-044	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	3/19/2007	21	0.3	0.18	49
								1010003-048	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	12/11/2003	3	0.43	0.11	67
								1010003-064	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	9/15/2010	33	2.7	0.79	33
								1010003-068	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	2/11/2004	5	0.31	0.10	55
FRESNO	Auberry CDP	MARY LOU MOBILE HOME PARK	1000265	100% GW	70	2	2	1000265-001	Gross alpha particle activity	15	pCi/L	11/19/2006	3	25	13.80	9
								1000265-002	Gross alpha particle activity	15	pCi/L	12/2/2009	3	24	14.29	7
								1000265-001	Uranium	30	ug/L	9/18/2007	7	33.8	22.24	5
FRESNO	Bowles CDP	MANNING GARDENS CONVALESCENT	1000324	100% GW	59	1	1	1000324-001	Gross alpha particle activity	15	pCi/L	5/14/2008	2	20	14.48	5
FRESNO	Caruthers CDP	CARUTHERS COMM SERV DIST	1010039	100% GW	2103	4	3	1010039-001	Arsenic	10	ug/L	10/11/2010	13	28	23.92	13
								1010039-004	Arsenic	10	ug/L	10/11/2010	13	22	20.08	13
								1010039-005	Arsenic	10	ug/L	10/11/2010	17	14.5	13.12	17
FRESNO	City of Fresno	RAU DAIRY	1009120	100% GW	80	1	1	1009120-001	Arsenic	10	ug/L	4/30/2010	2	14	8.67	3
FRESNO	City of Auberry	MEADOW LAKES CLUB	1000056	100% GW	85	2	1	1000056-004	Gross alpha particle activity	15	pCi/L	6/24/2009	9	67	23.56	12
								1000056-004	Uranium	20	pCi/L	7/27/2010	8	64	23.74	14
FRESNO	City of Auberry	PG&E HELMS SUPPORT FACILITY	1000472	100% GW	36	1	1	1000472-001	Arsenic	10	ug/L	7/7/2010	9	41	38.33	9
FRESNO	City of Dunlap	KINGS CANYON MOBILE HOME PARK	1000267	100% GW	200	3	1	1000267-004	Gross alpha particle activity	15	pCi/L	12/7/2009	2	20	14.19	3
FRESNO	City of Fresno	BAR 20 PARTNER	1000079	100% GW	60	1	1	1000079-022	Arsenic	10	ug/L	2/25/2010	2	14	11.07	3
FRESNO	Auberry CDP	FCWWD #40/SHAVER SPRINGS	1000042	100% GW	172	2	2	1000042-016	Arsenic	10	ug/L	6/10/2010	3	52	13.70	11
								1000042-002	Gross alpha particle activity	15	pCi/L	3/25/2010	11	197	39.20	13

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								1000042-016	Gross alpha particle activity	15	pCi/L	6/23/2010	15	97.8	30.93	16
								1000042-002	Uranium	20	pCi/L	12/30/2008	5	91.4	24.72	11
								1000042-016	Uranium	20	pCi/L	6/10/2010	8	67.3	25.45	12
FRESNO	City of Fresno	FCWWD #42/ALLUVIAL & FANCHER	1000078	100% GW	255	4	1	1000078-001	Nitrate (as NO3)	45	mg/L	4/8/2010	8	54	43.19	21
FRESNO	City of Fresno	CAMDEN TRAILER PARK	1000238	100% GW	90	1	1	1000238-023	Arsenic	10	ug/L	7/12/2010	5	35	31.90	5
FRESNO	City of Fresno	DOUBLE L MOBILE RANCH PARK	1000248	100% GW	80	1	1	1000248-001	Gross alpha particle activity	15	pCi/L	6/23/2010	3	24.5	21.83	3
FRESNO	City of Fresno	SUNNYSIDE CONVALESCENT HOSP	1000366	100% GW	116	1	1	1000366-001	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	1/26/2004	2	0.4	0.19	6
								1000366-001	Nitrate (as NO3)	45	mg/L	7/26/2010	2	50	31.11	9
FRESNO	City of Hanford	LINDA VISTA FARMS	1000445	100% GW	61	1	1	1000445-001	Gross alpha particle activity	15	pCi/L	10/13/2010	8	38.2	26.08	9
								1000445-001	Uranium	20	pCi/L	10/13/2010	5	30	21.51	9
FRESNO	City of Kerman	MURRIETA/HERNANDEZ FARMS	1000585	100% GW	4	1	1	1000585-001	Nitrate (as NO3)	45	mg/L	12/7/2009	2	350	340.00	2
FRESNO	City of Laton	ZONNEVELD DAIRY	1000369	100% GW	141	2	2	1000369-002	Arsenic	10	ug/L	9/22/2010	7	70	39.57	7
								1000369-023	Arsenic	10	ug/L	10/20/2010	9	27	23.56	9
								1000369-023	Gross alpha particle activity	15	pCi/L	11/10/2009	2	16.4	13.65	6
FRESNO	Lanare CDP	LANARE COMMUNITY SERVICES DIST	1000053	100% GW	400	2	1	1000053-001	Arsenic	10	ug/L	10/21/2010	2	31.9	28.20	2
FRESNO	Malaga CDP	MALAGA COUNTY WATER DISTRICT	1010042	100% GW	900	4	1	1010042-001	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	9/29/2010	4	0.4	0.32	4
FRESNO	Undetermined	WATERTEK-METROPOLITAN	1000057	100% GW	60	1	1	1000057-001	Gross alpha particle activity	15	pCi/L	6/20/2005	2	15.6	11.80	7
GLENN	City of Clovis	SHADY OAKS MOBILE HOME PARK	2000828	100% GW	40	2	2	2000828-001	Gross alpha particle activity	15	pCi/L	12/17/2008	2	337	123.20	3
								2000828-002	Gross alpha particle activity	15	pCi/L	12/17/2008	2	470	409.00	2
								2000828-001	Uranium	20	pCi/L	4/2/2010	2	224	63.12	5
								2000828-002	Uranium	20	pCi/L	4/2/2010	4	354	238.00	4
GLENN	City of Willows	WILLOW GLENN MOBILE H.P.	1100237	100% GW	150	2	1	1100237-001	Nitrate (as NO3)	45	mg/L	5/3/2010	6	48.3	36.31	36
INYO	City of Death Valley	NPS - DVNM - COW CR/NEVARES	1410503	100% GW	125	1	1	1410503-002	Fluoride	2	mg/L	11/3/2010	15	3.3	3.05	15
INYO	City of Death Valley	NPS - DEATH VALLEY, GRAPEVINE RS	1410504	100% GW	4	1	1	1410504-001	Arsenic	10	ug/L	6/9/2008	2	34	31.00	2
INYO	City of Keeler	Keeler Community Service District	1400036	100% GW	180	1	1	1400036-001	Arsenic	10	ug/L	10/4/2010	7	102	74.00	7
INYO	Dixon Lane-Meadow Creek CDP	Wilson Circle Mutual Water Company	1400135	100% GW	100	3	1	1400135-001	Gross alpha particle activity	15	pCi/L	10/15/2005	5	76.6	30.32	5
								1400135-001	Uranium	20	pCi/L	10/15/2005	4	32.8	32.80	4
INYO	Lone Pine CDP	Foothill Lone Pine Mobile Home Park, LLC	1400037	100% GW	100	1	1	1400037-001	Arsenic	10	ug/L	7/21/2010	26	120	53.63	27
								1400037-001	Gross alpha particle activity	15	pCi/L	7/21/2010	15	41.4	24.22	18
								1400037-001	Uranium	20	pCi/L	9/1/2009	11	36.1	24.33	18
INYO	Mesa CDP	Control Gorge Power Plant	1400155	100% GW	36	1	1	1400155-001	Arsenic	10	ug/L	2/17/2009	6	41	31.74	6
INYO	Round Valley CDP	Pine Creek Village	1400006	100% GW	350	2	1	1400006-002	Gross alpha particle activity	15	pCi/L	11/11/2010	10	31.2	19.59	13
								1400006-002	Uranium	20	pCi/L	8/18/2009	5	32.1	17.86	13
INYO	Wilkerson CDP	Sierra North Community Service District	1400109	100% GW	28	1	1	1400109-001	Fluoride	2	mg/L	3/18/2008	3	2.2	1.99	9
KERN COUNTY	Arvin city	ARVIN COMMUNITY SERVICES DIST	1510001	100% GW	11847	6	5	1510001-001	Arsenic	10	ug/L	7/14/2010	30	53	27.71	30
								1510001-005	Arsenic	10	ug/L	7/14/2010	21	56	29.53	22
								1510001-006	Arsenic	10	ug/L	7/14/2010	12	32	20.25	12
								1510001-009	Arsenic	10	ug/L	7/14/2010	17	53	23.45	19
								1510001-010	Arsenic	10	ug/L	10/7/2009	14	29	18.57	13
								1510001-009	Benzene	1	ug/L	8/20/2009	22	18	3.79	33
								1510001-010	Nitrate (as NO3)	45	mg/L	10/7/2009	12	58	36.56	40
								1510001-010	Tetrachloroethylene (PCE)	5	ug/L	6/13/2002	3	5.7	3.32	28

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
KERN COUNTY	Bakersfield city	CWS - NORTH GARDEN	1510055	100% GW			1	1510055-005	Nitrate (as NO3)	45	mg/L	9/20/2010	66	53	42.99	174
KERN COUNTY	Bakersfield city, Greenacres CDP, Rosedale CDP	VAUGHN WC INC F	1510029	100% GW	28100	12	2	1510029-016	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	11/23/2010	98	1.53	0.61	103
								1510029-009	Arsenic	10	ug/L	9/8/2009	8	13	9.03	21
								1510029-009	Ethylene dibromide (EDB)	0.05	ug/L	2/13/2007	32	0.19	0.05	104
								1510029-016	Nitrate (as NO3)	45	mg/L	1/3/2005	2	50.7	33.16	104
KERN COUNTY	Bakersfield city, Greenfield CDP	GREENFIELD COUNTY WD	1510024	100% GW	6500	5	3	1510024-003	Arsenic	10	ug/L	2/3/2009	2	12	9.31	8
								1510024-004	Arsenic	10	ug/L	5/17/2010	9	13	10.53	10
								1510024-009	Arsenic	10	ug/L	7/26/2010	6	12	9.98	11
								1510024-003	Gross alpha particle activity	15	pCi/L	8/7/2007	2	17.9	13.71	6
KERN COUNTY	Bear Valley Springs CDP	BEAR VALLEY CSD F	1510038	100% GW	7534	23	3	1510038-033	Gross alpha particle activity	15	pCi/L	9/17/2007	5	28.4	17.13	7
								1510038-034	Gross alpha particle activity	15	pCi/L	12/16/2009	3	35	11.47	9
								1510038-040	Nitrate (as NO3)	45	mg/L	9/17/2007	5	62	39.17	19
KERN COUNTY	Bodfish CDP	CWS - UPPER BODFISH WATER SYSTEM	1510026	100% GW	784	2	2	1510026-004	Arsenic	10	ug/L	8/17/2010	8	20	12.94	11
								1510026-005	Arsenic	10	ug/L	8/17/2010	11	51.001	39.38	11
								1510026-005	Fluoride	2	mg/L	8/4/2010	12	2.5	2.29	13
								1510026-004	Gross alpha particle activity	15	pCi/L	8/17/2010	7	27	21.00	9
								1510026-004	Uranium	20	pCi/L	11/16/2009	6	32.037	20.97	13
KERN COUNTY	Bodfish CDP	CWS - LOWER BODFISH WATER SYSTEM	1510056	100% GW	1618	4	2	1510056-008	Arsenic	10	ug/L	10/13/2010	30	14.743	12.79	33
								1510056-022	Arsenic	10	ug/L	10/13/2010	9	17.714	9.28	27
KERN COUNTY	China Lake Acres CDP, Ridgecrest city	INDIAN WELLS VALLEY W.D.	1510017	100% GW	30000	10	4	1510017-014	Arsenic	10	ug/L	9/20/2005	7	20	12.60	8
								1510017-015	Arsenic	10	ug/L	5/18/2010	6	13	9.74	18
								1510017-017	Arsenic	10	ug/L	11/2/2010	20	25	14.94	20
								1510017-036	Arsenic	10	ug/L	11/2/2010	42	46	26.31	42
KERN COUNTY	City of Bakersfield	SOUTH KERN MUTUAL WATER COMPANY	1500344	100% GW	32	1	1	1500344-001	Gross alpha particle activity	15	pCi/L	3/6/2007	4	20.6	18.01	5
								1500344-001	Uranium	20	pCi/L	7/11/2006	2	25.9	22.42	3
KERN COUNTY	City of Bakersfield	SEVENTH STANDARD MUTUAL	1500373	100% GW	66	1	1	1500373-002	Nitrate (as NO3)	45	mg/L	4/23/2010	11	79	47.22	15
KERN COUNTY	City of Bakersfield	ENOS LANE PUBLIC UTILITY DISTRICT	1500544	100% GW	270	2	2	1500544-002	Arsenic	10	ug/L	5/11/2010	3	16	10.45	6
								1500544-001	Nitrate (as NO3)	45	mg/L	8/14/2007	3	55.4	27.26	18
KERN COUNTY	City of Bakersfield	ROUND MOUNTAIN WATER COMPANY	1500561	100% GW	50	2	1	1500561-002	Gross alpha particle activity	15	pCi/L	10/26/2010	4	27.1	19.42	6
								1500561-002	Uranium	20	pCi/L	10/26/2010	7	28.8	20.92	13
KERN COUNTY	City of Bakersfield	SAN JOAQUIN ESTATES MUTUAL	1500575	100% GW	165	1	1	1500575-001	Nitrate (as NO3)	45	mg/L	8/17/2010	17	89	49.34	25
KERN COUNTY	City of Bakersfield	OASIS PROPERTY OWNERS ASSOCIATION	1500585	100% GW	100	1	1	1500585-003	Arsenic	10	ug/L	7/21/2009	3	13	9.88	14
KERN COUNTY	City of Bakersfield	SON SHINE PROPERTIES	1500588	100% GW	500	1	1	1500588-002	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	10/12/2010	13	1.2	0.67	14
								1500588-002	Nitrate (as NO3)	45	mg/L	1/26/2010	4	62	30.94	35
KERN COUNTY	City of Delano	KERN VALLEY STATE PRISON	1510802	100% GW	6546	2	2	1510802-001	Arsenic	10	ug/L	10/5/2010	15	23	15.08	17
								1510802-002	Arsenic	10	ug/L	10/5/2010	18	24	20.83	18
								1510802-001	Nitrite (as N)	1000	mg/L	10/5/2010	8	7600	1027.85	23
								1510802-002	Nitrite (as N)	1000	mg/L	10/5/2010	17	1600	1081.72	24
KERN COUNTY	City of Lost Hills	LOST HILLS UTILITY DISTRICT	1510046	100% GW	2772	2	2	1510046-002	Arsenic	10	ug/L	4/24/2007	12	48	16.68	26
								1510046-003	Arsenic	10	ug/L	4/12/2010	22	51	29.89	23
KERN COUNTY	City of Rosamond	WILLIAM FISHER MEMORIAL WATER COMPANY	1500455	100% GW	51	1	1	1500455-003	Arsenic	10	ug/L	11/9/2010	14	20	16.52	15
KERN COUNTY	City of Taft	WEST KERN WATER DISTRICT	1510022	100% GW	16630	11	3	1510022-001	Arsenic	10	ug/L	10/6/2010	14	14	10.77	19
								1510022-004	Gross alpha particle activity	15	pCi/L	9/30/2009	6	30.3	15.36	13
								1510022-005	Gross alpha particle activity	15	pCi/L	5/13/2008	4	25.8	18.93	6
								1510022-004	Uranium	20	pCi/L	12/9/2008	3	28.8	15.17	13
								1510022-005	Uranium	20	pCi/L	4/20/2005	2	26	18.00	6
KERN COUNTY	City of Tehachapi	WILSON ROAD WATER COMMUNITY	1500494	100% GW	72	1	1	1500494-001	Nitrate (as NO3)	45	mg/L	8/9/2010	5	58	33.10	12

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
KERN COUNTY	City of Tehachapi	PINON HILL WATER COMPANY	1500540	100% GW	80	1	1	1500540-001	Arsenic	10	ug/L	11/9/2010	15	15	12.48	18
KERN COUNTY	City of Tehachapi	FAIRVIEW WATER COMPANY, LLC	1502670	100% GW	100	2	1	1502670-001	Perchlorate	6	ug/L	5/7/2009	4	9.1	4.19	20
KERN COUNTY	Delano city	DELANO, CITY OF	1510005	100% GW	53855	11	9	1510005-004	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	7/13/2010	6	0.28	0.15	32
								1510005-004	Arsenic	10	ug/L	10/5/2010	17	19	13.72	18
								1510005-012	Arsenic	10	ug/L	10/5/2010	23	25	18.78	23
								1510005-016	Arsenic	10	ug/L	10/5/2010	20	25	15.96	23
								1510005-017	Arsenic	10	ug/L	4/13/2010	8	25	10.10	23
								1510005-018	Arsenic	10	ug/L	10/19/2010	19	37	21.15	20
								1510005-019	Arsenic	10	ug/L	10/21/2010	30	56	27.77	30
								1510005-020	Arsenic	10	ug/L	10/19/2010	40	54	33.80	40
								1510005-021	Arsenic	10	ug/L	10/5/2010	23	33	23.70	23
								1510005-031	Arsenic	10	ug/L	10/5/2010	24	28	19.13	24
KERN COUNTY	Frazier Park CDP	FRAZIER PARK PUD	1510007	100% GW	2348	5	1	1510007-004	Gross alpha particle activity	15	pCi/L	2/11/2010	4	23.1	12.94	7
KERN COUNTY	Fuller Acres CDP	FULLER ACRES MUTUAL WATER COMPANY	1500296	100% GW	640	2	1	1500296-002	Arsenic	10	ug/L	10/26/2005	2	13	8.64	5
KERN COUNTY	Golden Hills CDP, Lake Isabella CDP	GOLDEN HILLS CSD	1510045	100% GW	7434	12	3	1510045-011	Arsenic	10	ug/L	11/2/2010	9	21	11.64	11
								1510045-001	Tetrachloroethylene (PCE)	5	ug/L	8/4/2010	2	6.2	4.93	6
								1510045-006	Tetrachloroethylene (PCE)	5	ug/L	3/18/2010	2	6.4	2.81	14
KERN COUNTY	Inyokern CDP	CHINA LAKE NAVAL AIR WEAPONS STATION	1510703	100% GW	4500	14	1	1510703-018	Arsenic	10	ug/L	12/16/2009	2	12	11.50	2
KERN COUNTY	Keene CDP	VALLEY VIEW ESTATES MUTUAL WATER CO	1500569	100% GW	82	5	1	1500569-004	Nitrate (as NO3)	45	mg/L	7/3/2008	15	106	45.65	37
KERN COUNTY	Keene CDP, Tehachapi city	UNION PACIFIC RAILROAD COMPANY	1500371	100% GW	147	4	3	1500371-002	Fluoride	2	mg/L	4/27/2006	19	5.6	3.98	20
								1500371-010	Fluoride	2	mg/L	10/20/2009	6	5.5	2.13	14
								1500371-012	Fluoride	2	mg/L	12/17/2009	10	6.3	4.29	12
KERN COUNTY	Lake Isabella CDP	CWS - LAKELAND	1510049	100% GW	683	3	3	1510049-008	Antimony	6	ug/L	10/13/2010	23	22.3	17.06	23
								1510049-008	Arsenic	10	ug/L	10/13/2010	15	18	14.47	15
								1510049-003	Fluoride	2	mg/L	11/3/2010	26	3.47	3.31	26
								1510049-004	Fluoride	2	mg/L	10/19/2010	29	6.9	4.20	29
								1510049-008	Fluoride	2	mg/L	10/19/2010	29	6.6	6.18	29
								1510049-003	Gross alpha particle activity	15	pCi/L	7/8/2009	4	19.4	14.70	9
								1510049-004	Gross alpha particle activity	15	pCi/L	10/13/2010	17	32.7	18.88	24
								1510049-008	Gross alpha particle activity	15	pCi/L	10/13/2010	23	52.7	34.91	23
								1510049-003	Nitrate (as NO3)	45	mg/L	11/3/2010	68	220	80.68	67
								1510049-004	Uranium	20	pCi/L	1/12/2010	20	30	22.61	24
KERN COUNTY	Lamont CDP, Weedpatch CDP	LAMONT PUBLIC UTILITY DIST	1510012	100% GW	13296	7	2	1510012-006	Arsenic	10	ug/L	1/27/2010	7	50	12.47	18
								1510012-010	Arsenic	10	ug/L	5/12/2008	3	11	9.49	15
KERN COUNTY	Lebec CDP	KRISTA MUTUAL WATER COMPANY	1500475	100% GW	455	1	1	1500475-001	Fluoride	2	mg/L	7/1/2009	5	2.2	2.01	14
KERN COUNTY	McFarland city	CITY OF MCFARLAND	1510013	100% GW	12138	3	1	1510013-011	Arsenic	10	ug/L	8/11/2009	7	16	12.88	8
KERN COUNTY	Mountain Mesa CDP	MOUNTAIN MESA WC	1510042	100% GW	1126	3	2	1510042-001	Arsenic	10	ug/L	8/16/2010	24	20.912	14.78	25
								1510042-002	Arsenic	10	ug/L	8/16/2010	20	13	10.11	33
								1510042-001	Nitrate (as NO3)	45	mg/L	10/12/2010	31	55.135	40.95	71
KERN COUNTY	North Edwards CDP	NORTH EDWARDS WD	1510052	100% GW	650	2	1	1510052-002	Arsenic	10	ug/L	9/15/2010	16	42	35.31	15
								1510052-002	Gross alpha particle activity	15	pCi/L	5/25/2010	6	19	15.72	10
KERN COUNTY	Rosamond CDP	ROSAMOND MOBILEHOME PARK	1502232	100% GW	50	1	1	1502232-001	Gross alpha particle activity	15	pCi/L	10/18/2010	14	42.6	28.07	16
								1502232-001	Uranium	20	pCi/L	10/18/2010	15	33	29.73	15
KERN COUNTY	Rosedale CDP	MAHER MUTUAL WATER COMPANY	1500378	100% GW	150	1	1	1500378-001	Arsenic	10	ug/L	9/21/2010	8	24	21.25	8
KERN COUNTY	Rosedale CDP	BROCK MUTUAL WATER COMPANY	1500409	100% GW	500	2	1	1500409-002	Nitrate (as NO3)	45	mg/L	11/14/2008	2	63	28.16	22
KERN COUNTY	Rosedale CDP	GOOSELAKE WATER COMPANY	1500584	100% GW	80	1	1	1500584-001	Gross alpha particle activity	15	pCi/L	10/16/2009	3	26.9	15.75	6
								1500584-001	Nitrate (as NO3)	45	mg/L	12/19/2008	2	55	30.42	31
KERN COUNTY	Stallion Springs CDP	STALLION SPRINGS CSD	1510025	100% GW	4500	7	1	1510025-016	Nitrate (as NO3)	45	mg/L	3/26/2007	5	62	26.28	130
								1510025-016	Perchlorate	6	ug/L	5/20/2009	3	34	4.89	120

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
KERN COUNTY	Tehachapi city	TEHACHAPI, CITY OF	1510020	100% GW	7218	6	2	1510020-001	Nitrate (as NO3)	45	mg/L	3/17/2010	2	47	39.31	31
								1510020-002	Nitrate (as NO3)	45	mg/L	11/29/2006	3	54	37.67	54
KERN COUNTY	Southlake	Southlake	1510039	100% GW	2957	4	1	1510039-008	Gross alpha particle activity	15	pCi/L	3/37/2009	4	24	16.50	6
KERN COUNTY	Wasco city	WASCO, CITY OF	1510021	100% GW	19448	8	3	1510021-007	Nitrate (as NO3)	45	mg/L	6/2/2010	4	62.8	39.99	41
								1510021-008	Nitrate (as NO3)	45	mg/L	12/11/2007	6	56	30.90	42
								1510021-009	Nitrate (as NO3)	45	mg/L	9/13/2005	10	58.8	26.49	100
KERN COUNTY	Weldon CDP	RAINBIRD VALLEY MUTUAL WATER COMPANY	1500393	100% GW	188	1	1	1500393-001	Gross alpha particle activity	15	pCi/L	11/20/2008	2	49.8	47.25	2
								1500393-001	Uranium	20	pCi/L	12/8/2009	6	60	45.67	6
KERN COUNTY	Weldon CDP	TRADEWIND WATER ASSOC.	1500406	100% GW	500	2	2	1500406-002	Gross alpha particle activity	15	pCi/L	5/20/2008	4	18.7	15.54	5
								1500406-003	Gross alpha particle activity	15	pCi/L	9/18/2008	4	21.5	19.10	4
								1500406-002	Uranium	20	pCi/L	9/18/2008	2	26.8	21.60	3
KERN COUNTY	Bakersfield city	BAKERSFIELD, CITY OF	1510031	100% GW	147999	59	5	1510031-038	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	1/7/2008	47	0.41	0.20	93
								1510031-005	Arsenic	10	ug/L	10/6/2010	3	10.746	7.56	19
								1510031-048	Arsenic	10	ug/L	10/14/2009	7	15	10.28	16
								1510031-102	Arsenic	10	ug/L	10/6/2010	2	14.835	4.06	14
								1510031-103	Arsenic	10	ug/L	12/5/2007	4	12.18	6.26	27
KERN COUNTY	Boron CDP	BORON CSD	1510002	>50% GW Mixed	2500	1	1	1510002-002	Arsenic	10	ug/L	10/6/2010	58	90	69.93	58
KERN COUNTY	Edwards AFB CDP	EDWARDS AFB - MAIN BASE	1510701	>50% GW Mixed	12733	8	6	1510701-010	Arsenic	10	ug/L	10/7/2008	10	18.2	10.10	26
								1510701-011	Arsenic	10	ug/L	4/20/2005	4	22.2	9.26	19
								1510701-013	Arsenic	10	ug/L	8/18/2010	10	13	9.90	22
								1510701-014	Arsenic	10	ug/L	10/18/2010	15	13.7	10.11	28
								1510701-015	Arsenic	10	ug/L	10/18/2010	10	16.9	10.48	21
								1510701-017	Arsenic	10	ug/L	8/18/2010	19	21	12.69	21
KERN COUNTY	Kernville CDP, Wofford Heights CDP	CAL WATER SERVICE CO-KERNVILLE SYSTEM	1510033	>50% GW Mixed	5029	13	7	1510033-012	Fluoride	2	mg/L	7/16/2008	8	2.9	0.91	40
								1510033-014	Fluoride	2	mg/L	10/19/2010	35	3.15	2.38	39
								1510033-017	Fluoride	2	mg/L	7/27/2010	35	6.79	5.62	32
								1510033-043	Fluoride	2	mg/L	8/3/2010	97	2.91	2.53	98
								1510033-008	Gross alpha particle activity	15	pCi/L	1/13/2009	4	25	11.54	13
								1510033-056	Gross alpha particle activity	15	pCi/L	6/20/2006	5	25.8	15.79	9
								1510033-008	Uranium	20	pCi/L	7/27/2010	5	36.274	12.93	15
								1510033-056	Uranium	20	pCi/L	10/14/2003	3	22.75	14.53	13
KERN COUNTY	Wofford Heights CDP	CWS-SPLIT MOUNTAIN WATER SYSTEM	1500407	>50% GW Mixed	501	2	1	1500407-007	Arsenic	10	ug/L	5/26/2004	2	27	7.49	12
KERN COUNTY	Edwards	EDGEMONT ACRES MUTUAL WATER COMPANY	1500290	Mixed <50%GW	400	2	2	1500290-001	Arsenic	10	ug/L	4/14/2009	4	220	190	4
								1500290-003	Arsenic	10	ug/L	4/5/2010	3	260	243.333333	3
KERN COUNTY	Mojave	MOJAVE PUD	1510014	Mixed <50%GW	4000	5	2	1510014-004	Arsenic	10	ug/L	9/1/2010	13	18	15	13
								1510014-015	Arsenic	10	ug/L	9/1/2010	13	15	11.18	13
KERN COUNTY	Oildale	OILDALE MWC	1510015	Mixed <50%GW	26000	6	2	1510015-009	Gross alpha particle activity	15	pCi/L	10/11/2010	8	25.4	14.7258333	8
								1510015-010	Gross alpha particle activity	15	pCi/L	9/21/2009	2	24.2	12.305	2
								1510015-010	Tetrachloroethylene (PCE)	5	ug/L	5/24/2010	3	5.3	3.6375	3
KERN COUNTY	Rosamond	ROSAMOND CSD	1510018	Mixed <50%GW	11605	3	1	1510018-009	Arsenic	10	ug/L	8/24/2010	10	12	10.0565217	10
KERN COUNTY	Desert Lake	DESERT LAKE COMM SERV DIST	1510027	Mixed <50%GW	600	1	1	1510027-002	Arsenic	10	ug/L	9/15/2010	11	88	46.5454545	11
								1510027-002	Gross alpha particle activity	15	pCi/L	5/25/2010	3	20.5	15.445	3
KERN COUNTY	Bakersfield city	CWS - BAKERSFIELD	1510003	Undetermined			3	1510003-100	Arsenic	10	ug/L	1/22/2007	2	12	6.29	31
								1510003-103	Arsenic	10	ug/L	9/20/2010	31	19.19	12.70	41
								1510003-114	Trichloroethylene (TCE)	5	ug/L	10/13/2010	28	9.8	4.28	75
KERN COUNTY	Bakersfield city	EAST NILES CSD	1510006	Undetermined	25500	7	5	1510006-005	Arsenic	10	ug/L	8/26/2009	11	45	24.55	11
								1510006-006	Arsenic	10	ug/L	9/2/2010	10	11	9.78	21
								1510006-010	Arsenic	10	ug/L	11/2/2010	21	47	31.43	21
								1510006-024	Arsenic	10	ug/L	2/9/2010	3	13	7.20	21
								1510006-029	Arsenic	10	ug/L	11/1/2010	45	78	23.44	49
KERN COUNTY	Bakersfield	QUAIL VALLEY WATER DIST-WESTSIDE SYSTEM	1503226	100% GW	60	2	1	1503226-001	Antimony	6	ug/L	9/27/2010	13	13	9.95	13
								1503226-001	Fluoride	2	mg/L	9/27/2010	12	29	7.85	13
KERN COUNTY	Arvin city	ARVIN COMMUNITY SERVICES DIST	1510001	100% GW	11847	6	1	1510001-016	Arsenic	10	ug/L	7/14/2010	6	15	12.63	8

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
KERN COUNTY	Bakersfield	FOURTH STREET WATER SYSTEM	1500449	100% GW	25	2	2	1500449-001	Arsenic	10	ug/L	7/2/2010	6	18	14.50	6
								1500449-002	Arsenic	10	ug/L	7/2/2010	12	23	14.33	12
KERN COUNTY	Bakersfield city	CASA LOMA WATER CO, INC.	1510004	100% GW	600	3	1	1510004-003	Tetrachloroethylene (PCE)	5	ug/L	3/11/2002	2	9.1	2.37	26
KERN COUNTY	Bear Valley Springs CDP	BEAR VALLEY CSD F	1510038	100% GW	7534	23	2	1510038-031	Gross alpha particle activity	15	pCi/L	12/5/2007	6	30	18.99	8
								1510038-004	Nitrate (as NO3)	45	mg/L	6/1/2007	2	50.9	31.13	24
KERN COUNTY	City of Bakersfield	OLD RIVER MUTUAL WATER COMPANY	1500096	100% GW	60	1	1	1500096-001	Gross alpha particle activity	15	pCi/L	1/31/2008	2	19	17.40	2
								1500096-001	Uranium	20	pCi/L	10/29/2010	9	52	29.12	9
KERN COUNTY	City of Bakersfield	EL ADOBE POA, INC.	1500493	100% GW	200	2	2	1500493-001	Arsenic	10	ug/L	4/19/2010	3	21	9.13	10
								1500493-002	Arsenic	10	ug/L	10/12/2010	11	24	20.40	12
KERN COUNTY	City of Bakersfield	ROUND MOUNTAIN WATER COMPANY	1500561	100% GW	50	2	1	1500561-001	Gross alpha particle activity	15	pCi/L	10/26/2010	8	50.1	39.71	7
								1500561-001	Uranium	20	pCi/L	10/26/2010	21	64.4	36.09	21
KERN COUNTY	City of Bakersfield	WHEELER FARMS HEADQUARTERS	1502017	100% GW	25	1	1	1502017-001	Nitrate (as NO3)	45	mg/L	10/5/2010	35	160	122.19	36
KERN COUNTY	City of Bakersfield	PANAMA ROAD PROPERTY OWNERS ASSOC	1502465	100% GW	50	1	1	1502465-002	Arsenic	10	ug/L	3/19/2008	4	13	9.54	14
KERN COUNTY	City of Bakersfield	DEL SOL WATER CO-OP	1502597	100% GW	25	1	1	1502597-001	Gross alpha particle activity	15	pCi/L	12/6/2007	7	26.9	22.00	7
								1502597-001	Uranium	20	pCi/L	6/8/2010	4	24.8	19.80	11
KERN COUNTY	City of Bakersfield	GOSFORD ROAD WATER COMPANY	1502622	100% GW	52	2	1	1502622-001	Arsenic	10	ug/L	7/1/2010	10	14	12.16	11
KERN COUNTY	City of Bakersfield	EAST WILSON ROAD WATER COMPANY	1502699	100% GW	35	1	1	1502699-001	Nitrate (as NO3)	45	mg/L	10/12/2010	25	120	69.80	25
KERN COUNTY	City of Bakersfield	QUAIL VALLEY WATER DIST-EASTSIDE SYSTEM	1502724	100% GW	60	2	2	1502724-001	Arsenic	10	ug/L	9/27/2010	15	120	87.80	15
								1502724-002	Arsenic	10	ug/L	9/27/2010	11	70	56.45	11
KERN COUNTY	City of Frazier Park	PINON PINES MWC	1510054	100% GW	740	4	2	1510054-004	Arsenic	10	ug/L	11/1/2010	6	18	11.66	9
								1510054-006	Fluoride	2	mg/L	6/18/2010	20	3.9	3.23	20
KERN COUNTY	City of Randsburg	RAND COMMUNITIES CWD - RANDSBURG	1510016	100% GW	931	2	2	1510016-001	Arsenic	10	ug/L	10/4/2010	15	31	22.69	16
								1510016-002	Arsenic	10	ug/L	10/4/2010	8	50	13.48	17
KERN COUNTY	Inyokern CDP	CHINA LAKE NAVAL AIR WEAPONS STATION	1510703	100% GW	4500	14	1	1510703-009	Arsenic	10	ug/L	5/20/2009	3	40	31.33	3
KERN COUNTY	Keene CDP	VALLEY VIEW ESTATES MUTUAL WATER CO	1500569	100% GW	82	5	1	1500569-001	Nitrate (as NO3)	45	mg/L	4/13/2009	2	57.6	21.11	30
KERN COUNTY	Lake Isabella CDP	KRVWC - KERNVALE MUTUAL WATER CO	1500364	100% GW	26	1	1	1500364-001	Arsenic	10	ug/L	10/4/2010	11	32	23.75	11
								1500364-001	Gross alpha particle activity	15	pCi/L	7/9/2008	3	32.1	31.60	3
								1500364-001	Uranium	20	pCi/L	10/4/2010	12	37	30.91	13
KERN COUNTY	Lake Isabella CDP	HUNGRY GULCH WATER SYSTEM	1500436	100% GW	37	2	2	1500436-001	Arsenic	10	ug/L	11/10/2010	32	130	83.25	31
								1500436-002	Arsenic	10	ug/L	11/10/2010	29	190	79.21	29
								1500436-002	Gross alpha particle activity	15	pCi/L	8/30/2007	4	23.33	10.08	9
KERN COUNTY	Lake Isabella CDP	BOULDER CANYON WATER ASSOCIATION	1500521	100% GW	29	2	2	1500521-001	Arsenic	10	ug/L	11/10/2010	19	26	16.54	20
								1500521-002	Arsenic	10	ug/L	11/10/2010	19	30	19.82	21
KERN COUNTY	Lebec CDP	TEJON RANCH MAIN HEADQUARTERS	1500413	100% GW	53	1	1	1500413-001	Gross alpha particle activity	15	pCi/L	3/31/2010	2	18.6	14.80	3
KERN COUNTY	Lebec CDP	LEBEC COUNTY WATER DISTRICT	1510051	100% GW	830	3	3	1510051-003	Fluoride	2	mg/L	7/14/2010	7	2.3	2.12	9
								1510051-001	Gross alpha particle activity	15	pCi/L	12/11/2007	2	16.4	11.63	5
								1510051-003	Gross alpha particle activity	15	pCi/L	5/21/2008	4	21.8	16.89	5
KERN COUNTY	McFarland city	CITY OF MCFARLAND	1510013	100% GW	12138	3	2	1510013-014	Arsenic	10	ug/L	9/1/2009	2	11	9.20	5
KERN COUNTY	North Edwards CDP	AERIAL ACRES WATER SYSTEM	1500405	100% GW	120	2	2	1500405-001	Arsenic	10	ug/L	10/4/2010	13	27	23.69	13
								1500405-002	Arsenic	10	ug/L	10/4/2010	13	44	31.23	13
KERN COUNTY	North Edwards CDP	FOUNTAIN TRAILER PARK WATER	1500461	100% GW	68	1	1	1500461-001	Arsenic	10	ug/L	7/28/2010	8	230	101.88	8

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
KERN COUNTY	North Edwards CDP	NORTH EDWARDS WD	1510052	100% GW	650	2	1	1510052-001	Arsenic	10	ug/L	9/15/2010	16	39	33.38	16
KERN COUNTY	Onyx CDP	CWS-ONYX WATER SYSTEM	1510043	100% GW	776	2	1	1510043-004	Gross alpha particle activity	15	pCi/L	1/28/2003	2	20.4	11.79	10
								1510043-004	Uranium	20	pCi/L	4/8/2003	2	22.4	15.58	10
KERN COUNTY	Pine Mountain Club CDP	MIL POTRERO MWC	1510028	100% GW	1800	7	1	1510028-007	Arsenic	10	ug/L	10/13/2010	4	28	15.80	6
KERN COUNTY	Rosamond CDP	LANDS OF PROMISE MUTUAL WATER ASSOCIATIO	1500424	100% GW	190	4	4	1500424-003	Arsenic	10	ug/L	7/20/2010	11	20	15.68	11
								1500424-004	Arsenic	10	ug/L	7/20/2010	16	20	15.94	16
								1500424-005	Arsenic	10	ug/L	7/20/2010	14	18	13.15	15
								1500424-006	Arsenic	10	ug/L	7/20/2010	15	18	15.00	15
KERN COUNTY	Rosamond CDP	ROSE VILLA APARTMENTS	1500426	100% GW	100	1	1	1500426-001	Arsenic	10	ug/L	4/8/2010	4	12	10.03	12
KERN COUNTY	Rosamond CDP	LUCKY 18 ON ROSAMOND, LLC	1500571	100% GW	73	2	2	1500571-001	Arsenic	10	ug/L	7/1/2010	10	24	19.70	10
								1500571-002	Arsenic	10	ug/L	7/1/2010	6	33	16.97	10
								1500571-002	Gross alpha particle activity	15	pCi/L	11/19/2007	2	19.7	13.22	4
KERN COUNTY	Rosamond CDP	DESERT BREEZE MOBILE HOME ESTATES	1502247	100% GW	95	1	1	1502247-001	Gross alpha particle activity	15	pCi/L	8/19/2008	3	18.2	15.98	4
KERN COUNTY	Rosamond CDP	FIRST MUTUAL WATER SYSTEM	1502569	100% GW	40	1	1	1502569-001	Arsenic	10	ug/L	11/9/2010	18	18	15.61	18
KERN COUNTY	Rosedale CDP	NORD ROAD WATER ASSOCIATION	1502383	100% GW	39	1	1	1502383-001	Arsenic	10	ug/L	10/15/2010	12	17	15.25	12
KERN COUNTY	Weldon CDP	LAKEVIEW RANCHOS MUTUAL WATER	1500525	100% GW	120	3	2	1500525-002	Arsenic	10	ug/L	11/10/2010	8	96	46.00	9
								1500525-003	Arsenic	10	ug/L	11/10/2010	9	23	17.50	10
								1500525-003	Gross alpha particle activity	15	pCi/L	1/27/2009	6	38.9	22.45	6
KERN COUNTY	Wofford Heights CDP	R.S. MUTUAL WATER COMPANY	1500458	100% GW	25	1	1	1500458-001	Arsenic	10	ug/L	9/3/2010	12	16	11.61	16
								1500458-001	Gross alpha particle activity	15	pCi/L	5/3/2010	7	41.1	27.91	8
								1500458-001	Uranium	20	pCi/L	9/3/2010	24	38	25.39	26
KINGS	City of Leemore	CHARDELLS	1600293	Undetermined			1	1600293-001	Arsenic	10	ug/L	11/3/2008				
KINGS	Armona CDP	ARMONA COMMUNITY SERVICES DIST	1610001	100% GW	3239	2	2	1610001-001	Arsenic	10	ug/L	5/26/2010	6	76	11.79	16
								1610001-007	Arsenic	10	ug/L	10/20/2010	11	114	22.50	19
								1610001-001	Gross alpha particle activity	15	pCi/L	6/10/2009	3	18.5	12.52	11
								1610001-007	Gross alpha particle activity	15	pCi/L	9/26/2007	3	23.7	11.84	12
KINGS	Corcoran city	CORCORAN, CITY OF	1610004	100% GW	25893	9	10	1610004-015	Aluminum	1000	ug/L	3/19/2008	2	1700	1260.00	3
								1610004-016	Aluminum	1000	ug/L	4/13/2009	3	1800	1245.00	4
								1610004-001	Arsenic	10	ug/L	1/30/2008	16	32	17.12	25
								1610004-002	Arsenic	10	ug/L	10/11/2010	35	26	22.37	35
								1610004-003	Arsenic	10	ug/L	10/11/2010	33	25	18.85	33
								1610004-010	Arsenic	10	ug/L	4/13/2009	10	55	28.00	11
								1610004-015	Arsenic	10	ug/L	10/11/2010	27	33	14.84	31
								1610004-016	Arsenic	10	ug/L	10/11/2010	18	20	12.22	31
								1610004-026	Arsenic	10	ug/L	10/11/2010	17	24	19.12	17
								1610004-027	Arsenic	10	ug/L	10/11/2010	17	24	16.59	17
								1610004-028	Arsenic	10	ug/L	7/26/2010	16	28	25.94	16
								1610004-001	Nitrate (as NO3)	45	mg/L	10/11/2010	28	88	35.30	76
KINGS	Home Garden CDP	HOME GARDEN CSD	1610007	100% GW	1750	3	1	1610007-002	Arsenic	10	ug/L	10/13/2010	35	53	22.92	37
KINGS	Kettleman City CDP	KETTLEMAN CITY CSD	1610009	100% GW	1499	2	2	1610009-002	Arsenic	10	ug/L	7/1/2010	12	15.1	12.26	15
								1610009-003	Arsenic	10	ug/L	7/1/2010	14	23.2	17.61	15
								1610009-002	Benzene	1	ug/L	10/6/2010	30	160	64.24	33
								1610009-003	Benzene	1	ug/L	10/6/2010	31	57	11.82	33
KINGS	Lemoore city	LEMOORE, CITY OF	1610005	100% GW	24500	12	6	1610005-003	Arsenic	10	ug/L	11/9/2010	31	22	18.69	32
								1610005-005	Arsenic	10	ug/L	11/9/2010	28	22	15.35	32
								1610005-009	Arsenic	10	ug/L	11/9/2010	33	28	24.30	33
								1610005-010	Arsenic	10	ug/L	3/28/2005	11	21	11.88	21
								1610005-007	Gross alpha particle activity	15	pCi/L	7/11/2008	3	18.29	14.06	7
								1610005-008	Gross alpha particle activity	15	pCi/L	11/19/2002	4	23.99	16.39	6
KINGS	City of Hanford	LACEY COURTS MHP	1600010	100% GW	66	1	1	1600010-001	Arsenic	10	ug/L	10/12/2010	10	26	24.80	10

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
KINGS	City of Hanford	EL DORADO MOBILE PARK	1600002	100% GW	300	1	1	1600002-002	Gross alpha particle activity	15	pCi/L	12/5/2007	2	36	21.25	4
KINGS	City of Hanford	FOUR SEASONS MOBILE HOME PARK	1600004	100% GW	350	1	1	1600004-001	Arsenic	10	ug/L	7/13/2010	7	116	97.57	7
KINGS	City of Lemoore	LEMOORE MOBILE HOME PARK	1600031	100% GW	180	1	1	1600031-001	Gross alpha particle activity	15	pCi/L	7/9/2010	2	23.9	15.51	7
KINGS	City of Lemoore	HAMBLIN MUTUAL WATER CO	1600504	100% GW	80	1	1	1600504-001	Arsenic	10	ug/L	7/5/2007	5	50	37.30	5
KINGS	Hanford city	HANFORD, CITY OF	1610003	100% GW	53320	16	7	1610003-025	Arsenic	10	ug/L	3/4/2008	38	17	11.30	55
								1610003-026	Arsenic	10	ug/L	6/2/2004	24	21	11.25	51
								1610003-027	Arsenic	10	ug/L	11/2/2006	32	45	14.68	54
								1610003-028	Arsenic	10	ug/L	9/6/2007	52	35	20.27	58
								1610003-031	Arsenic	10	ug/L	3/2/2004	6	56	9.21	50
								1610003-033	Arsenic	10	ug/L	12/2/2002	2	69	8.83	50
								1610003-034	Arsenic	10	ug/L	12/1/2006	44	78	26.30	51
KINGS	Home Garden CDP	HOME GARDEN CSD	1610007	100% GW	1750	3	1	1610007-004	Arsenic	10	ug/L	8/9/2010	32	110	37.53	34
LAKE	City of Lakeport	CORINTHIAN BAY MUTUAL WATER COMPANY	1700549	100% GW	125	2	1	1700549-001	Nitrate (as NO3)	45	mg/L	3/27/2003	2	48	15.14	7
LAKE	City of Lower Lake	SUNRISE SHORE MUTUAL WATER COMPANY	1700536	100% GW	45	1	1	1700536-004	Aluminum	1000	ug/L	8/31/2010	3	1300	538.96	25
LAKE	Upper Lake CDP	CAL 20 VILLAGE	1700595	100% GW	150	2	1	1700595-001	Methyl tertiary butyl ether (MTBE)	13	ug/L	11/10/2010	26	27	14.03	40
LASSEN	Herlong CDP	SIERRA ARMY DEPOT-HERLONG	1810700	100% GW	1500	3	1	1810700-003	Gross alpha particle activity	15	pCi/L	1/13/2009	5	41.6	20.37	9
								1810700-003	Uranium	20	pCi/L	11/29/2007	3	23.8	23.68	3
LASSEN	Susanville city	HIGH DESERT STATE PRISON	1805004	100% GW	10950	7	4	1805004-003	Arsenic	10	ug/L	4/29/2008	5	15	8.85	17
								1805004-004	Arsenic	10	ug/L	12/22/2008	18	39	28.56	18
								1805004-005	Arsenic	10	ug/L	12/22/2008	17	19	16.53	17
								1805004-009	Arsenic	10	ug/L	11/25/2008	3	17	8.22	10
LOS ANGELES	Altadena CDP, Pasadena city	KINNELOA IRRIGATION DIST.	1910035	100% GW	1500	7	6	1910035-002	Fluoride	2	mg/L	1/20/2010	53	2.8	2.18	72
								1910035-003	Fluoride	2	mg/L	10/6/2009	8	2.5	1.85	77
								1910035-005	Fluoride	2	mg/L	10/19/2010	77	3.36	2.56	76
								1910035-007	Fluoride	2	mg/L	1/20/2010	26	2.93	2.16	36
								1910035-008	Fluoride	2	mg/L	10/19/2010	71	4.32	3.03	72
								1910035-015	Fluoride	2	mg/L	1/20/2010	32	2.56	1.95	73
LOS ANGELES	Anaheim city, Baldwin Park city, El Monte city, Industry city, North El Monte CDP	CALIFORNIA DOMESTIC WATER COMPANY	1910199	100% GW	1200	7	5	1910199-005	Carbon tetrachloride	0.5	ug/L	11/2/2010	83	4.3	1.14	140
								1910199-006	Carbon tetrachloride	0.5	ug/L	11/2/2010	115	1.9	0.79	139
								1910199-007	Carbon tetrachloride	0.5	ug/L	11/2/2010	130	5.4	2.39	139
								1910199-014	Carbon tetrachloride	0.5	ug/L	2/4/2008	97	4.2	1.87	98
								1910199-005	Nitrate (as NO3)	45	mg/L	5/7/2007	8	48	33.98	142
								1910199-005	Perchlorate	6	ug/L	12/6/2010	71	9.7	6.25	110
								1910199-014	Perchlorate	6	ug/L	12/6/2010	80	13	9.19	80
								1910199-005	Tetrachloroethylene (PCE)	5	ug/L	11/2/2010	42	19	4.47	140
								1910199-006	Tetrachloroethylene (PCE)	5	ug/L	11/2/2010	60	14.6	4.53	139
								1910199-007	Tetrachloroethylene (PCE)	5	ug/L	11/2/2010	85	19	8.14	140
								1910199-008	Tetrachloroethylene (PCE)	5	ug/L	2/2/2009	11	9.8	2.73	139
								1910199-005	Trichloroethylene (TCE)	5	ug/L	11/2/2010	57	29	7.16	140
								1910199-006	Trichloroethylene (TCE)	5	ug/L	11/2/2010	80	19	5.52	139
								1910199-007	Trichloroethylene (TCE)	5	ug/L	11/2/2010	126	27	12.02	140
								1910199-014	Trichloroethylene (TCE)	5	ug/L	2/4/2008	40	8.1	5.02	98
LOS ANGELES	Arcadia city, East Pasadena CDP, Pasadena city	EAST PASADENA WATER CO.	1910020	100% GW	9818	4	2	1910020-004	Carbon tetrachloride	0.5	ug/L	8/16/2004	7	0.97	0.22	93
								1910020-003	Gross alpha particle activity	15	pCi/L	12/22/2009	6	25	16.54	11
								1910020-004	Gross alpha particle activity	15	pCi/L	3/23/2009	4	23	13.91	11
								1910020-004	Nitrate (as NO3)	45	mg/L	12/22/2009	7	56	31.64	93
								1910020-003	Tetrachloroethylene (PCE)	5	ug/L	3/6/2002	2	7.1	3.05	102
								1910020-004	Tetrachloroethylene (PCE)	5	ug/L	2/16/2010	8	17	3.84	93
								1910020-004	Trichloroethylene (TCE)	5	ug/L	8/16/2004	6	9	1.54	92

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
LOS ANGELES	Arcadia city, Sierra Madre city	SIERRA MADRE-CITY, WATER DEPT.	1910148	100% GW	10800	5	3	1910148-005	Tetrachloroethylene (PCE)	5	ug/L	5/24/2010	2	5.2	1.96	82
								1910148-006	Tetrachloroethylene (PCE)	5	ug/L	8/17/2004	2	9.4	1.89	81
								1910148-003	Trichloroethylene (TCE)	5	ug/L	12/10/2004	3	6.3	1.05	86
								1910148-005	Trichloroethylene (TCE)	5	ug/L	1/11/2005	4	6.1	1.86	86
								1910148-006	Trichloroethylene (TCE)	5	ug/L	10/5/2009	9	19	3.03	84
LOS ANGELES	Artesia city, Cerritos city, Hawaiian Gardens city, Lakewood city, Los Alamitos city	GSWC - ARTESIA	1910004	100% GW	35376	5	3	1910004-010	Arsenic	10	ug/L	12/8/2010	104	22	15.88	105
								1910004-014	Arsenic	10	ug/L	12/8/2010	99	30	21.32	100
								1910004-031	Arsenic	10	ug/L	12/20/2010	134	35	20.35	134
LOS ANGELES	Avocado Heights CDP, Baldwin Park city, El Monte city, Industry city, La Puente city, Montebello city, Rosemead city, South El Monte city, West Covina city, West Puente Valley CDP, West Whittier-Los Nietos CDP	SAN GABRIEL VALLEY WATER CO.-EL MONTE	1910039	100% GW	162074	35	18	1910039-018	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	12/1/2010	195	43	11.44	250
								1910039-112	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	7/8/2010	5	7.1	4.18	73
								1910039-023	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	8/5/2009	8	0.6	0.15	40
								1910039-026	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	11/9/2010	31	3	1.04	36
								1910039-027	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	11/9/2010	33	3.6	2.06	34
								1910039-112	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	11/9/2010	66	1.5	0.88	73
								1910039-114	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	11/9/2010	79	5.4	2.87	82
								1910039-115	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	11/9/2010	47	4.6	0.82	76
								1910039-023	Carbon tetrachloride	0.5	ug/L	5/7/2009	10	0.62	0.22	50
								1910039-026	Carbon tetrachloride	0.5	ug/L	2/6/2006	11	1.2	0.33	36
								1910039-027	Carbon tetrachloride	0.5	ug/L	11/9/2010	35	8.6	5.45	34
								1910039-069	Carbon tetrachloride	0.5	ug/L	11/1/2010	41	2.2	0.50	59
								1910039-077	Carbon tetrachloride	0.5	ug/L	11/9/2010	38	2.8	2.08	38
								1910039-112	Carbon tetrachloride	0.5	ug/L	11/9/2010	74	4.9	2.93	73
								1910039-113	Carbon tetrachloride	0.5	ug/L	11/9/2010	74	11	7.34	73
								1910039-114	Carbon tetrachloride	0.5	ug/L	11/9/2010	82	12	2.33	82
								1910039-115	Carbon tetrachloride	0.5	ug/L	11/9/2010	81	17	12.04	82
								1910039-112	cis-1,2-Dichloroethylene	6	ug/L	7/8/2010	4	6.5	3.88	73
								1910039-023	Nitrate (as NO3)	45	mg/L	11/9/2010	34	54	48.57	38
								1910039-026	Nitrate (as NO3)	45	mg/L	11/9/2010	33	98	71.83	34
								1910039-112	Nitrate (as NO3)	45	mg/L	11/9/2010	72	100	60.33	71
								1910039-114	Nitrate (as NO3)	45	mg/L	11/9/2010	65	110	52.32	78
								1910039-023	Perchlorate	6	ug/L	11/9/2010	38	15	10.37	39
								1910039-026	Perchlorate	6	ug/L	11/9/2010	36	44.2	28.48	36
								1910039-027	Perchlorate	6	ug/L	11/9/2010	33	88	58.30	33
								1910039-077	Perchlorate	6	ug/L	11/9/2010	36	10	7.67	39
								1910039-112	Perchlorate	6	ug/L	11/9/2010	74	40	31.16	74
								1910039-113	Perchlorate	6	ug/L	11/9/2010	33	9.9	5.01	74
								1910039-114	Perchlorate	6	ug/L	11/9/2010	78	83	58.83	81
								1910039-115	Perchlorate	6	ug/L	11/9/2010	75	86	20.95	81
								1910039-009	Tetrachloroethylene (PCE)	5	ug/L	11/10/2010	246	340	81.44	238
								1910039-010	Tetrachloroethylene (PCE)	5	ug/L	11/10/2010	252	170	44.67	247
								1910039-011	Tetrachloroethylene (PCE)	5	ug/L	11/10/2010	289	78	44.58	280
								1910039-012	Tetrachloroethylene (PCE)	5	ug/L	5/7/2009	78	140	4.08	309
								1910039-014	Tetrachloroethylene (PCE)	5	ug/L	5/1/2008	4	7.6	1.72	129
								1910039-018	Tetrachloroethylene (PCE)	5	ug/L	12/1/2010	217	26	8.41	250
								1910039-027	Tetrachloroethylene (PCE)	5	ug/L	11/9/2010	7	6.8	3.37	34
								1910039-029	Tetrachloroethylene (PCE)	5	ug/L	12/1/2010	114	35	8.32	129
								1910039-036	Tetrachloroethylene (PCE)	5	ug/L	11/17/2008	32	7	4.16	101

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								1910039-112	Tetrachloroethylene (PCE)	5	ug/L	11/9/2010	74	33	20.34	73
								1910039-113	Tetrachloroethylene (PCE)	5	ug/L	11/9/2010	37	7.9	4.43	73
								1910039-114	Tetrachloroethylene (PCE)	5	ug/L	6/2/2010	25	6.3	4.56	82
								1910039-018	Trichloroethylene (TCE)	5	ug/L	12/1/2010	157	21	6.90	250
								1910039-023	Trichloroethylene (TCE)	5	ug/L	5/7/2009	10	5.9	4.21	50
								1910039-026	Trichloroethylene (TCE)	5	ug/L	5/6/2010	32	21	9.93	36
								1910039-027	Trichloroethylene (TCE)	5	ug/L	11/9/2010	35	99	54.43	34
								1910039-029	Trichloroethylene (TCE)	5	ug/L	9/2/2010	4	8.2	2.56	129
								1910039-077	Trichloroethylene (TCE)	5	ug/L	11/9/2010	23	8.5	5.42	38
								1910039-112	Trichloroethylene (TCE)	5	ug/L	11/9/2010	74	81	41.08	73
								1910039-113	Trichloroethylene (TCE)	5	ug/L	11/9/2010	60	21	12.40	73
								1910039-114	Trichloroethylene (TCE)	5	ug/L	11/9/2010	80	70	43.59	82
								1910039-115	Trichloroethylene (TCE)	5	ug/L	11/9/2010	75	58	19.72	82
LOS ANGELES	Avocado Heights CDP, Industry city	CITY OF INDUSTRY WATERWORKS SYSTEMS	1910029	100% GW	7000	5	1	1910029-007	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	8/10/2004	2	0.68	0.04	30
								1910029-007	Perchlorate	6	ug/L	11/17/2009	10	10.6	6.26	25
LOS ANGELES	Baldwin Park city, West Covina city, West Puente Valley CDP	LA PUENTE VALLEY CWD	1910060	100% GW	7500	8	3	1910060-002	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	11/1/2010	190	4.7	2.41	189
								1910060-003	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	1/5/2009	198	3.9	1.34	214
								1910060-023	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	9/27/2010	53	2.1	1.12	50
								1910060-002	Carbon tetrachloride	0.5	ug/L	11/1/2010	191	8.5	4.47	189
								1910060-003	Carbon tetrachloride	0.5	ug/L	1/5/2009	191	8.5	1.42	214
								1910060-023	Carbon tetrachloride	0.5	ug/L	9/27/2010	53	2.2	1.17	50
								1910060-002	Perchlorate	6	ug/L	11/1/2010	181	87	52.48	181
								1910060-003	Perchlorate	6	ug/L	11/1/2010	211	74	36.15	209
								1910060-023	Perchlorate	6	ug/L	9/27/2010	48	48	29.85	48
								1910060-002	Trichloroethylene (TCE)	5	ug/L	11/1/2010	191	110	62.85	189
								1910060-003	Trichloroethylene (TCE)	5	ug/L	11/1/2010	207	67	23.64	214
								1910060-023	Trichloroethylene (TCE)	5	ug/L	9/27/2010	53	38	23.55	50
LOS ANGELES	Castaic CDP	PARADISE RANCH MHP	1910099	100% GW	185	4	4	1910099-010	Aluminum	1000	ug/L	5/3/2007	4	16000	4293.33	6
								1910099-009	Fluoride	2	mg/L	1/6/2010	15	7.2	2.50	31
								1910099-010	Fluoride	2	mg/L	11/5/2008	3	2.7	1.08	32
								1910099-011	Fluoride	2	mg/L	11/7/2007	2	6.4	1.10	31
								1910099-019	Fluoride	2	mg/L	11/3/2010	15	5.5	2.92	19
								1910099-010	Gross alpha particle activity	15	pCi/L	8/4/2010	3	19	13.02	7
LOS ANGELES	City of Lancaster	LAND PROJECT MUTUAL WATER CO.	1910246	100% GW	1500	4	3	1910246-001	Arsenic	10	ug/L	3/30/2009	9	15	12.56	9
								1910246-002	Arsenic	10	ug/L	8/23/2010	12	27	16.83	12
								1910246-004	Arsenic	10	ug/L	8/23/2010	7	13	10.45	16
LOS ANGELES	Downey city, Lynwood city, Paramount city, South Gate city	GSWC - HOLLYDALE	1910195	100% GW	5610	2	1	1910195-001	Arsenic	10	ug/L	2/5/2010	34	23	18.24	33
LOS ANGELES	East Pasadena CDP, East San Gabriel CDP, Temple City city	SUNNY SLOPE WATER CO.	1910157	100% GW	30555	4	1	1910157-012	Carbon tetrachloride	0.5	ug/L	11/1/2010	84	1.3	0.52	124
								1910157-012	Nitrate (as NO3)	45	mg/L	4/1/2002	4	51	36.49	130
								1910157-012	Tetrachloroethylene (PCE)	5	ug/L	2/2/2004	9	6.9	3.16	124
LOS ANGELES	El Monte city, South El Monte city	EL MONTE-CITY, WATER DEPT.	1910038	100% GW	22722	7	3	1910038-008	Carbon tetrachloride	0.5	ug/L	10/5/2010	22	0.81	0.25	104
								1910038-002	Tetrachloroethylene (PCE)	5	ug/L	7/13/2010	45	11	4.43	143
								1910038-008	Tetrachloroethylene (PCE)	5	ug/L	10/12/2010	139	24	11.53	139
								1910038-008	Trichloroethylene (TCE)	5	ug/L	10/12/2010	125	51	25.84	138
LOS ANGELES	Green Valley CDP	GREEN VALLEY CWD	1910244	100% GW	1000	8	1	1910244-009	Nitrate (as NO3)	45	mg/L	3/14/2007	10	72	31.74	43
LOS ANGELES	Lancaster city	LEISURE LAKE MOBILE ESTATES	1910066	100% GW	300	3	3	1910066-001	Arsenic	10	ug/L	6/30/2010	2	13	7.61	28
								1910066-002	Arsenic	10	ug/L	9/16/2010	16	22	12.56	16
								1910066-005	Arsenic	10	ug/L	9/16/2010	14	14	12.43	14
								1910092-001	Arsenic	10	ug/L	11/3/2010	36	17	13.44	36
								1910092-010	Arsenic	10	ug/L	11/2/2010	28	15	10.59	44
								1910092-013	Perchlorate	6	ug/L	8/15/2005	15	10	2.70	119

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								1910092-001	Tetrachloroethylene (PCE)	5	ug/L	11/3/2010	52	14	7.35	62
								1910092-002	Tetrachloroethylene (PCE)	5	ug/L	6/2/2010	104	64.1	23.84	103
								1910092-004	Tetrachloroethylene (PCE)	5	ug/L	11/3/2010	102	24	13.25	101
								1910092-006	Tetrachloroethylene (PCE)	5	ug/L	11/17/2010	233	43	25.74	226
								1910092-010	Tetrachloroethylene (PCE)	5	ug/L	11/30/2010	63	68	6.30	100
								1910092-011	Tetrachloroethylene (PCE)	5	ug/L	11/30/2010	111	22	10.33	115
								1910092-013	Tetrachloroethylene (PCE)	5	ug/L	11/30/2010	97	85	36.79	97
								1910092-038	Tetrachloroethylene (PCE)	5	ug/L	9/7/2010	65	128	83.44	65
								1910092-006	Trichloroethylene (TCE)	5	ug/L	9/9/2008	39	6.3	3.87	226
LOS ANGELES	Montebello city, Pico Rivera city	SOUTH MONTEBELLO IRRIGATION DIST.	1910153	100% GW	7880	4	1	1910153-003	Arsenic	10	ug/L	3/26/2009	7	17	5.27	95
LOS ANGELES	Pico Rivera city	CENTRAL BASIN MWD	1910253	100% GW	0	2	1	1910253-001	Tetrachloroethylene (PCE)	5	ug/L	1/12/2005	3	9.8	1.54	58
LOS ANGELES	Pico Rivera city, Whittier city	PICO WD	1910125	100% GW	24000	6	1	1910125-011	Tetrachloroethylene (PCE)	5	ug/L	5/28/2008	8	6.3	4.19	74
LOS ANGELES	Pico Rivera city, Whittier city	WHITTIER-CITY, WATER DEPT.	1910173	100% GW	48000	10	5	1910173-010	Tetrachloroethylene (PCE)	5	ug/L	9/17/2003	23	11	2.53	103
								1910173-013	Tetrachloroethylene (PCE)	5	ug/L	10/12/2010	64	11	5.60	98
								1910173-023	Tetrachloroethylene (PCE)	5	ug/L	10/7/2010	51	51	23.05	57
								1910173-024	Tetrachloroethylene (PCE)	5	ug/L	7/2/2008	21	12	3.71	56
								1910173-025	Tetrachloroethylene (PCE)	5	ug/L	6/2/2009	25	12	4.60	60
LOS ANGELES	Rosemead city	AMARILLO MUTUAL WATER COMPANY	1910002	100% GW	3134	3	1	1910002-002	Tetrachloroethylene (PCE)	5	ug/L	9/10/2002	2	5.7	3.49	39
LOS ANGELES	Sun Village CDP	LITTLEROCK CREEK IRRIGATION DIST.	1910064	100% GW	2900	5	1	1910064-008	Di(2-ethylhexyl)phthalate (DEHP)	4	ug/L	6/1/2005	2	22	6.47	5
LOS ANGELES	Alhambra city, Rosemead city, San Gabriel city, San Marino city	SAN GABRIEL COUNTY WD	1910144	100% GW	45000	5	2	1910144-005	Nitrate (as NO3)	45	mg/L	9/26/2003	9	51	33.91	323
								1910144-007	Nitrate (as NO3)	45	mg/L	3/12/2003	4	51	22.48	386
LOS ANGELES	Cerritos city, Lakewood city, Long Beach city	LAKEWOOD - CITY, WATER DEPT.	1910239	100% GW	79345	12	1	1910239-052	Arsenic	10	ug/L	8/24/2010	8	16.5	12.86	10
LOS ANGELES	East Los Angeles CDP, Lynwood city, South Gate city	SOUTH GATE-CITY, WATER DEPT.	1910152	100% GW	98434	7	1	1910152-008	Tetrachloroethylene (PCE)	5	ug/L	12/2/2010	86	12	7.51	88
LOS ANGELES	El Monte city, Monrovia city, North El Monte CDP, Rosemead city, Temple City city	GSWC-SOUTH ARCADIA	1910212	100% GW	24730	7	3	1910212-004	Tetrachloroethylene (PCE)	5	ug/L	10/12/2010	2	5.4	2.58	131
								1910212-002	Trichloroethylene (TCE)	5	ug/L	11/9/2010	65	21	8.83	66
								1910212-003	Trichloroethylene (TCE)	5	ug/L	11/9/2010	116	13	7.41	128
								1910212-004	Trichloroethylene (TCE)	5	ug/L	11/9/2010	107	12	6.87	131
LOS ANGELES	Hacienda Heights CDP, La Puente city, Valinda CDP, West Covina city, West Puente Valley CDP	SUBURBAN WATER SYSTEMS-SAN JOSE F	1910205	100% GW	134996	6	2	1910205-027	Nitrate (as NO3)	45	mg/L	11/8/2007	3	47	41.39	15
								1910205-027	Perchlorate	6	ug/L	12/27/2007	11	12	8.95	13
								1910205-045	Perchlorate	6	ug/L	11/22/2010	187	12	6.61	258
								1910205-045	Trichloroethylene (TCE)	5	ug/L	11/10/2010	10	7.8	1.75	101
LOS ANGELES	Monrovia city	MONROVIA-CITY, WATER DEPT.	1910090	100% GW	39147	5	3	1910090-002	Nitrate (as NO3)	45	mg/L	11/3/2009	30	66	36.68	129
								1910090-003	Nitrate (as NO3)	45	mg/L	1/28/2003	2	56	19.19	144
								1910090-002	Trichloroethylene (TCE)	5	ug/L	10/5/2010	115	16	6.78	153
								1910090-003	Trichloroethylene (TCE)	5	ug/L	2/2/2010	17	12	2.96	169
								1910090-008	Trichloroethylene (TCE)	5	ug/L	11/2/2010	51	19	4.33	160
LOS ANGELES	Acton CDP	LOS ANGELES CO WW DIST 37-ACTON	1910248	>50% GW Mixed	4317	3	1	1910248-001	Nitrate (as NO3)	45	mg/L	12/23/2004	3	45.9	33.56	99
LOS ANGELES	Alhambra city, East Pasadena CDP, El Monte city, Pasadena city, Rosemead city, San Gabriel city, San Marino city, Temple City city	CAL/AM WATER COMPANY - SAN MARINO	1910139	>50% GW Mixed	45000	12	2	1910139-006	Nitrate (as NO3)	45	mg/L	11/1/2010	111	54.445	43.98	214
								1910139-007	Nitrate (as NO3)	45	mg/L	11/1/2010	142	69.6	35.74	254
								1910139-007	Tetrachloroethylene (PCE)	5	ug/L	11/1/2010	44	9.9	3.87	79
LOS ANGELES	Alhambra city, Pasadena city, San Gabriel city, San Marino city	CITY OF ALHAMBRA	1910001	>50% GW Mixed	92158	11	5	1910001-011	cis-1,2-Dichloroethylene	6	ug/L	12/1/2010	21	36	27.17	21
								1910001-006	Nitrate (as NO3)	45	mg/L	11/15/2010	112	52	44.51	367
								1910001-007	Nitrate (as NO3)	45	mg/L	1/18/2010	16	76	42.20	59
								1910001-008	Nitrate (as NO3)	45	mg/L	10/19/2009	5	62	38.34	118

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								1910001-012	Nitrate (as NO3)	45	mg/L	11/8/2010	9	60	25.39	115
								1910001-006	Trichloroethylene (TCE)	5	ug/L	6/22/2009	106	13	5.53	191
								1910001-007	Trichloroethylene (TCE)	5	ug/L	12/1/2010	52	16	8.77	55
								1910001-008	Trichloroethylene (TCE)	5	ug/L	11/2/2009	118	21	14.51	119
								1910001-011	Trichloroethylene (TCE)	5	ug/L	12/1/2010	22	39	27.73	22
LOS ANGELES	Alhambra city, San Gabriel city, San Marino city, South Pasadena city	CITY OF SOUTH PASADENA	1910154	>50% GW Mixed	25824	4	2	1910154-002	Carbon tetrachloride	0.5	ug/L	4/6/2010	20	0.82	0.36	112
								1910154-002	Nitrate (as NO3)	45	mg/L	11/8/2010	106	54.12	47.82	113
								1910154-002	Perchlorate	6	ug/L	2/24/2009	2	6.4	4.36	50
								1910154-002	Tetrachloroethylene (PCE)	5	ug/L	11/2/2010	51	11	5.08	112
								1910154-006	Tetrachloroethylene (PCE)	5	ug/L	9/5/2006	15	7.3	3.57	123
LOS ANGELES	Altadena CDP	LAS FLORES WATER CO.	1910061	>50% GW Mixed	4500	1	1	1910061-003	Nitrate (as NO3)	45	mg/L	12/26/2007	35	52	40.66	426
								1910061-003	Perchlorate	6	ug/L	10/18/2010	168	15	5.74	420
								1910061-003	Tetrachloroethylene (PCE)	5	ug/L	2/7/2005	127	18	3.61	422
LOS ANGELES	Arcadia city, East Pasadena CDP, Mayflower Village CDP, Monrovia city, Temple City city	CITY OF ARCADIA	1910003	>50% GW Mixed	44818	14	5	1910003-008	Nitrate (as NO3)	45	mg/L	3/11/2010	3	46	25.28	54
								1910003-009	Nitrate (as NO3)	45	mg/L	4/13/2010	8	53.2	34.96	41
								1910003-018	Nitrate (as NO3)	45	mg/L	11/9/2010	69	57	42.57	111
								1910003-011	Tetrachloroethylene (PCE)	5	ug/L	1/12/2010	12	7.4	3.76	97
								1910003-013	Tetrachloroethylene (PCE)	5	ug/L	11/9/2010	90	18.5	7.65	109
								1910003-018	Tetrachloroethylene (PCE)	5	ug/L	10/12/2010	5	7.7	1.98	39
								1910003-011	Trichloroethylene (TCE)	5	ug/L	9/16/2003	6	8.2	3.64	97
								1910003-013	Trichloroethylene (TCE)	5	ug/L	11/9/2010	91	16.6	7.44	109
LOS ANGELES	Azusa city, Vincent CDP, West Covina city	AZUSA LIGHT AND WATER	1910007	>50% GW Mixed	108000	12	1	1910007-010	Nitrate (as NO3)	45	mg/L	11/3/2010	79	66	57.55	65
								1910007-010	Perchlorate	6	ug/L	11/3/2010	53	12.6	9.30	46
LOS ANGELES	Bell city, Bell Gardens city, Cudahy city, Maywood city, South Gate city	GSWC - BELL, BELL GARDENS	1910011	>50% GW Mixed	24819	5	2	1910011-007	Tetrachloroethylene (PCE)	5	ug/L	11/2/2010	44	38	5.25	82
								1910011-012	Tetrachloroethylene (PCE)	5	ug/L	12/7/2010	34	25	7.00	64
								1910011-012	Trichloroethylene (TCE)	5	ug/L	9/8/2010	26	14	5.11	64
LOS ANGELES	Beverly Hills city, Culver City city, Los Angeles city	BEVERLY HILLS-CITY, WATER DEPT.	1910156	>50% GW Mixed	44290	5	2	1910156-013	Arsenic	10	ug/L	11/2/2010	26	29.5	19.71	28
								1910156-012	Fluoride	2	mg/L	12/17/2007	2	2.35	1.21	30
LOS ANGELES	Carson city, Long Beach city, Torrance city	CALIFORNIA WATER SERVICE CO. - DOMINGUEZ	1910033	>50% GW Mixed	143844	10	1	1910033-022	Total Trihalomethanes	80	ug/L	7/7/2009	2	91	10.55	65
LOS ANGELES	Castaic CDP, Santa Clarita city	VALENCIA WATER CO.	1910240	>50% GW Mixed	101000	22	1	1910240-005	Perchlorate	6	ug/L	4/12/2005	2	10	4.00	100
LOS ANGELES	Claremont city, Glendale city, La Canada Flintridge city, Pomona city	POMONA - CITY, WATER DEPT.	1910126	>50% GW Mixed	163408	33	24	1910126-003	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	9/7/2005	4	7.8	4.16	68
								1910126-007	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	10/13/2010	64	49	33.83	64
								1910126-014	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	8/4/2010	3	7.2	2.97	32
								1910126-023	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	11/4/2010	16	9	5.42	40
								1910126-040	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	11/3/2010	10	18	5.09	46
								1910126-041	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	11/4/2010	3	24	11.36	5
								1910126-050	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	12/1/2010	57	56.5	41.16	57
								1910126-011	Chromium, Total	50	ug/L	5/14/2008	14	170	58.04	36
								1910126-002	Nitrate (as NO3)	45	mg/L	12/1/2010	28	70	42.00	87
								1910126-003	Nitrate (as NO3)	45	mg/L	9/8/2010	57	96	67.23	60
								1910126-006	Nitrate (as NO3)	45	mg/L	6/9/2010	64	86	68.97	63
								1910126-007	Nitrate (as NO3)	45	mg/L	10/13/2010	63	85.3	63.63	64
								1910126-010	Nitrate (as NO3)	45	mg/L	12/1/2010	31	60	43.43	102
								1910126-011	Nitrate (as NO3)	45	mg/L	5/14/2008	38	86	75.02	36
								1910126-013	Nitrate (as NO3)	45	mg/L	4/4/2007	2	57.2	37.84	80
								1910126-014	Nitrate (as NO3)	45	mg/L	9/8/2010	78	84	63.53	78
								1910126-015	Nitrate (as NO3)	45	mg/L	5/28/2008	69	113	63.20	67
								1910126-016	Nitrate (as NO3)	45	mg/L	6/10/2010	69	87	71.80	68
								1910126-017	Nitrate (as NO3)	45	mg/L	6/4/2008	62	102	65.49	60
								1910126-018	Nitrate (as NO3)	45	mg/L	5/26/2010	40	82	71.76	38
								1910126-021	Nitrate (as NO3)	45	mg/L	12/1/2010	66	70	54.77	68
								1910126-023	Nitrate (as NO3)	45	mg/L	11/4/2010	84	75	60.67	82
								1910126-025	Nitrate (as NO3)	45	mg/L	11/4/2010	31	56	40.34	93
								1910126-026	Nitrate (as NO3)	45	mg/L	11/4/2010	104	107.7	73.37	102
								1910126-029	Nitrate (as NO3)	45	mg/L	11/7/2006	12	56	35.29	55
								1910126-040	Nitrate (as NO3)	45	mg/L	11/3/2010	45	131	52.29	51

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								1910126-041	Nitrate (as NO3)	45	mg/L	11/4/2010	5	59	54.40	5
								1910126-049	Nitrate (as NO3)	45	mg/L	12/1/2010	39	73	46.01	88
								1910126-050	Nitrate (as NO3)	45	mg/L	12/1/2010	59	77	54.72	59
								1910126-051	Nitrate (as NO3)	45	mg/L	11/8/2010	71	92	51.36	84
								1910126-052	Nitrate (as NO3)	45	mg/L	8/4/2010	96	82	65.60	94
								1910126-069	Nitrate (as NO3)	45	mg/L	11/2/2010	24	70	53.89	27
								1910126-002	Perchlorate	6	ug/L	12/1/2010	30	11	6.59	48
								1910126-003	Perchlorate	6	ug/L	9/8/2010	32	11	8.60	33
								1910126-006	Perchlorate	6	ug/L	6/9/2010	40	15	12.19	40
								1910126-007	Perchlorate	6	ug/L	10/13/2010	63	13	10.37	63
								1910126-010	Perchlorate	6	ug/L	12/1/2010	23	9.6	5.91	55
								1910126-011	Perchlorate	6	ug/L	5/14/2008	34	15	12.55	34
								1910126-014	Perchlorate	6	ug/L	9/8/2010	50	12	9.94	50
								1910126-015	Perchlorate	6	ug/L	5/28/2008	32	15	10.84	32
								1910126-016	Perchlorate	6	ug/L	6/10/2010	65	16	12.31	65
								1910126-017	Perchlorate	6	ug/L	6/4/2008	34	17	12.67	34
								1910126-018	Perchlorate	6	ug/L	5/26/2010	28	13	11.31	28
								1910126-023	Perchlorate	6	ug/L	11/4/2010	43	12	8.94	44
								1910126-025	Perchlorate	6	ug/L	11/4/2010	10	6.7	4.58	53
								1910126-026	Perchlorate	6	ug/L	11/4/2010	47	12	8.61	51
								1910126-040	Perchlorate	6	ug/L	11/3/2010	45	12	7.56	50
								1910126-049	Perchlorate	6	ug/L	12/1/2010	37	13	8.56	47
								1910126-050	Perchlorate	6	ug/L	12/1/2010	56	12	8.43	58
								1910126-051	Perchlorate	6	ug/L	3/18/2008	2	12	3.28	42
								1910126-052	Perchlorate	6	ug/L	8/4/2010	60	17	12.32	60
								1910126-014	Tetrachloroethylene (PCE)	5	ug/L	8/4/2010	50	13	5.92	75
								1910126-018	Tetrachloroethylene (PCE)	5	ug/L	5/9/2006	2	7.3	4.14	15
								1910126-023	Tetrachloroethylene (PCE)	5	ug/L	11/4/2010	79	19	11.09	79
								1910126-025	Tetrachloroethylene (PCE)	5	ug/L	6/4/2008	11	8.5	3.69	85
								1910126-040	Tetrachloroethylene (PCE)	5	ug/L	11/3/2010	50	20	9.06	50
								1910126-006	Trichloroethylene (TCE)	5	ug/L	10/1/2008	5	21.5	4.60	27
								1910126-007	Trichloroethylene (TCE)	5	ug/L	7/1/2008	19	7.8	4.59	64
								1910126-011	Trichloroethylene (TCE)	5	ug/L	5/14/2008	33	45.55	12.85	36
								1910126-014	Trichloroethylene (TCE)	5	ug/L	9/8/2010	39	15	5.95	75
								1910126-015	Trichloroethylene (TCE)	5	ug/L	6/5/2007	5	11.1	4.52	14
								1910126-016	Trichloroethylene (TCE)	5	ug/L	4/1/2009	2	9.9	2.99	18
								1910126-017	Trichloroethylene (TCE)	5	ug/L	6/5/2007	6	9.3	3.90	17
								1910126-018	Trichloroethylene (TCE)	5	ug/L	5/26/2010	14	17	10.34	15
								1910126-023	Trichloroethylene (TCE)	5	ug/L	11/4/2010	16	6.9	4.41	79
								1910126-025	Trichloroethylene (TCE)	5	ug/L	11/4/2010	70	13	5.83	85
								1910126-026	Trichloroethylene (TCE)	5	ug/L	9/9/2010	2	12	2.62	42
								1910126-049	Trichloroethylene (TCE)	5	ug/L	1/22/2007	2	9.7	2.09	39
								1910126-050	Trichloroethylene (TCE)	5	ug/L	9/5/2007	19	7.5	4.54	57
LOS ANGELES	Commerce city, East Los Angeles CDP, Montebello city	CALIFORNIA WATER SERVICE CO. - ELA F	1910036	>50% GW Mixed	149139	12	3	1910036-025	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	7/8/2010	3	6.6	3.06	145
								1910036-004	Perchlorate	6	ug/L	11/9/2009	164	19	7.23	256
								1910036-004	Tetrachloroethylene (PCE)	5	ug/L	9/10/2004	3	6.3	2.20	72
								1910036-025	Tetrachloroethylene (PCE)	5	ug/L	11/2/2010	39	9.4	4.56	145
								1910036-034	Trichloroethylene (TCE)	5	ug/L	5/4/2010	10	7.9	3.27	56
LOS ANGELES	Cudahy city, Huntington Park city, South Gate city, Walnut Park CDP	HUNTINGTON PARK-CITY, WATER DEPT.	1910049	>50% GW Mixed	18417	6	2	1910049-008	Carbon tetrachloride	0.5	ug/L	8/14/2009	145	5.4	1.07	160
								1910049-008	Nitrate (as NO3)	45	mg/L	8/16/2010	3	59	30.26	43
								1910049-006	Trichloroethylene (TCE)	5	ug/L	12/27/2007	5	9.5	1.45	150
LOS ANGELES	Glendale city, La Crescenta-Montrose CDP, Los Angeles city	CRESCENTA VALLEY CWD	1910028	>50% GW Mixed	38000	13	11	1910028-005	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	2/2/2010	2	0.57	0.16	10
								1910028-005	Methyl tertiary butyl ether (MTBE)	13	ug/L	3/9/2010	9	65	4.74	104
								1910028-007	Methyl tertiary butyl ether (MTBE)	13	ug/L	2/6/2007	21	50	8.47	97
								1910028-002	Nitrate (as NO3)	45	mg/L	11/2/2010	90	62	49.63	102
								1910028-005	Nitrate (as NO3)	45	mg/L	11/2/2010	104	73	60.39	104
								1910028-006	Nitrate (as NO3)	45	mg/L	5/3/2010	31	58	41.71	94
								1910028-007	Nitrate (as NO3)	45	mg/L	11/2/2010	102	62	50.04	105
								1910028-008	Nitrate (as NO3)	45	mg/L	9/3/2009	2	53	39.27	101
								1910028-009	Nitrate (as NO3)	45	mg/L	11/2/2010	75	59	48.99	89
								1910028-010	Nitrate (as NO3)	45	mg/L	11/2/2010	108	63	54.27	105
								1910028-011	Nitrate (as NO3)	45	mg/L	10/15/2010	58	63	47.33	103

Table 8.1

List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								1910028-012	Nitrate (as NO3)	45	mg/L	11/2/2010	96	66	55.83	98
								1910028-013	Nitrate (as NO3)	45	mg/L	11/2/2010	63	60	46.17	100
								1910028-024	Nitrate (as NO3)	45	mg/L	2/3/2009	19	51	40.74	91
								1910028-013	Tetrachloroethylene (PCE)	5	ug/L	6/17/2008	3	6.7	3.68	48
LOS ANGELES	Lakewood city, Long Beach city	LONG BEACH-CITY, WATER DEPT.	1910065	>50% GW Mixed	490882	30	3	1910065-057	Arsenic	10	ug/L	8/26/2010	3	26	22.33	3
								1910065-058	Arsenic	10	ug/L	8/12/2010	3	16	14.67	3
								1910065-059	Arsenic	10	ug/L	8/12/2010	7	14	13.00	7
LOS ANGELES	Lancaster city, Quartz Hill CDP	PALM RANCH IRRIGATION DIST.	1910103	>50% GW Mixed	5528	4	3	1910103-004	Arsenic	10	ug/L	11/16/2010	87	71	36.91	89
								1910103-007	Arsenic	10	ug/L	11/16/2010	80	19	12.90	111
								1910103-002	Nitrate (as NO3)	45	mg/L	11/9/2010	6	49	42.84	119
LOS ANGELES	Leona Valley CDP	CALIFORNIAFWATER SERVICE CO-LEONA VALLEY	1910243	>50% GW Mixed	1216	3	1	1910243-006	Aluminum	1000	ug/L	5/3/2007	2	3900	135.31	44
								1910243-006	Fluoride	2	mg/L	11/16/2010	36	3.86	2.33	41
LOS ANGELES	Long Beach city	SIGNAL HILL - CITY, WATER DEPT.	1910149	>50% GW Mixed	11229	3	1	1910149-006	Arsenic	10	ug/L	10/4/2010	39	24	15.41	39
LOS ANGELES	Long Beach city, Paramount city, South Gate city	PARAMOUNT - CITY, WATER DEPT.	1910105	>50% GW Mixed	58087	3	1	1910105-015	Arsenic	10	ug/L	10/19/2010	36	20	13.92	40
LOS ANGELES	Los Angeles city, Pasadena city, Rosemead city, San Gabriel city, West Puente Valley CDP	GSWC-SOUTH SAN GABRIEL	1910223	>50% GW Mixed	16266	3	1	1910223-004	Perchlorate	6	ug/L	11/21/2005	9	8.1	2.27	107
								1910223-004	Tetrachloroethylene (PCE)	5	ug/L	11/9/2010	111	46	11.99	112
								1910223-004	Trichloroethylene (TCE)	5	ug/L	7/19/2005	8	6.8	2.05	112
LOS ANGELES	Los Angeles city, San Fernando city	SAN FERNANDO-CITY, WATER DEPT.	1910143	>50% GW Mixed	23564	3	1	1910143-003	Nitrate (as NO3)	45	mg/L	10/6/2010	4	63	37.13	66
LOS ANGELES	Pomona city	CALIF STATE POLYTECHNICAL UNIV - POMONA	1910022	>50% GW Mixed	24500	1	1	1910022-005	Nitrate (as NO3)	45	mg/L	11/2/2010	65	60	49.93	82
								1910022-005	Perchlorate	6	ug/L	3/2/2010	4	7.3	5.41	37
LOS ANGELES	Santa Clarita city	NEWHALL CWD-PINETREE	1910250	>50% GW Mixed	8818	3	1	1910250-001	Gross alpha particle activity	15	pCi/L	2/12/2009	2	20	9.53	7
LOS ANGELES	West Covina city	VALENCIA HEIGHTS WATER CO.	1910163	>50% GW Mixed	5500	5	4	1910163-001	Gross alpha particle activity	15	pCi/L	8/5/2009	22	33	17.07	36
								1910163-002	Gross alpha particle activity	15	pCi/L	11/1/2006	16	29	16.82	25
								1910163-005	Gross alpha particle activity	15	pCi/L	8/4/2010	2	23	9.55	39
								1910163-010	Gross alpha particle activity	15	pCi/L	10/19/2006	2	18	8.73	40
								1910163-010	Nitrate (as NO3)	45	mg/L	10/6/2010	32	84	41.77	117
								1910163-010	Perchlorate	6	ug/L	10/11/2010	28	15	5.16	65
								1910163-001	Uranium	20	pCi/L	8/5/2009	7	26	16.66	35
								1910163-002	Uranium	20	pCi/L	1/17/2006	5	23.9	16.37	24
LOS ANGELES	Lancaster	WHITE FENCE FARMS MWC NO.3	1900523	Mixed <50%GW	567	2	1	1900523-002	Nitrate (as NO3)	45	mg/L	7/29/2010	4	58	33.2066667	4
LOS ANGELES	Santa Clarita	SANTA CLARITA WATER DIVISION F	1910017	Mixed <50%GW	111000	16	1	1910017-015	Nitrate (as NO3)	45	mg/L	2/13/2008	3	46.9	30.0905747	3
LOS ANGELES	Claremont	GSWC - CLAREMONT	1910024	Mixed <50%GW	37016	17	2	1910024-007	Carbon tetrachloride	0.5	ug/L	12/13/2005	12	0.73	0.30638298	12
								1910024-017	Nitrate (as NO3)	45	mg/L	3/6/2003	7	47	35.34	7
								1910024-007	Trichloroethylene (TCE)	5	ug/L	11/9/2010	92	26	15.2357895	92
LOS ANGELES	Glendale	GLENDALE-CITY, WATER DEPT.	1910043	Mixed <50%GW	207157	14	11	1910043-026	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	8/1/2006	20	14	3.99242424	20
								1910043-027	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	11/9/2010	81	74	38.2592593	80
								1910043-029	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	11/9/2010	54	17	7.30555556	53
								1910043-030	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	11/9/2010	90	13	8.23940594	90
								1910043-026	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	7/5/2005	2	0.6	0.37070707	2
								1910043-027	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	11/9/2010	72	1.7	1.15679012	71
								1910043-025	Carbon tetrachloride	0.5	ug/L	11/9/2010	103	1.1	0.67464912	89
								1910043-026	Carbon tetrachloride	0.5	ug/L	10/12/2010	84	1.5	0.78383838	83
								1910043-027	Carbon tetrachloride	0.5	ug/L	11/9/2010	80	27	10.6850617	79
								1910043-030	Carbon tetrachloride	0.5	ug/L	11/9/2010	101	2.2	1.28009901	100
								1910043-031	Carbon tetrachloride	0.5	ug/L	11/9/2010	98	1.5	0.94969388	97
								1910043-032	Carbon tetrachloride	0.5	ug/L	11/9/2010	101	4.6	2.4660396	100
								1910043-027	Chromium, Total	50	ug/L	11/9/2010	30	87	49.6219512	30
								1910043-031	Chromium, Total	50	ug/L	5/19/2009	7	58	38.4210526	7
								1910043-029	cis-1,2-Dichloroethylene	6	ug/L	11/9/2010	89	26	12.9905556	88

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								1910043-030	cis-1,2-Dichloroethylene	6	ug/L	11/9/2010	100	26	15.3633663	99
								1910043-002	Nitrate (as NO3)	45	mg/L	11/1/2006	2	51	29.8037037	2
								1910043-003	Nitrate (as NO3)	45	mg/L	2/4/2009	39	51.8	43.1073394	39
								1910043-001	Tetrachloroethylene (PCE)	5	ug/L	10/3/2007	2	5.36	2.30508929	2
								1910043-025	Tetrachloroethylene (PCE)	5	ug/L	11/9/2010	114	251	160.219298	97
								1910043-026	Tetrachloroethylene (PCE)	5	ug/L	11/9/2010	99	180	94.720202	98
								1910043-027	Tetrachloroethylene (PCE)	5	ug/L	11/9/2010	79	28	12.4066667	78
								1910043-028	Tetrachloroethylene (PCE)	5	ug/L	11/9/2010	100	51	38.7089109	99
								1910043-029	Tetrachloroethylene (PCE)	5	ug/L	11/9/2010	75	13	6.40655556	75
								1910043-030	Tetrachloroethylene (PCE)	5	ug/L	7/18/2007	16	6.8	4.09732673	16
								1910043-031	Tetrachloroethylene (PCE)	5	ug/L	11/9/2010	98	26	16.3795918	97
								1910043-025	Trichloroethylene (TCE)	5	ug/L	11/9/2010	114	199	144.736842	97
								1910043-026	Trichloroethylene (TCE)	5	ug/L	11/9/2010	99	211	123.717172	98
								1910043-027	Trichloroethylene (TCE)	5	ug/L	11/9/2010	81	870	531.160494	80
								1910043-028	Trichloroethylene (TCE)	5	ug/L	11/9/2010	100	110	65.9712871	99
								1910043-029	Trichloroethylene (TCE)	5	ug/L	11/9/2010	90	160	78.54	89
								1910043-030	Trichloroethylene (TCE)	5	ug/L	11/9/2010	101	210	119.069307	100
								1910043-031	Trichloroethylene (TCE)	5	ug/L	11/9/2010	98	37	20.3061224	97
								1910043-030	Vinyl chloride	0.5	ug/L	4/18/2007	54	2	0.78188119	53
LOS ANGELES	Baldwin Hills	CAL/AM WATER COMPANY - BALDWIN HILLS	1910052	Mixed <50%GW	21678	4	1	1910052-008	Trichloroethylene (TCE)	5	ug/L	10/19/2010	6	8.5	3.4	6
LOS ANGELES	La Canada Flintridge	LA CANADA IRRIGATION DIST.	1910054	Mixed <50%GW	9300	3	2	1910054-002	Nitrate (as NO3)	45	mg/L	3/22/2010	7	54	39.9375	7
								1910054-003	Nitrate (as NO3)	45	mg/L	12/28/2009	2	50	34.5029412	2
LOS ANGELES	La Canada Flintridge	LINCOLN AVENUE WATER CO.	1910063	Mixed <50%GW	16000	2	2	1910063-002	Carbon tetrachloride	0.5	ug/L	11/2/2010	81	4	1.8043956	81
								1910063-003	Carbon tetrachloride	0.5	ug/L	8/6/2009	51	2.5	0.89909091	51
								1910063-002	Perchlorate	6	ug/L	11/16/2010	278	47	22.4612903	278
								1910063-003	Perchlorate	6	ug/L	8/18/2009	156	17	10.0492228	156
								1910063-003	Trichloroethylene (TCE)	5	ug/L	5/9/2006	7	17	3.95311688	7
LOS ANGELES	Los Angeles	LOS ANGELES-CITY, DEPT. OF WATER & POWER	1910067	Mixed <50%GW	4071873	71	47	1910067-062	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	10/5/2010	33	21.7	7.65681818	33
								1910067-095	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	1/24/2003	10	12.7	2.0905	10
								1910067-110	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	10/27/2010	23	17.8	4.39354167	22
								1910067-182	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	10/22/2009	4	6.99	1.75703448	4
								1910067-183	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	1/13/2009	13	12.9	2.84159302	13
								1910067-184	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	10/13/2010	31	14.6	5.24763158	31
								1910067-185	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	10/22/2009	24	15.8	4.04405814	23
								1910067-186	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	10/22/2009	9	8.52	2.31365854	8
								1910067-062	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	4/23/2008	6	0.75	0.05512121	6
								1910067-064	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	10/6/2005	11	0.71	0.15493182	11
								1910067-065	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	10/6/2005	20	1.52	0.87215385	20
								1910067-062	Carbon tetrachloride	0.5	ug/L	10/5/2010	62	2.71	1.17618182	61
								1910067-064	Carbon tetrachloride	0.5	ug/L	8/28/2008	4	1.34	0.07675	4
								1910067-065	Carbon tetrachloride	0.5	ug/L	9/15/2005	25	0.9	0.62646154	25
								1910067-067	Carbon tetrachloride	0.5	ug/L	10/5/2010	38	0.85	0.35390909	38
								1910067-068	Carbon tetrachloride	0.5	ug/L	10/5/2010	71	6.38	3.07233803	71
								1910067-141	Carbon tetrachloride	0.5	ug/L	12/29/2009	10	1.44	0.18688235	9
								1910067-182	Carbon tetrachloride	0.5	ug/L	10/22/2009	16	1.05	0.14051724	16
								1910067-183	Carbon tetrachloride	0.5	ug/L	1/13/2009	20	1.8	0.2512907	19
								1910067-184	Carbon tetrachloride	0.5	ug/L	5/21/2010	48	2.03	0.65784211	46
								1910067-185	Carbon tetrachloride	0.5	ug/L	10/22/2009	44	1.8	0.4795814	43
								1910067-186	Carbon tetrachloride	0.5	ug/L	10/22/2009	7	0.785	0.05497561	6
								1910067-062	Chromium, Total	50	ug/L	10/5/2010	36	392	117.044872	36
								1910067-062	cis-1,2-Dichloroethylene	6	ug/L	9/8/2010	26	23	6.80106061	26
								1910067-067	Gross alpha particle activity	15	pCi/L	1/27/2010	4	19.2	16.3666667	4
								1910067-068	Gross alpha particle activity	15	pCi/L	10/7/2009	4	20.5	17.1166667	4
								1910067-062	Nitrate (as NO3)	45	mg/L	5/20/2008	36	61.1	45.6004054	36
								1910067-064	Nitrate (as NO3)	45	mg/L	4/23/2008	16	52.7	39.7954902	16
								1910067-065	Nitrate (as NO3)	45	mg/L	10/6/2005	33	54	47.2810256	33
								1910067-067	Nitrate (as NO3)	45	mg/L	8/6/2009	4	48.3	35.2108451	4
								1910067-068	Nitrate (as NO3)	45	mg/L	5/25/2005	28	51.4	37.7536364	28
								1910067-110	Nitrate (as NO3)	45	mg/L	4/27/2005	2	46.5	38.3792308	2
								1910067-183	Nitrate (as NO3)	45	mg/L	2/28/2008	5	46.5	30.5816049	5

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								1910067-184	Nitrate (as NO3)	45	mg/L	2/28/2008	11	53.1	37.1215068	11
								1910067-185	Nitrate (as NO3)	45	mg/L	2/28/2008	21	58.5	33.3537349	21
								1910067-186	Nitrate (as NO3)	45	mg/L	2/28/2008	12	53.1	30.3462338	12
								1910067-187	Nitrate (as NO3)	45	mg/L	1/30/2008	19	63.3	32.7079104	18
								1910067-188	Nitrate (as NO3)	45	mg/L	10/22/2009	3	53.1	26.8147541	3
								1910067-123	Perchlorate	6	ug/L	4/9/2002	2	6.5	3.23924051	2
								1910067-124	Perchlorate	6	ug/L	5/26/2006	6	7.2	4.08843373	6
								1910067-125	Perchlorate	6	ug/L	5/17/2002	2	6.6	3.41833333	2
								1910067-187	Perchlorate	6	ug/L	8/13/2002	6	11	4.20485714	6
								1910067-188	Perchlorate	6	ug/L	1/28/2009	31	21	6.54328571	31
								1910067-189	Perchlorate	6	ug/L	2/11/2005	12	11	4.37323944	12
								1910067-062	Tetrachloroethylene (PCE)	5	ug/L	10/5/2010	64	55.3	18.3836364	63
								1910067-063	Tetrachloroethylene (PCE)	5	ug/L	10/5/2010	55	37.1	7.14971014	54
								1910067-064	Tetrachloroethylene (PCE)	5	ug/L	8/28/2008	45	35	15.7357778	44
								1910067-065	Tetrachloroethylene (PCE)	5	ug/L	10/6/2005	26	46	36.2115385	26
								1910067-066	Tetrachloroethylene (PCE)	5	ug/L	10/5/2010	65	14.1	9.35545455	65
								1910067-067	Tetrachloroethylene (PCE)	5	ug/L	8/3/2010	54	14	6.5174697	53
								1910067-068	Tetrachloroethylene (PCE)	5	ug/L	10/5/2010	70	16.1	9.54126761	70
								1910067-084	Tetrachloroethylene (PCE)	5	ug/L	12/23/2009	6	6.02	2.26753488	6
								1910067-098	Tetrachloroethylene (PCE)	5	ug/L	9/25/2007	9	8.32	1.87506897	8
								1910067-104	Tetrachloroethylene (PCE)	5	ug/L	5/21/2009	4	11.5	1.34342029	4
								1910067-108	Tetrachloroethylene (PCE)	5	ug/L	8/19/2008	15	6.83	4.01783333	12
								1910067-110	Tetrachloroethylene (PCE)	5	ug/L	10/27/2010	70	21.7	12.1286111	67
								1910067-149	Tetrachloroethylene (PCE)	5	ug/L	1/28/2009	16	8.75	3.4798	16
								1910067-150	Tetrachloroethylene (PCE)	5	ug/L	5/12/2005	4	7.12	3.00087952	4
								1910067-180	Tetrachloroethylene (PCE)	5	ug/L	9/15/2009	11	18.2	2.12097143	11
								1910067-181	Tetrachloroethylene (PCE)	5	ug/L	10/22/2009	12	14.9	2.86702564	12
								1910067-182	Tetrachloroethylene (PCE)	5	ug/L	10/22/2009	24	15.7	3.90402299	23
								1910067-183	Tetrachloroethylene (PCE)	5	ug/L	10/13/2010	40	24.1	6.35589535	38
								1910067-184	Tetrachloroethylene (PCE)	5	ug/L	10/13/2010	26	31.7	6.97317105	26
								1910067-185	Tetrachloroethylene (PCE)	5	ug/L	10/22/2009	16	27.6	3.25547674	15
								1910067-186	Tetrachloroethylene (PCE)	5	ug/L	2/23/2008	11	8.77	2.09037805	10
								1910067-187	Tetrachloroethylene (PCE)	5	ug/L	6/2/2005	10	7.42	1.58062857	10
								1910067-031	Trichloroethylene (TCE)	5	ug/L	10/28/2010	29	15.7	5.14306452	29
								1910067-051	Trichloroethylene (TCE)	5	ug/L	7/26/2010	5	7.77	2.687	4
								1910067-060	Trichloroethylene (TCE)	5	ug/L	4/6/2010	10	9.01	3.42714035	10
								1910067-062	Trichloroethylene (TCE)	5	ug/L	10/5/2010	65	1300	414.030303	64
								1910067-063	Trichloroethylene (TCE)	5	ug/L	10/5/2010	69	915	48.9431884	68
								1910067-064	Trichloroethylene (TCE)	5	ug/L	8/28/2008	45	65	34.9288889	44
								1910067-065	Trichloroethylene (TCE)	5	ug/L	10/6/2005	26	53	36.9461538	26
								1910067-066	Trichloroethylene (TCE)	5	ug/L	10/5/2010	65	25.5	13.9933333	65
								1910067-067	Trichloroethylene (TCE)	5	ug/L	10/5/2010	65	242	97.7075758	64
								1910067-068	Trichloroethylene (TCE)	5	ug/L	10/5/2010	71	86.3	31.3266197	71
								1910067-084	Trichloroethylene (TCE)	5	ug/L	10/21/2010	29	29.8	10.8773953	29
								1910067-087	Trichloroethylene (TCE)	5	ug/L	9/24/2009	16	9.96	2.96341667	16
								1910067-095	Trichloroethylene (TCE)	5	ug/L	4/22/2010	9	8.85	1.99736047	9
								1910067-097	Trichloroethylene (TCE)	5	ug/L	3/11/2010	4	10.1	1.28939189	4
								1910067-098	Trichloroethylene (TCE)	5	ug/L	9/25/2007	11	8.87	2.35474138	10
								1910067-104	Trichloroethylene (TCE)	5	ug/L	2/18/2010	15	33	3.46678261	15
								1910067-105	Trichloroethylene (TCE)	5	ug/L	10/16/2007	4	8.1	0.92859091	4
								1910067-106	Trichloroethylene (TCE)	5	ug/L	3/3/2010	5	7.8	1.39655128	5
								1910067-108	Trichloroethylene (TCE)	5	ug/L	11/25/2008	31	8.36	5.15833333	28
								1910067-110	Trichloroethylene (TCE)	5	ug/L	10/27/2010	69	19.2	11.2758333	66
								1910067-118	Trichloroethylene (TCE)	5	ug/L	9/9/2009	23	52.6	8.96221429	23
								1910067-119	Trichloroethylene (TCE)	5	ug/L	10/19/2010	22	17	4.12357895	21
								1910067-120	Trichloroethylene (TCE)	5	ug/L	6/10/2008	8	7.5	1.47196875	6
								1910067-127	Trichloroethylene (TCE)	5	ug/L	10/19/2010	59	48.7	11.344427	59
								1910067-128	Trichloroethylene (TCE)	5	ug/L	9/9/2009	20	49.9	7.60209722	20
								1910067-129	Trichloroethylene (TCE)	5	ug/L	9/17/2009	10	18	1.50658696	10
								1910067-130	Trichloroethylene (TCE)	5	ug/L	9/17/2009	13	42	3.66790244	13
								1910067-131	Trichloroethylene (TCE)	5	ug/L	3/3/2010	30	41.7	7.04245455	29
								1910067-132	Trichloroethylene (TCE)	5	ug/L	8/5/2009	27	40	5.96296667	25

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								1910067-141	Trichloroethylene (TCE)	5	ug/L	11/26/2009	9	10.6	3.37147059	8
								1910067-149	Trichloroethylene (TCE)	5	ug/L	11/26/2009	11	19.4	4.32701667	11
								1910067-150	Trichloroethylene (TCE)	5	ug/L	11/26/2009	59	15.5	8.00168675	57
								1910067-152	Trichloroethylene (TCE)	5	ug/L	8/10/2005	30	14	5.17284932	30
								1910067-179	Trichloroethylene (TCE)	5	ug/L	7/16/2009	3	10.5	0.82174627	3
								1910067-180	Trichloroethylene (TCE)	5	ug/L	9/15/2009	21	25.1	3.47167143	21
								1910067-181	Trichloroethylene (TCE)	5	ug/L	10/22/2009	35	22.5	5.55916667	34
								1910067-182	Trichloroethylene (TCE)	5	ug/L	10/22/2009	57	29.2	9.39311494	54
								1910067-183	Trichloroethylene (TCE)	5	ug/L	10/13/2010	59	46.4	12.9370814	56
								1910067-184	Trichloroethylene (TCE)	5	ug/L	10/13/2010	67	45.2	15.1295132	65
								1910067-185	Trichloroethylene (TCE)	5	ug/L	10/13/2010	60	37.5	10.0430581	58
								1910067-186	Trichloroethylene (TCE)	5	ug/L	10/22/2009	50	21.5	7.37303659	48
								1910067-187	Trichloroethylene (TCE)	5	ug/L	10/22/2009	43	13.7	5.65214286	43
								1910067-188	Trichloroethylene (TCE)	5	ug/L	10/22/2009	43	20.1	7.97690278	43
								1910067-189	Trichloroethylene (TCE)	5	ug/L	8/11/2009	32	11.1	4.2931625	31
								1910067-189	Trichlorofluoromethane (Freon 11)	150	ug/L	1/28/2009	2	244	32.096625	2
								1910067-067	Uranium	20	pCi/L	8/25/2004	2	21.6	15.8669048	2
LOS ANGELES	Los Angeles	LOS ANGELES CO WW DIST 4 & 34-LANCASTER	1910070	Mixed <50%GW	146709	55	19	1910070-002	Arsenic	10	ug/L	10/17/2005	31	19.2	7.47597403	30
								1910070-025	Arsenic	10	ug/L	11/3/2010	4	12.6	6.4	4
								1910070-032	Arsenic	10	ug/L	6/14/2005	2	15.9	8.5325	2
								1910070-037	Arsenic	10	ug/L	8/9/2007	4	15.4	4.90608696	4
								1910070-038	Arsenic	10	ug/L	3/4/2010	4	10.5	9.05466667	4
								1910070-039	Arsenic	10	ug/L	7/6/2010	79	16.4	9.77882353	78
								1910070-043	Arsenic	10	ug/L	12/8/2008	3	13.1	7.65666667	3
								1910070-044	Arsenic	10	ug/L	10/12/2005	2	14.5	6.7	2
								1910070-046	Arsenic	10	ug/L	1/13/2009	2	17.1	10.0625	2
								1910070-053	Arsenic	10	ug/L	6/4/2009	6	16.6	4.68315789	6
								1910070-058	Arsenic	10	ug/L	8/4/2010	6	12.9	8.24368421	6
								1910070-062	Arsenic	10	ug/L	1/26/2007	16	22.4	9.44925	15
								1910070-063	Arsenic	10	ug/L	1/26/2007	22	26.1	8.64035088	22
								1910070-066	Arsenic	10	ug/L	7/14/2010	8	43	23.2815385	7
								1910070-067	Arsenic	10	ug/L	10/25/2005	6	15.6	8.96357143	5
								1910070-068	Arsenic	10	ug/L	8/2/2005	4	16.5	8.42071429	4
								1910070-069	Arsenic	10	ug/L	11/22/2005	5	14.9	7.03470588	4
								1910070-070	Arsenic	10	ug/L	9/29/2005	11	23.1	15.3153846	10
								1910070-071	Arsenic	10	ug/L	8/2/2005	8	15.9	9.76375	8
LOS ANGELES	Lynwood	LYNWOOD-CITY, WATER DEPT.	1910079	Mixed <50%GW	71061	5	1	1910079-011	Tetrachloroethylene (PCE)	5	ug/L	10/27/2008	7	6.7	3.96444444	7
LOS ANGELES	Manhattan Beach	MANHATTAN BEACH-CITY, WATER DEPT.	1910083	Mixed <50%GW	33852	2	1	1910083-006	Gross alpha particle activity	15	pCi/L	2/16/2006	2	29.7	6.7225	2
LOS ANGELES	Pasadena	PASADENA-CITY, WATER DEPT.	1910124	Mixed <50%GW	169000	11	7	1910124-006	cis-1,2-Dichloroethylene	6	ug/L	9/3/2010	8	20.7	3.61189542	8
								1910124-006	Gross alpha particle activity	15	pCi/L	5/6/2003	2	17.95	11.945	2
								1910124-047	Gross alpha particle activity	15	pCi/L	5/6/2003	2	21.56	13.35	2
								1910124-006	Nitrate (as NO3)	45	mg/L	9/1/2010	5	50.5	37.8750365	5
								1910124-014	Nitrate (as NO3)	45	mg/L	8/18/2010	2	46.4	33.2232787	2
								1910124-018	Nitrate (as NO3)	45	mg/L	11/2/2010	50	57.9	43.899469	49
								1910124-006	Perchlorate	6	ug/L	11/2/2010	134	25.3	10.7923704	133
								1910124-010	Perchlorate	6	ug/L	2/16/2005	26	12.5	3.04043689	26
								1910124-014	Perchlorate	6	ug/L	8/18/2010	5	7.94	2.25508197	5
								1910124-018	Perchlorate	6	ug/L	11/2/2010	112	31.6	12.7452679	112
								1910124-020	Perchlorate	6	ug/L	11/24/2009	9	9.75	2.6803125	9
								1910124-028	Perchlorate	6	ug/L	11/23/2010	155	17.7	6.46917476	154
								1910124-006	Tetrachloroethylene (PCE)	5	ug/L	9/3/2010	9	12.9	3.08986928	9
								1910124-006	Trichloroethylene (TCE)	5	ug/L	11/2/2010	117	26.2	6.25405229	117
LOS ANGELES	Covina	COVINA IRRIGATING CO.	1910128	Mixed <50%GW	0	3	1	1910128-002	Nitrate (as NO3)	45	mg/L	4/22/2010	3	49	25.6630769	3
								1910128-002	Perchlorate	6	ug/L	4/22/2010	3	6.4	3.64193548	3

Table 8.1

List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
LOS ANGELES	Quartz Hill	QUARTZ HILL WATER DIST.	1910130	Mixed <50%GW	17000	8	1	1910130-015	Nitrate (as NO3)	45	mg/L	5/1/2007	2	46	41.8571429	2
LOS ANGELES	San Dimas	GSWC-SAN DIMAS	1910142	Mixed <50%GW	53199	8	5	1910142-003	Nitrate (as NO3)	45	mg/L	10/22/2004	22	62	30.7838144	20
								1910142-004	Nitrate (as NO3)	45	mg/L	2/28/2005	16	73	32.0495575	16
								1910142-005	Nitrate (as NO3)	45	mg/L	11/15/2010	58	120	65.4682353	57
								1910142-009	Nitrate (as NO3)	45	mg/L	6/8/2007	2	47	28.112	2
								1910142-004	Perchlorate	6	ug/L	9/14/2010	8	13	3.16741573	8
								1910142-005	Perchlorate	6	ug/L	11/15/2010	66	20	9.96626506	64
								1910142-013	Perchlorate	6	ug/L	11/6/2003	3	8	1.41896552	2
LOS ANGELES	Santa Monica	SANTA MONICA-CITY, WATER DIVISION	1910146	Mixed <50%GW	84184	5	2	1910146-017	Carbon tetrachloride	0.5	ug/L	10/21/2010	17	0.8	0.43846154	16
								1910146-015	Tetrachloroethylene (PCE)	5	ug/L	10/21/2010	80	22.2	13.59625	75
								1910146-017	Tetrachloroethylene (PCE)	5	ug/L	10/21/2010	39	30	18.1794872	36
								1910146-015	Trichloroethylene (TCE)	5	ug/L	10/21/2010	76	35	17.485	71
								1910146-017	Trichloroethylene (TCE)	5	ug/L	10/21/2010	39	71	38.0717949	36
LOS ANGELES	La Canada Flintridge	VALLEY WATER CO.	1910166	Mixed <50%GW	9900	4	4	1910166-002	Nitrate (as NO3)	45	mg/L	9/9/2010	19	64	34.7661017	19
								1910166-003	Nitrate (as NO3)	45	mg/L	9/9/2010	21	72	31.8383111	21
								1910166-004	Nitrate (as NO3)	45	mg/L	8/3/2010	29	70.4	46.6695	29
								1910166-005	Nitrate (as NO3)	45	mg/L	7/7/2010	21	62	34.8399286	21
								1910166-003	Tetrachloroethylene (PCE)	5	ug/L	7/7/2010	5	9	2.49318182	5
								1910166-004	Tetrachloroethylene (PCE)	5	ug/L	7/1/2002	3	6	2.07567568	3
LOS ANGELES	Burbank	BURBANK-CITY, WATER DEPT.	1910179	Mixed <50%GW	108082	9	8	1910179-026	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	7/7/2010	7	25	2.9212766	7
								1910179-027	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	1/5/2010	2	25	2.6174359	2
								1910179-004	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	2/9/2007	2	2.5	0.20959184	2
								1910179-029	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	7/10/2003	6	10	0.6278	6
								1910179-004	Carbon tetrachloride	0.5	ug/L	11/2/2010	43	2.5	0.61530612	43
								1910179-024	Carbon tetrachloride	0.5	ug/L	11/2/2010	28	10	0.69210526	28
								1910179-025	Carbon tetrachloride	0.5	ug/L	10/5/2010	23	1	0.28854167	23
								1910179-026	Carbon tetrachloride	0.5	ug/L	11/2/2010	28	25	0.85659574	28
								1910179-027	Carbon tetrachloride	0.5	ug/L	11/2/2010	45	25	1.61128205	45
								1910179-028	Carbon tetrachloride	0.5	ug/L	10/5/2010	26	5	0.47	26
								1910179-029	Carbon tetrachloride	0.5	ug/L	11/2/2010	41	10	0.7845	41
								1910179-023	cis-1,2-Dichloroethylene	6	ug/L	1/6/2009	3	7.6	1.50053763	3
								1910179-004	Gross alpha particle activity	15	pCi/L	8/19/2004	2	16.4	14.18	2
								1910179-026	Gross alpha particle activity	15	pCi/L	12/13/2004	3	16.1	13.54	3
								1910179-027	Gross alpha particle activity	15	pCi/L	4/17/2007	4	16.57	14.6116667	4
								1910179-023	Nitrate (as NO3)	45	mg/L	12/11/2007	4	50	37.1934066	4
								1910179-024	Nitrate (as NO3)	45	mg/L	7/7/2010	5	49	40.9363736	5
								1910179-026	Nitrate (as NO3)	45	mg/L	1/5/2010	34	54.8	43.5032609	34
								1910179-027	Nitrate (as NO3)	45	mg/L	6/2/2003	15	50.4	41.6078947	15
								1910179-004	Tetrachloroethylene (PCE)	5	ug/L	11/2/2010	98	495	104.866327	97
								1910179-023	Tetrachloroethylene (PCE)	5	ug/L	11/2/2010	92	461	90.8430108	91
								1910179-024	Tetrachloroethylene (PCE)	5	ug/L	11/2/2010	95	739	344.263158	94
								1910179-025	Tetrachloroethylene (PCE)	5	ug/L	10/5/2010	88	544	193.839583	87
								1910179-026	Tetrachloroethylene (PCE)	5	ug/L	11/2/2010	94	1630	526.675532	93
								1910179-027	Tetrachloroethylene (PCE)	5	ug/L	11/2/2010	78	840	217.752564	77
								1910179-028	Tetrachloroethylene (PCE)	5	ug/L	11/2/2010	90	550	205.86	89
								1910179-029	Tetrachloroethylene (PCE)	5	ug/L	11/2/2010	100	633	255.92	99
								1910179-004	Trichloroethylene (TCE)	5	ug/L	11/2/2010	98	179	39.1408163	97
								1910179-023	Trichloroethylene (TCE)	5	ug/L	11/2/2010	92	388	148.354839	91
								1910179-024	Trichloroethylene (TCE)	5	ug/L	11/2/2010	95	691	294.221053	94
								1910179-025	Trichloroethylene (TCE)	5	ug/L	10/5/2010	83	410	163.667708	82
								1910179-026	Trichloroethylene (TCE)	5	ug/L	11/2/2010	94	486	176.534043	93
								1910179-027	Trichloroethylene (TCE)	5	ug/L	11/2/2010	77	370	134.744872	76
								1910179-028	Trichloroethylene (TCE)	5	ug/L	11/2/2010	90	189	72.7977778	89
								1910179-029	Trichloroethylene (TCE)	5	ug/L	11/2/2010	100	168	61.252	99

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
LOS ANGELES	Burbank	LOS ANGELES CWWD 40, R24, 27,33-PEARBLSM	1910203	Mixed <50%GW	9731	5	1	1910203-019	Nitrate (as NO3)	45	mg/L	8/18/2010	21	56.6	37.494	21
LOS ANGELES	Santa Fe Springs	SANTA FE SPRINGS - CITY, WATER DEPT.	1910245	Mixed <50%GW	17438	2	1	1910245-004	Trichloroethylene (TCE)	5	ug/L	12/17/2009	2	6.3	1.78235294	2
LOS ANGELES	Baldwin Park city, Irwindale city, San Dimas city, West Covina city	VALLEY COUNTY WATER DIST.	1910009	Undetermined	73196	10	7	1910009-034	1,1-Dichloroethane (1,1-DCA)	5	ug/L	2/6/2006	2	5.6	1.00	32
								1910009-001	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	10/26/2004	7	8.7	0.96	106
								1910009-002	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	9/22/2004	3	10	0.93	102
								1910009-007	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	10/20/2010	41	43	24.11	42
								1910009-033	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	1/20/2009	19	106	26.12	29
								1910009-034	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	3/11/2009	20	49	14.16	32
								1910009-001	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	10/26/2004	10	1.4	0.30	104
								1910009-002	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	10/26/2004	11	1.2	0.30	102
								1910009-007	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	8/30/2010	36	1.1	0.69	42
								1910009-033	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	2/1/2006	2	0.7	0.24	29
								1910009-007	Carbon tetrachloride	0.5	ug/L	10/20/2010	42	2.7	1.52	42
								1910009-001	cis-1,2-Dichloroethylene	6	ug/L	10/26/2004	11	16	1.41	104
								1910009-002	cis-1,2-Dichloroethylene	6	ug/L	10/26/2004	9	14	1.29	102
								1910009-007	cis-1,2-Dichloroethylene	6	ug/L	10/20/2010	42	25	15.89	42
								1910009-033	Nitrate (as NO3)	45	mg/L	9/15/2010	39	86	73.45	37
								1910009-034	Nitrate (as NO3)	45	mg/L	12/16/2009	41	80	60.72	41
								1910009-007	Perchlorate	6	ug/L	10/20/2010	38	33	15.64	38
								1910009-033	Perchlorate	6	ug/L	9/15/2010	28	13	9.66	28
								1910009-034	Perchlorate	6	ug/L	12/16/2009	30	17	11.84	30
								1910009-001	Tetrachloroethylene (PCE)	5	ug/L	9/28/2009	26	110	10.09	106
								1910009-002	Tetrachloroethylene (PCE)	5	ug/L	9/28/2009	39	94	10.47	104
								1910009-005	Tetrachloroethylene (PCE)	5	ug/L	4/27/2010	10	14	1.96	100
								1910009-006	Tetrachloroethylene (PCE)	5	ug/L	3/22/2010	9	16	1.41	107
								1910009-007	Tetrachloroethylene (PCE)	5	ug/L	10/20/2010	42	760	364.12	42
								1910009-033	Tetrachloroethylene (PCE)	5	ug/L	1/20/2009	20	35	12.70	29
								1910009-034	Tetrachloroethylene (PCE)	5	ug/L	11/18/2009	30	32	15.03	32
								1910009-001	Trichloroethylene (TCE)	5	ug/L	10/26/2004	19	36	3.68	106
								1910009-002	Trichloroethylene (TCE)	5	ug/L	10/26/2004	19	42	3.97	104
								1910009-007	Trichloroethylene (TCE)	5	ug/L	10/20/2010	42	218	127.93	42
								1910009-033	Trichloroethylene (TCE)	5	ug/L	12/9/2008	19	30	9.24	29
								1910009-034	Trichloroethylene (TCE)	5	ug/L	3/11/2009	21	20	9.03	32
LOS ANGELES	Azusa city, Glendora city, Vincent CDP	GLENDORA-CITY, WATER DEPT.	1910044	Undetermined	53000	9	2	1910044-008	Nitrate (as NO3)	45	mg/L	5/31/2005	2	46.7	32.38	251
								1910044-009	Nitrate (as NO3)	45	mg/L	11/2/2010	53	52	40.92	341
LOS ANGELES	Bell city, Commerce city, Maywood city	MAYWOOD MUTUAL WATER CO. #3	1910086	Undetermined	9500	3	1	1910086-003	Trichloroethylene (TCE)	5	ug/L	10/12/2010	3	5.3	2.85	40
LOS ANGELES	Claremont city, La Verne city, Pomona city	LA VERNE, CITY WD	1910062	Undetermined	34051	9	8	1910062-008	Nitrate (as NO3)	45	mg/L	6/23/2010	37	81	56.90	49
								1910062-009	Nitrate (as NO3)	45	mg/L	11/3/2010	55	81	60.50	59
								1910062-010	Nitrate (as NO3)	45	mg/L	11/3/2010	56	110	91.72	57
								1910062-012	Nitrate (as NO3)	45	mg/L	11/3/2010	91	120	99.11	91
								1910062-016	Nitrate (as NO3)	45	mg/L	11/10/2010	67	100	93.60	67
								1910062-018	Nitrate (as NO3)	45	mg/L	8/11/2010	40	100	93.75	40
								1910062-032	Nitrate (as NO3)	45	mg/L	11/3/2010	65	120	87.67	64
								1910062-008	Perchlorate	6	ug/L	2/17/2010	30	11	5.66	48
								1910062-009	Perchlorate	6	ug/L	2/4/2009	5	7.3	2.91	57
								1910062-010	Perchlorate	6	ug/L	10/6/2010	48	21	10.69	51
								1910062-012	Perchlorate	6	ug/L	11/3/2010	56	18	14.09	56
								1910062-016	Perchlorate	6	ug/L	11/10/2010	56	18	13.70	56

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								1910062-018	Perchlorate	6	ug/L	8/11/2010	31	24	19.19	31
								1910062-032	Perchlorate	6	ug/L	11/3/2010	38	15	8.12	45
								1910062-039	Perchlorate	6	ug/L	10/6/2010	9	10	3.96	65
								1910062-012	Trichloroethylene (TCE)	5	ug/L	11/3/2010	47	18	12.76	46
								1910062-016	Trichloroethylene (TCE)	5	ug/L	11/10/2010	41	33	15.92	41
LOS ANGELES	Commerce city	COMMERCE-CITY, WATER DEPT.	1910050	Undetermined	1341	3	1	1910050-005	Tetrachloroethylene (PCE)	5	ug/L	11/2/2010	41	28	8.92	51
								1910050-005	Trichloroethylene (TCE)	5	ug/L	11/2/2010	36	22	8.67	51
LOS ANGELES	Downey city, Norwalk city, Santa Fe Springs city	GSWC - NORWALK	1910098	Undetermined	31786	8	7	1910098-001	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	4/7/2009	5	7.7	2.73	51
								1910098-002	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	9/8/2010	38	64	17.26	54
								1910098-003	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	4/7/2009	55	33	10.98	86
								1910098-004	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	11/2/2010	46	32	10.48	63
								1910098-007	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	12/7/2010	8	10	2.64	58
								1910098-007	1,2-Dichloroethane (1,2-DCA)	0.5	ug/L	12/7/2010	13	1.2	0.55	28
								1910098-001	Tetrachloroethylene (PCE)	5	ug/L	4/7/2009	19	13	4.53	56
								1910098-004	Tetrachloroethylene (PCE)	5	ug/L	11/2/2010	2	8.4	1.57	30
								1910098-007	Tetrachloroethylene (PCE)	5	ug/L	12/7/2010	46	24	11.00	50
								1910098-008	Tetrachloroethylene (PCE)	5	ug/L	11/3/2009	14	14	9.18	18
								1910098-009	Tetrachloroethylene (PCE)	5	ug/L	12/7/2010	98	20	8.79	110
								1910098-001	Trichloroethylene (TCE)	5	ug/L	4/7/2009	73	18	10.52	88
								1910098-004	Trichloroethylene (TCE)	5	ug/L	11/2/2010	5	11	1.77	30
								1910098-007	Trichloroethylene (TCE)	5	ug/L	12/7/2010	38	21	9.95	50
								1910098-008	Trichloroethylene (TCE)	5	ug/L	11/3/2009	13	18	8.89	18
								1910098-009	Trichloroethylene (TCE)	5	ug/L	12/7/2010	98	17	7.19	110
LOS ANGELES	Lancaster city	WHITE FENCE FARMS MUTUAL WATER CO.	1910249	Undetermined	1760	2	1	1910249-009	Nitrate (as NO3)	45	mg/L	11/2/2010	35	59	53.06	35
LOS ANGELES	City of Lancaster	LANCASTER PARK MOBILE HOME PARK	1900038	100% GW	53	1	1	1900038-001	Arsenic	10	ug/L	10/6/2009	2	18	16.50	2
LOS ANGELES	City of Lancaster	METTLER VALLEY MUTUAL	1900100	100% GW	200	2	1	1900100-001	Arsenic	10	ug/L	10/25/2010	12	15	13.57	12
LOS ANGELES	City of Lancaster	MITCHELL S AVENUE E MOBILE HOME PARK	1900785	100% GW	35	1	1	1900785-001	Arsenic	10	ug/L	2/8/2010	8	24	20.26	7
LOS ANGELES	City of Lancaster	WINTERHAVEN MOBILE ESTATES	1900961	100% GW	27	1	1	1900961-001	Arsenic	10	ug/L	9/20/2010	13	69	49.08	13
LOS ANGELES	Lancaster city	AVERYDALE MWC	1910023	100% GW	1500	3	2	1910023-001	Aluminum	1000	ug/L	8/15/2008	2	3700	2333.33	3
								1910023-004	Arsenic	10	ug/L	11/19/2005	3	22	9.03	7
LOS ANGELES	Undetermined	SMITH S VILLAGE MOBILE HOME PARK	1900520	100% GW	75	1	1	1900520-001	Arsenic	10	ug/L	9/27/2010	34	62.2	46.05	32
LOS ANGELES	City of San Dimas	SAN DIMAS CANYON IMPROVMENT ASSOCIATION	1900064	>50% GW Mixed	125	1	1	1900064-001	Fluoride	2	mg/L	6/19/2002	2	2.44	2.16	3
LOS ANGELES	Pomona city	POMONA - CITY, WATER DEPT.	1910126	>50% GW Mixed	163408	33	1	1910126-053	Arsenic	10	ug/L	10/12/2005	4	18	6.31	28
LOS ANGELES	Downey city, South Gate city	DOWNEY - CITY, WATER DEPT.	1910034	>50% GW Mixed	113000	21	2	1910034-018	Gross alpha particle activity	15	pCi/L	5/14/2002	2	32.3	9.78	8

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
LOS ANGELES	El Monte city	ADAMS RANCH MUTUAL	1900009	Undetermined	300	1	1	1900009-003	Tetrachloroethylene (PCE)	5	ug/L	9/9/2010	4	6.2	3.17	31
								1900009-003	Trichloroethylene (TCE)	5	ug/L	11/11/2010	26	18.5	9.04	29
MADERA	Ahwahnee CDP	HILLVIEW WATER CO-GOLDSIDE-HIL	2010014	100% GW	927	8	1	2010014-010	Gross alpha particle activity	15	pCi/L	12/27/2007	3	30.5	19.47	6
								2010014-010	Uranium	30	ug/L	1/18/2008	6	54	35.68	4
MADERA	Chowchilla city	VALLEY STATE PRISON FOR WOMEN	2010801	100% GW	4000	2	2	2010801-001	Arsenic	10	ug/L	6/24/2010	8	14	10.88	13
								2010801-002	Arsenic	10	ug/L	6/24/2010	10	14	10.03	15
MADERA	Raymond	HILLVIEW WATER CO-RAYMOND	2010012	100% GW	243	5	4	2010012-002	Arsenic	10	ug/L	6/28/2005	2	12	12.00	2
								2010012-007	Arsenic	10	ug/L	6/28/2005	2	14.4	14.20	2
								2010012-010	Gross alpha particle activity	15	pCi/L	8/25/2008	2	44	42.15	2
								2010012-006	Nitrate (as NO3)	45	mg/L	9/20/2010	12	63.3	39.82	46
								2010012-010	Uranium	20	pCi/L	8/20/2009	3	45	41.90	3
MADERA	Madera city	MADERA-CITY	2010002	100% GW	58178	19	1	2010002-022	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	7/27/2010	19	0.45	0.05	125
								2010002-022	Ethylene dibromide (EDB)	0.05	ug/L	9/14/2010	150	0.75	0.11	126
MADERA	Oakhurst CDP	HILLVIEW WC-OAKHURST/SIERRA LAKES	2010007	100% GW	3006	18	8	2010007-001	Arsenic	10	ug/L	3/18/2009	2	13	7.77	7
								2010007-009	Arsenic	10	ug/L	8/27/2008	4	25	17.10	4
								2010007-010	Arsenic	10	ug/L	8/27/2008	4	149	56.88	4
								2010007-024	Arsenic	10	ug/L	12/22/2009	3	17.8	8.43	10
								2010007-030	Arsenic	10	ug/L	9/22/2010	5	12.4	10.49	9
								2010007-032	Arsenic	10	ug/L	6/23/2010	4	50.6	35.83	4
								2010007-033	Arsenic	10	ug/L	8/27/2008	3	21.3	17.50	3
								2010007-034	Arsenic	10	ug/L	8/27/2008	2	33.5	31.20	2
								2010007-010	Gross alpha particle activity	15	pCi/L	8/27/2008	2	52.7	50.10	2
								2010007-032	Gross alpha particle activity	15	pCi/L	9/16/2008	4	48	31.25	4
								2010007-033	Gross alpha particle activity	15	pCi/L	9/16/2008	3	18	15.75	4
								2010007-034	Gross alpha particle activity	15	pCi/L	9/16/2008	3	148	83.07	3
								2010007-010	Uranium	20	pCi/L	7/26/2010	63	578	66.46	63
								2010007-032	Uranium	20	pCi/L	6/23/2010	10	202	92.07	12
MADERA	Bass Lake	BASS LAKE WATER COMPANY	2010003	Mixed <50%GW	2800	3	1	2010003-001	Gross alpha particle activity	15	pCi/L	3/20/2008	25	166	100.6292	24
								2010003-001	Uranium	20	pCi/L	7/6/2010	37	1000	153.53	35
								2010003-001	Uranium	30	ug/L	10/4/2010	56	1600	301.37931	27
MADERA	Ahwahnee CDP	MD#46 AHWAHNEE RESORTS	2000293	100% GW	300	6	5	2000293-003	Arsenic	10	ug/L	5/11/2010	8	14	10.99	11
								2000293-001	Gross alpha particle activity	15	pCi/L	8/17/2010	6	29	18.98	8
								2000293-004	Gross alpha particle activity	15	pCi/L	8/17/2010	8	32	25.89	7
								2000293-005	Gross alpha particle activity	15	pCi/L	8/17/2010	4	44	18.20	8
								2000293-006	Gross alpha particle activity	15	pCi/L	8/17/2010	6	27	19.08	8
								2000293-001	Uranium	20	pCi/L	2/9/2010	2	27.3	18.30	7
								2000293-004	Uranium	20	pCi/L	8/17/2010	7	33	29.40	6
								2000293-005	Uranium	20	pCi/L	2/9/2010	2	39.2	20.31	7
								2000293-006	Uranium	20	pCi/L	8/17/2010	4	24	20.54	7
MADERA	Ahwahnee CDP	PIKE RANCH MUTUAL WATER CO	2000526	100% GW	75	1	1	2000526-002	Gross alpha particle activity	15	pCi/L	7/1/2010	16	244	100.02	16
								2000526-002	Uranium	20	pCi/L	7/1/2010	7	191	87.03	8
MADERA	City of Firebaugh	EAST ACRES MUTUAL WATER COMPANY	2000512	100% GW	250	2	2	2000512-001	Arsenic	10	ug/L	9/15/2010	9	34	22.72	10
								2000512-003	Arsenic	10	ug/L	9/15/2010	5	25	12.63	10
MADERA	City of Firebaugh	MAHAL APARTMENTS	2000800	100% GW	50	1	1	2000800-001	Gross alpha particle activity	15	pCi/L	2/16/2010	4	31	23.24	5
								2000800-001	Uranium	30	ug/L	10/8/2007	6	35.3	31.40	4
MADERA	Bonadelle Ranchos - Madera Ranchos	VALLEY TEEN RANCH	2000785	100% GW	50	1	1	2000785-002	Arsenic	10	ug/L	8/24/2010	11	146	74.31	12
MADERA	City of Madera	MD#85 VALETA MUTUAL WATER COMPANY	2000511	100% GW	45	1	1	2000511-001	Nitrate (as NO3)	45	mg/L	5/4/2009	14	58.5	36.66	39
MADERA	City of Madera	LEISURE ACRES MUTUAL WATER COMPANY	2000534	100% GW	45	1	1	2000534-001	Arsenic	10	ug/L	6/29/2009	3	14.9	9.73	10
MADERA	City of Madera	CEDAR VALLEY MUTUAL WATER CO	2000538	100% GW	137	1	1	2000538-001	Arsenic	10	ug/L	1/5/2010	11	37.4	19.04	12
MADERA	City of Madera	MD#06 LAKE SHORE	2000550	100% GW	130	3	2	2000550-001	Arsenic	10	ug/L	9/15/2010	20	301	84.65	21

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
		PARK						2000550-002	Arsenic	10	ug/L	9/15/2010	22	377	92.36	23
								2000550-001	Gross alpha particle activity	15	pCi/L	1/13/2010	6	476	183.38	6
								2000550-002	Gross alpha particle activity	15	pCi/L	1/13/2010	9	549	122.77	9
								2000550-001	Uranium	20	pCi/L	1/13/2010	2	102	75.50	2
								2000550-002	Uranium	20	pCi/L	1/13/2010	3	157	109.67	3
MADERA	City of Madera	MD#07 MARINA VIEW HEIGHTS	2000551	100% GW	200	2	2	2000551-002	Arsenic	10	ug/L	7/21/2010	11	18.4	12.41	14
								2000551-001	Gross alpha particle activity	15	pCi/L	1/13/2010	6	317	132.00	7
								2000551-002	Gross alpha particle activity	15	pCi/L	1/13/2010	6	161	72.42	6
								2000551-001	Uranium	30	ug/L	11/29/2007	10	407	207.90	5
								2000551-002	Uranium	20	pCi/L	1/13/2010	2	57	52.50	2
MADERA	City of Madera	MD#08 NORTH FORK WATER SYSTEM	2000561	100% GW	264	1	1	2000561-001	Arsenic	10	ug/L	1/13/2010	11	15.4	12.84	11
MADERA	City of Madera	MAMMOTH POOL MOBILE HOME PARK	2000589	100% GW	60	4	3	2000589-001	Gross alpha particle activity	15	pCi/L	8/11/2008	2	26	17.48	4
								2000589-003	Gross alpha particle activity	15	pCi/L	8/11/2008	2	18	13.80	4
								2000589-004	Gross alpha particle activity	15	pCi/L	8/11/2008	2	19	13.82	5
MADERA	City of Madera	MD#42 STILL MEADOW	2000737	100% GW	100	2	2	2000737-001	Arsenic	10	ug/L	1/12/2010	12	21.7	17.66	12
								2000737-002	Arsenic	10	ug/L	1/12/2010	12	28.7	22.57	12
								2000737-001	Gross alpha particle activity	15	pCi/L	8/17/2010	15	44	28.27	15
								2000737-002	Gross alpha particle activity	15	pCi/L	2/25/2008	2	16.3	12.41	8
								2000737-001	Uranium	20	pCi/L	8/17/2010	8	37.7	30.10	9
MADERA	City of North Fork	BASS LAKE ANNEX #3	2000501	100% GW	42	1	1	2000501-004	Gross alpha particle activity	15	pCi/L	3/25/2009	4	80.5	33.86	7
								2000501-004	Uranium	20	ug/L	6/2/2010	6	112	45.80	9
MADERA	City of North Fork	SIERRA LINDA MUTUAL WATER CO	2000506	100% GW	180	3	2	2000506-002	Arsenic	10	ug/L	9/19/2010	9	34.5	28.66	10
								2000506-006	Arsenic	10	ug/L	3/14/2010	2	11.6	8.97	6
								2000506-002	Gross alpha particle activity	15	pCi/L	3/14/2010	5	121	75.78	6
								2000506-006	Gross alpha particle activity	15	pCi/L	6/6/2010	4	423	237.75	4
								2000506-002	Uranium	20	ug/L	3/14/2010	2	102	76.40	2
								2000506-006	Uranium	20	pCi/L	6/6/2010	4	410	240.38	4
MADERA	City of North Fork	TWO TWENTY FOUR MOBILE HOME PK	2000592	100% GW	30	1	1	2000592-001	Gross alpha particle activity	15	pCi/L	8/20/2010	4	377	128.40	5
								2000592-001	Uranium	20	pCi/L	8/20/2010	2	393	309.00	2
MADERA	Oakhurst CDP	BASS LAKE HEIGHTS MUTUAL WATER	2000502	100% GW	250	3	3	2000502-001	Arsenic	10	ug/L	6/10/2010	7	31	21.51	7
								2000502-002	Arsenic	10	ug/L	6/10/2010	8	30	19.28	9
								2000502-003	Arsenic	10	ug/L	6/10/2010	6	21	19.18	6
MADERA	Oakhurst CDP	SKY ACRES MUTUAL WATER CORP	2000524	100% GW	90	3	1	2000524-003	Arsenic	10	ug/L	5/6/2010	2	14.9	8.96	5
MADERA	Oakhurst CDP	YOSEMITE FORKS ESTATES MUTUAL WTR	2000527	100% GW	110	4	1	2000527-001	Arsenic	10	ug/L	3/12/2010	3	18	17.00	3
MADERA	Oakhurst CDP	SUGAR PINE HOMEOWNERS ASSOC	2000533	100% GW	120	2	1	2000533-001	Gross alpha particle activity	15	pCi/L	6/12/2007	2	18	13.38	8
MADERA	Oakhurst CDP	ECCO	2000688	100% GW	100	3	1	2000688-006	Arsenic	10	ug/L	8/3/2010	4	17	14.36	5
MADERA	Oakhurst CDP	HILLVIEW WC-OAKHURST/SIERRA LAKES	2010007	100% GW	3006	18	3	2010007-007	Arsenic	10	ug/L	8/27/2008	4	21.9	17.48	4
								2010007-012	Arsenic	10	ug/L	8/27/2008	4	92.4	40.35	4
								2010007-012	Gross alpha particle activity	15	pCi/L	7/23/2007	2	48.5	38.75	2
								2010007-017	Tetrachloroethylene (PCE)	5	ug/L	10/18/2010	3	18	12.88	3
MADERA	Ahwahnee CDP	MD#43 MIAMI CREEK KNOLLS	2000557	>50% GW Mixed	100	3	1	2000557-003	Nitrate (as NO3)	45	mg/L	5/15/2007	2	67.7	38.48	9
MADERA	City of Madera	MD#24 TEAFORD MEADOW LAKES	2000552	>50% GW Mixed	150	3	1	2000552-002	Arsenic	10	ug/L	9/15/2010	3	46.7	10.87	11
MADERA	Oakhurst CDP	OAKHURST MOBILE HOME ESTATES	2000593	>50% GW Mixed	114	3	1	2000593-001	Gross alpha particle activity	15	pCi/L	11/18/2009	7	28.5	16.20	11
								2000593-001	Uranium	20	pCi/L	11/18/2009	6	30	13.43	12
MARIN	City of Novato	NPS PRNS - BEACHES	2110502	100% GW	55	1	1	2110502-001	Total Trihalomethanes	80	ug/L	5/9/2006	2	117	67.33	3
MARIN	Nicasio CDP	NICASIO VALLEY RANCH MUTUAL	2100579	>50% GW Mixed	51	2	1	2100579-001	Arsenic	10	ug/L	12/30/2009	6	81	32.89	11
MARIPOSA	City of Mariposa	PONDEROSA BASIN MUTUAL WTR CO	2210002	100% GW	665	6	1	2210002-008	Gross alpha particle activity	15	pCi/L	9/2/2008	2	20	12.10	4
MARIPOSA	Fish Camp CDP	FISHCAMP MUTUAL WATER COMPANY	2210903	100% GW	200	4	2	2210903-002	Gross alpha particle activity	15	pCi/L	9/21/2004	3	24.8	11.18	8
								2210903-003	Gross alpha particle activity	15	pCi/L	9/14/2010	7	31.2	20.83	8

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
MENDOCINO	Laytonville CDP	LAYTONVILLE COUNTY WATER DISTRICT	2310011	100% GW	1301	2	2	2310011-001	Arsenic	10	ug/L	2/4/2010	85	68	55.45	84
								2310011-006	Arsenic	10	ug/L	3/4/2010	20	73	61.90	20
MERCED	City of Merced	MCHA Los Banos Center - CLOSED	2400108	100% GW	270	1	1	2400108-001	Arsenic	10	ug/L	7/24/2008	6	16.4	13.95	6
								2400108-001	Fluoride	2	mg/L	1/30/2003	3	2.4	1.01	5
								2400108-001	Gross alpha particle activity	15	pCi/L	4/17/2008	5	58.3	30.20	5
								2400108-001	Uranium	30	ug/L	4/17/2008	6	85.6	67.67	3
MERCED	Atwater city	ATWATER, CITY OF	2410001	100% GW	28100	10	1	2410001-009	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	8/26/2009	20	0.55	0.18	61
MERCED	Franklin CDP	MEADOWBROOK WC	2410008	100% GW	4400	3	1	2410008-010	Gross alpha particle activity	15	pCi/L	9/16/2008	2	16	12.20	5
MERCED	Hilmar-Irwin CDP	HILMAR COUNTY WATER DISTRICT	2410012	100% GW	4850	3	1	2410012-006	Arsenic	10	ug/L	10/21/2010	27	16.6	11.47	34
MERCED	Livingston city	LIVINGSTON-CITY	2410004	100% GW	13940	8	2	2410004-013	Arsenic	10	ug/L	7/14/2009	2	11	8.45	4
								2410004-025	Arsenic	10	ug/L	11/2/2010	7	36	31.14	7
MERCED	Los Banos city	LOS BANOS-CITY	2410005	100% GW	36198	12	1	2410005-007	Gross alpha particle activity	15	pCi/L	11/2/2005	2	15.4	12.54	7
MERCED	Merced city	MERCED, CITY OF	2410009	100% GW	80095	23	3	2410009-023	Arsenic	10	ug/L	9/30/2010	27	12	9.32	92
								2410009-013	Nitrate (as NO3)	45	mg/L	11/12/2010	41	54	40.91	130
								2410009-014	Nitrate (as NO3)	45	mg/L	11/12/2010	16	62	40.15	41
MERCED	City of Merced	John Latorraca Correction Center	2400172	100% GW	800	3	3	2400172-001	Arsenic	10	ug/L	1/22/2009	7	45.7	24.53	7
								2400172-002	Arsenic	10	ug/L	1/22/2009	7	23	16.97	7
								2400172-012	Arsenic	10	ug/L	11/6/2007	7	52	44.30	7
MERCED	El Nido CDP	El Nido Mobile Home Park	2400053	100% GW	250	2	3	2400053-003	Arsenic	10	ug/L	9/2/2010	20	70	41.95	26
								2400053-013	Arsenic	10	ug/L	5/27/2010	7	65.7	55.96	7
								2400053-014	Arsenic	10	ug/L	10/28/2010	45	65	36.51	44
								2400053-003	Nitrate (as NO3)	45	mg/L	3/29/2004	2	46.6	23.78	6
MERCED	Le Grand CDP	LE GRAND COMM SERVICES DIST	2410011	100% GW	1700	3	1	2410011-005	Arsenic	10	ug/L	3/25/2010	5	16.1	10.38	10
MONO	Bridgeport CDP	BRIDGEPORT PUD	2610003	100% GW	300	3	3	2610003-002	Arsenic	10	ug/L	1/5/2010	5	35	25.27	6
								2610003-003	Arsenic	10	ug/L	1/5/2010	6	28	14.64	6
								2610003-004	Arsenic	10	ug/L	1/5/2010	5	28	25.00	5
MONO	Coleville CDP	USMC HOUSING - COLEVILLE	2610701	100% GW	367	3	3	2610701-001	Arsenic	10	ug/L	3/2/2010	21	43	32.24	20
								2610701-004	Arsenic	10	ug/L	3/2/2010	21	33	28.43	20
								2610701-005	Arsenic	10	ug/L	3/21/2010	9	96	84.10	10
								2610701-005	Fluoride	2	mg/L	3/21/2010	9	3	2.51	9
MONO	Mammoth Lakes town	MAMMOTH CWD	2610001	>50% GW Mixed	8214	9	7	2610001-007	Arsenic	10	ug/L	11/2/2010	90	150	38.11	92
								2610001-009	Arsenic	10	ug/L	11/2/2010	71	37	17.06	73
								2610001-015	Arsenic	10	ug/L	11/2/2010	53	18	12.21	72
								2610001-016	Arsenic	10	ug/L	11/2/2010	52	49	22.67	54
								2610001-017	Arsenic	10	ug/L	10/13/2010	61	88	27.15	61
								2610001-018	Arsenic	10	ug/L	9/22/2009	17	33	10.36	48
								2610001-019	Arsenic	10	ug/L	11/2/2010	65	170	93.49	65
MONO	Crowley Lake CDP	CROWLEY LAKE MUT. WATER DIST.	2600546	100% GW	250	2	1	2600546-001	Gross alpha particle activity	15	pCi/L	10/6/2008	6	22.5	18.38	6
								2600546-001	Uranium	20	pCi/L	4/4/2005	4	27.4	22.05	6
MONO	Crowley Lake CDP	MOUNTAIN MEADOWS MWC	2600620	100% GW	225	4	3	2600620-001	Gross alpha particle activity	15	pCi/L	7/24/2009	4	30.4	25.06	5
								2600620-004	Gross alpha particle activity	15	pCi/L	7/24/2009	3	42.3	38.47	3
								2600620-001	Uranium	20	pCi/L	8/25/2010	6	41	28.83	7
								2600620-003	Uranium	20	pCi/L	8/25/2010	2	40.4	12.28	7
								2600620-004	Uranium	20	pCi/L	5/26/2010	5	40.5	29.13	6
MONTEREY	Ambler Park CDP	CAL AM WATER COMPANY - AMBLER PARK	2710006	100% GW	960	3	3	2710006-004	Arsenic	10	ug/L	10/4/2010	49	20	11.90	67
								2710006-005	Arsenic	10	ug/L	11/1/2010	100	50	26.11	99
								2710006-006	Arsenic	10	ug/L	11/1/2010	67	113	35.40	67
MONTEREY	Toro CDP	CAL AM WATER COMPANY - TORO	2710021	100% GW	1296	2	2	2710021-003	Arsenic	10	ug/L	11/1/2010	20	22	13.71	24
								2710021-004	Arsenic	10	ug/L	11/1/2010	23	17	14.26	23
MONTEREY	Salinas city	CWSC SALINAS	2710010	100% GW	114840	32	7	2710010-028	Gross alpha particle activity	15	pCi/L	5/28/2009	4	20	10.13	23
								2710010-010	Methyl tertiary butyl ether (MTBE)	13	ug/L	11/18/2010	172	284.96	23.00	312
								2710010-006	Nitrate (as NO3)	45	mg/L	7/13/2010	55	58	44.65	120
								2710010-018	Nitrate (as NO3)	45	mg/L	11/2/2010	9	70	40.86	124
								2710010-019	Nitrate (as NO3)	45	mg/L	11/2/2010	81	88.367	58.86	93
								2710010-029	Nitrate (as NO3)	45	mg/L	9/13/2010	11	53.834	32.22	46

Table 8.1

List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								2710010-039	Nitrate (as NO3)	45	mg/L	11/17/2010	92	72.37	57.51	91
MONTEREY	Soledad city	SALINAS VALLEY STATE PRISON	2710851	100% GW	6585	2	2	2710851-002	Nitrate (as NO3)	45	mg/L	10/12/2010	15	59	39.95	101
								2710851-004	Nitrate (as NO3)	45	mg/L	11/2/2010	24	72	52.49	36
MONTEREY	Spreckels CDP	TASCO SPRECKELS WATER COMPANY	2710023	100% GW	660	2	1	2710023-005	Gross alpha particle activity	15	pCi/L	12/17/2008	3	27.2	15.19	6
MONTEREY	Carmel Valley Village CDP, Del Monte Forest CDP, Sand City city, Seaside city	CAL AM WATER COMPANY - MONTEREY	2710004	>50% GW Mixed	122492	25	1	2710004-050	Arsenic	10	ug/L	9/14/2010	18	18	12.84	19
MONTEREY	City of Salinas	CORRAL DE TIERRA ESTATES WC	2700536	100% GW	45	1	1	2700536-004	Arsenic	10	ug/L	3/2/2009	9	86	68.44	9
MONTEREY	City of Salinas	LAGUNA SECA WC	2700612	100% GW	162	1	1	2700612-003	Arsenic	10	ug/L	8/8/2006	4	14	11.40	5
MONTEREY	City of Salinas	IVERSON & JACKS APTS WS	2701068	100% GW	150	1	1	2701068-001	Nitrate (as NO3)	45	mg/L	5/25/2010	3	82	69.33	3
MONTEREY	Gonzales city	RIVER RD WS #25	2701063	100% GW	65	1	1	2701063-001	Nitrate (as NO3)	45	mg/L	1/25/2010	3	167	110.33	3
MONTEREY	Greenfield city	APPLE AVE WS #03	2701036	100% GW	60	1	1	2701036-001	Nitrate (as NO3)	45	mg/L	6/6/2005	5	50	44.18	11
MONTEREY	Prunedale CDP	COLONIAL OAKS WC	2700534	100% GW	198	4	2	2700534-003	Nitrate (as NO3)	45	mg/L	5/3/2010	6	51	44.33	18
								2700534-004	Nitrate (as NO3)	45	mg/L	8/5/2010	8	66	45.72	18
MONTEREY	Prunedale CDP	MORO COJO MWA	2700656	100% GW	67	2	1	2700656-007	Nitrate (as NO3)	45	mg/L	7/20/2010	4	54	48.17	6
MONTEREY	Prunedale CDP	OAK HEIGHTS W & R CO INC	2700665	100% GW	105	3	1	2700665-003	Nitrate (as NO3)	45	mg/L	1/15/2008	8	80	39.32	19
MONTEREY	Prunedale CDP	PRUNEDALE MWC	2700702	100% GW	252	4	4	2700702-001	Arsenic	10	ug/L	12/10/2004	2	12	8.02	9
								2700702-002	Arsenic	10	ug/L	12/28/2009	8	19	15.50	8
								2700702-003	Arsenic	10	ug/L	12/26/2009	8	62	49.38	8
								2700702-004	Arsenic	10	ug/L	12/26/2009	7	68	53.71	7
MONTEREY	Prunedale CDP	SAN MIGUEL WS #01	2700738	100% GW	100	2	2	2700738-001	Nitrate (as NO3)	45	mg/L	9/8/2010	5	59	42.64	11
								2700738-002	Nitrate (as NO3)	45	mg/L	9/8/2010	4	56	41.30	10
MONTEREY	Prunedale CDP	MORO RD WS #09	2701926	100% GW	210	3	2	2701926-003	Arsenic	10	ug/L	7/1/2010	8	25	10.32	16
								2701926-002	Nitrate (as NO3)	45	mg/L	4/1/2010	6	48	45.00	8
NAPA	City of Calistoga	CALISTOGA FARM WORKER CENTER	2800039	100% GW	25	1	1	2800039-001	Arsenic	10	ug/L	12/1/2010	20	120	88.95	21
NAPA	City of Calistoga	TUCKER ACRES MUTUAL WATER CO.	2800516	100% GW	200	1	1	2800516-002	Arsenic	10	ug/L	3/31/2009	3	27	13.88	9
NEVADA	City of Truckee	TRUCKEE-DONNER PUD - HIRSCHDALE	2910010	100% GW	48	1	1	2910010-001	Arsenic	10	ug/L	11/4/2010	37	100	43.24	37
NEVADA	Truckee town	TRUCKEE-DONNER PUD, MAIN	2910003	100% GW	14300	12	3	2910003-005	Arsenic	10	ug/L	9/9/2009	7	53	17.35	16
				100% GW				2910003-007	Arsenic	10	ug/L	6/15/2009	2	16	11.20	6
				100% GW				2910003-012	Arsenic	10	ug/L	4/27/2005	2	13	11.60	3
NEVADA	Kingvale CDP	PLAVADA COMMUNITY ASSOCIATION	2910011	100% GW	300	3	2	2910011-006	Arsenic	10	ug/L	9/20/2010	12	28.6	16.88	12
								2910011-007	Arsenic	10	ug/L	9/20/2010	11	41.5	32.68	11
ORANGE	Anaheim city, Fullerton city	CITY OF FULLERTON	3010010	>50% GW Mixed	137367	11	1	3010010-012	Trichloroethylene (TCE)	5	ug/L	2/3/2004	12	6.7	3.36	67
ORANGE	Garden Grove city, Newport Beach city, Orange city, Placentia city, Santa Ana city, Tustin city	CITY OF SANTA ANA	3010038	>50% GW Mixed	353428	20	1	3010038-019	Nitrate (as NO3)	45	mg/L	9/17/2003	3	48.05	29.86	106
ORANGE	Irvine city, Lake Forest city, Orange city, Santa Ana city, Tustin city	IRVINE RANCH WATER DISTRICT	3010092	>50% GW Mixed	316000	27	2	3010092-058	Gross alpha particle activity	15	pCi/L	5/12/2008	2	17.8	11.83	13
								3010092-015	Perchlorate	6	ug/L	1/14/2010	8	7.9	1.90	37
								3010092-015	Tetrachloroethylene (PCE)	5	ug/L	2/12/2003	2	5.5	1.49	47
ORANGE	North Tustin CDP, Orange city, Tustin city	CITY OF TUSTIN	3010046	>50% GW Mixed	62100	12	5	3010046-002	Nitrate (as NO3)	45	mg/L	8/6/2003	2	47.92	35.15	33
								3010046-008	Nitrate (as NO3)	45	mg/L	5/19/2010	33	76.4	59.92	34
								3010046-009	Nitrate (as NO3)	45	mg/L	11/17/2010	32	98.04	76.68	32
								3010046-017	Nitrate (as NO3)	45	mg/L	2/21/2007	6	50.85	34.02	32
								3010046-022	Nitrate (as NO3)	45	mg/L	11/17/2010	32	80.8	58.99	35
								3010046-009	Perchlorate	6	ug/L	11/17/2010	26	10.6	7.10	35

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								3010046-022	Perchlorate	6	ug/L	2/11/2010	13	8	4.40	37
ORANGE	West Orange	GOLDEN STATE WC - WEST ORANGE	3010022	Mixed <50%GW	108995	20	1	3010022-022	Perchlorate	6	ug/L	8/4/2004	5	7.9	5.12941176	5
ORANGE	Yorba Linda	YORBA LINDA WATER DISTRICT	3010037	Mixed <50%GW	77513	10	1	3010037-001	Arsenic	10	ug/L	9/1/2010	32	83	11.7859649	29
ORANGE	Yorba Linda	GOLDEN STATE WC - YORBA LINDA	3010070	Mixed <50%GW	5742	2	1	3010070-003	Gross alpha particle activity	15	pCi/L	1/25/2010	17	26.8	23.3647059	17
								3010070-003	Uranium	20	pCi/L	1/25/2010	88	29	23.5248936	86
								3010070-003	Uranium	30	pCi/L	6/7/2010	114	43	32.5373134	67
ORANGE	Fountain Valley city, Newport Beach city	CITY OF NEWPORT BEACH	3010023	Undetermined	84218	4	1	3010023-005	Gross alpha particle activity	15	pCi/L	2/28/2007	3	15.7	13.25	14
ORANGE	Fullerton city	PAGE AVENUE MUTUAL WATER COMPANY	3000585	100% GW	104	1	1	3000585-001	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	5/3/2010	3	6.3	3.03	44
								3000585-001	Perchlorate	6	ug/L	10/1/2007	5	9.1	4.21	35
ORANGE	Huntington Beach city	LIBERTY PARK WATER ASSOCIATION	3000618	100% GW	100	1	1	3000618-001	Gross alpha particle activity	15	pCi/L	3/14/2003	5	18.7	13.08	15
ORANGE	Santa Ana city	CATALINA STREET PUMP OWNERS	3000662	100% GW	150	1	1	3000662-001	Gross alpha particle activity	15	pCi/L	4/5/2010	25	26.8	22.26	26
								3000662-001	Uranium	20	pCi/L	4/5/2010	24	25.8	21.70	26
ORANGE	Santa Ana city	DIAMOND PARK MUTUAL WATER CO.	3000663	100% GW	200	1	1	3000663-001	Nitrate (as NO3)	45	mg/L	10/4/2010	19	49.9	39.17	61
ORANGE	Stanton city	HYNES ESTATES MUTUAL WATER CO.	3000519	100% GW	120	2	1	3000519-001	Gross alpha particle activity	15	pCi/L	10/5/2009	7	17.8	14.98	17
PLACER	Tahoma CDP	TAHOMA MEADOWS MUTUAL WATER COMPANY	3100033	100% GW	120	1	1	3100033-001	Arsenic	10	ug/L	10/5/2010	24	246	37.95	19
PLACER	Lake Forest	LAKE FOREST UTILITY COMPANY	3110032	Mixed <50%GW	50	1	1	3110032-004	Arsenic	10	ug/L	3/19/2007	2	21	14.3333333	2
PLUMAS	Crescent Mills CDP	IVCSD - Crescent Mills	3200510	100% GW	258	2	1	3200510-001	Arsenic	10	ug/L	2/2/2010	2	12	6.60	6
PLUMAS	Beckwourth CDP, Portola city	CITY OF PORTOLA	3210003	100% GW	2500	4	2	3210003-005	Arsenic	10	ug/L	7/6/2010	12	31	13.89	20
								3210003-006	Arsenic	10	ug/L	7/6/2010	6	25	8.27	20
PLUMAS	Delleker CDP	GRIZZLY LAKE RID-DELLEKER	3200104	100% GW	657	3	2	3200104-002	Gross alpha particle activity	15	pCi/L	1/4/2010	8	32	17.45	13
								3200104-003	Gross alpha particle activity	15	pCi/L	4/13/2010	8	39.3	18.75	12
								3200104-002	Uranium	20	pCi/L	7/27/2010	4	36.9	16.64	17
								3200104-003	Uranium	20	pCi/L	1/4/2010	7	31.4	16.38	16
PLUMAS	Gold Mountain CDP	GOLD MOUNTAIN CSD	3205003	100% GW	100	2	1	3205003-002	Gross alpha particle activity	15	pCi/L	2/2/2009	5	23	20.52	5
PLUMAS	Undetermined	GRIZZLY RANCH CSD	3205006	100% GW	25	2	1	3205006-001	Arsenic	10	ug/L	9/14/2010	21	83	43.32	22
RIVERSIDE	City of Lake Elsinore	Ortega Oaks RV Park&Campground	3301482	100% GW	25	2	1	3301482-001	Arsenic	10	ug/L	9/29/2010	5	14	13.40	5
RIVERSIDE	Blythe city	CHUCKAWALLA VALLEY/IRONWOOD STATE PRISON	3310802	100% GW	7370	6	4	3310802-001	Arsenic	10	ug/L	11/2/2010	45	39	33.91	44
								3310802-002	Arsenic	10	ug/L	11/9/2010	36	38	34.33	36
								3310802-003	Arsenic	10	ug/L	7/20/2010	4	51	30.40	5
								3310802-006	Arsenic	10	ug/L	12/7/2010	29	39	35.03	29
								3310802-001	Fluoride	2	mg/L	11/2/2010	42	10.8	8.56	41
								3310802-002	Fluoride	2	mg/L	11/9/2010	36	14.2	7.99	36
								3310802-003	Fluoride	2	mg/L	7/20/2010	4	9.3	8.33	4
								3310802-006	Fluoride	2	mg/L	12/7/2010	29	11	7.81	29
RIVERSIDE	City of Redlands	Fisherman s Retreat	3301267	100% GW	100	3	1	3301267-001	Nitrate (as NO3)	45	mg/L	6/22/2009	2	130	50.80	5
RIVERSIDE	City of Riverside	Boe Del Heights Mutual Water	3301046	100% GW	250	1	1	3301046-001	Gross alpha particle activity	15	pCi/L	8/27/2007	2	15.6	13.36	5
RIVERSIDE	City of Riverside	CHINO BASIN DESALTER AUTH. - DESALTER 2	3310083	100% GW	0	11	8	3310083-002	Nitrate (as NO3)	45	mg/L	11/1/2010	51	100	84.41	51
								3310083-003	Nitrate (as NO3)	45	mg/L	11/1/2010	58	94	70.59	58
								3310083-004	Nitrate (as NO3)	45	mg/L	11/1/2010	46	90	78.76	46
								3310083-005	Nitrate (as NO3)	45	mg/L	11/1/2010	33	98	86.59	34
								3310083-007	Nitrate (as NO3)	45	mg/L	11/1/2010	47	150	114.64	47

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								3310083-008	Nitrate (as NO3)	45	mg/L	5/4/2010	43	86	75.21	43
								3310083-009	Nitrate (as NO3)	45	mg/L	8/4/2010	47	97	73.53	49
								3310083-010	Nitrate (as NO3)	45	mg/L	11/1/2010	41	260	189.51	41
RIVERSIDE	Corona city, Home Gardens CDP	HOME GARDENS COUNTY WD	3310018	100% GW	3033	2	1	3310018-005	Arsenic	10	ug/L	10/4/2010	12	39	32.42	12
								3310018-005	Fluoride	2	mg/L	10/11/2010	91	3.7	2.72	93
								3310018-005	Gross alpha particle activity	15	pCi/L	10/4/2010	6	48	36.83	6
								3310018-005	Uranium	20	pCi/L	10/4/2010	11	42	28.54	13
RIVERSIDE	Desert Hot Springs city	MISSION SPRINGS WD	3310008	100% GW	29802	12	2	3310008-014	Gross alpha particle activity	15	pCi/L	9/8/2010	9	22	15.21	17
								3310008-026	Gross alpha particle activity	15	pCi/L	9/8/2010	7	24	17.00	9
								3310008-014	Uranium	20	pCi/L	9/2/2009	4	23	18.43	17
RIVERSIDE	Glen Avon CDP, Mira Loma CDP, Pedley CDP, Rubidoux CDP	JURUPA COMMUNITY SD	3310021	100% GW	87846	22	8	3310021-016	Nitrate (as NO3)	45	mg/L	11/4/2010	95	87	49.92	172
								3310021-017	Nitrate (as NO3)	45	mg/L	11/4/2010	101	97	72.38	103
								3310021-018	Nitrate (as NO3)	45	mg/L	11/4/2010	102	81	46.64	200
								3310021-020	Nitrate (as NO3)	45	mg/L	9/9/2010	111	72	43.23	196
								3310021-021	Nitrate (as NO3)	45	mg/L	8/12/2010	26	53	38.88	180
								3310021-022	Nitrate (as NO3)	45	mg/L	9/9/2010	114	130	93.91	115
								3310021-023	Nitrate (as NO3)	45	mg/L	8/12/2010	48	52	39.54	260
								3310021-024	Nitrate (as NO3)	45	mg/L	5/31/2006	20	57	40.71	242
RIVERSIDE	Idyllwild-Pine Cove CDP	IDYLLWILD WATER DISTRICT	3310019	100% GW	2500	26	1	3310019-004	Gross alpha particle activity	15	pCi/L	10/14/2010	17	36.3	17.32	24
RIVERSIDE	Indio city	LA QUINTA RIDGE MOBILE ESTATES	3301372	100% GW	350	2	1	3301372-002	Perchlorate	6	ug/L	6/12/2008	4	9	7.23	4
RIVERSIDE	Mecca CDP	COACHELLA VWD: I.D. NO. 10	3310063	100% GW	7638	3	3	3310063-002	Arsenic	10	ug/L	11/17/2010	90	36	22.84	87
								3310063-005	Arsenic	10	ug/L	11/17/2010	40	17	11.28	56
								3310063-007	Arsenic	10	ug/L	11/2/2010	28	18	15.36	28
RIVERSIDE	Mesa Verde CDP	RIVERSIDE CSA #122-MESA VERDE	3310028	100% GW	1000	3	2	3310028-003	Fluoride	2	mg/L	9/20/2005	2	2.82	2.47	3
RIVERSIDE	Riverside city	WESTERN MWD (ARLINGTON)	3310075	100% GW	0	7	5	3310075-001	Gross alpha particle activity	15	pCi/L	1/26/2010	6	18.8	14.64	12
								3310075-002	Gross alpha particle activity	15	pCi/L	1/27/2010	5	16.7	13.08	14
								3310075-003	Gross alpha particle activity	15	pCi/L	1/27/2010	5	20.7	13.61	13
								3310075-004	Gross alpha particle activity	15	pCi/L	1/28/2010	2	37	14.14	13
								3310075-005	Gross alpha particle activity	15	pCi/L	1/26/2010	3	16.8	13.03	13
								3310075-001	Nitrate (as NO3)	45	mg/L	11/3/2010	101	86	73.00	101
								3310075-002	Nitrate (as NO3)	45	mg/L	11/3/2010	110	98	81.16	109
								3310075-003	Nitrate (as NO3)	45	mg/L	11/3/2010	107	100	89.69	106
								3310075-004	Nitrate (as NO3)	45	mg/L	11/3/2010	109	102	86.31	108
								3310075-005	Nitrate (as NO3)	45	mg/L	11/3/2010	108	82	67.48	107
								3310075-001	Perchlorate	6	ug/L	11/3/2010	20	8	5.52	68
								3310075-002	Perchlorate	6	ug/L	11/3/2010	42	9.5	6.32	69
								3310075-003	Perchlorate	6	ug/L	11/3/2010	34	8.2	6.07	66
								3310075-004	Perchlorate	6	ug/L	8/11/2009	5	7.2	5.03	66
RIVERSIDE	Rubidoux CDP	RUBIDOUX COMMUNITY SD	3310044	100% GW	26177	7	3	3310044-002	Nitrate (as NO3)	45	mg/L	11/23/2010	419	60	51.51	430
								3310044-004	Nitrate (as NO3)	45	mg/L	11/1/2010	100	66	52.93	102
								3310044-006	Nitrate (as NO3)	45	mg/L	10/13/2010	76	63	53.33	75
								3310044-002	Perchlorate	6	ug/L	11/2/2010	93	12	8.80	94
								3310044-004	Perchlorate	6	ug/L	11/10/2010	51	11	8.45	53
								3310044-006	Perchlorate	6	ug/L	8/18/2010	34	14	8.00	36
RIVERSIDE	Whitewater CDP	WEST PALM SPRINGS VILLAGE	3310078	100% GW	628	2	1	3310078-001	Gross alpha particle activity	15	pCi/L	3/1/2010	12	37	25.84	14
								3310078-001	Uranium	20	pCi/L	3/1/2010	29	37	30.65	23
RIVERSIDE	Cathedral City city, Palm Springs city	DESERT WATER AGENCY	3310005	>50% GW Mixed	71656	32	1	3310005-008	Gross alpha particle activity	15	pCi/L	6/9/2010	8	28.9	18.87	11
								3310005-008	Uranium	20	pCi/L	9/17/2008	2	24	18.06	11
RIVERSIDE	Colton city, Grand Terrace city, Highgrove CDP, Highland city, Home Gardens CDP, Rialto city, Riverside city, San Bernardino city	RIVERSIDE, CITY OF	3310031	>50% GW Mixed	291398	59	34	3310031-015	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	9/30/2010	108	1.58	0.38	128
								3310031-036	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	1/29/2010	21	0.76	0.50	23
								3310031-038	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	10/17/2003	5	0.31	0.10	54
								3310031-040	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	7/11/2002	4	0.48	0.04	90
								3310031-067	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	9/30/2010	95	1.7	0.56	97
								3310031-074	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	8/26/2010	78	1.3	0.67	81
								3310031-080	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	9/3/2009	50	0.44	0.27	66
								3310031-093	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	9/16/2010	98	1.8	0.71	100
								3310031-111	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	4/29/2004	3	0.26	0.10	31
								3310031-167	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	7/27/2010	4	0.23	0.20	10

Table 8.1

List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								3310031-024	Arsenic	10	ug/L	3/13/2006	3	11	7.91	31
								3310031-015	Gross alpha particle activity	15	pCi/L	5/14/2009	3	28.9	11.86	27
								3310031-027	Gross alpha particle activity	15	pCi/L	6/11/2010	34	46.5	28.65	35
								3310031-028	Gross alpha particle activity	15	pCi/L	8/10/2010	36	41.5	21.74	43
								3310031-029	Gross alpha particle activity	15	pCi/L	5/14/2009	2	16	9.07	25
								3310031-031	Gross alpha particle activity	15	pCi/L	9/10/2010	34	44	24.11	39
								3310031-032	Gross alpha particle activity	15	pCi/L	9/16/2010	39	48.1	25.03	42
								3310031-033	Gross alpha particle activity	15	pCi/L	6/17/2010	13	34.2	26.52	13
								3310031-034	Gross alpha particle activity	15	pCi/L	8/20/2010	16	32.9	17.38	25
								3310031-037	Gross alpha particle activity	15	pCi/L	8/24/2005	2	25	7.67	22
								3310031-074	Gross alpha particle activity	15	pCi/L	6/18/2010	14	24	14.99	35
								3310031-081	Gross alpha particle activity	15	pCi/L	9/16/2010	25	39	20.75	35
								3310031-154	Gross alpha particle activity	15	pCi/L	9/17/2010	16	46.9	23.37	21
								3310031-164	Gross alpha particle activity	15	pCi/L	8/4/2010	16	26	18.11	23
								3310031-015	Nitrate (as NO3)	45	mg/L	1/7/2009	2	66	42.02	100
								3310031-029	Nitrate (as NO3)	45	mg/L	5/14/2009	17	60	45.38	31
								3310031-030	Nitrate (as NO3)	45	mg/L	10/27/2010	34	61	50.68	38
								3310031-038	Nitrate (as NO3)	45	mg/L	8/13/2009	6	47	43.71	41
								3310031-074	Nitrate (as NO3)	45	mg/L	8/26/2010	64	76	64.74	68
								3310031-085	Nitrate (as NO3)	45	mg/L	11/18/2010	26	55	50.38	29
								3310031-093	Nitrate (as NO3)	45	mg/L	5/26/2004	11	59	37.26	86
								3310031-027	Perchlorate	6	ug/L	12/16/2009	20	60	6.94	49
								3310031-028	Perchlorate	6	ug/L	8/10/2010	37	22	6.77	56
								3310031-029	Perchlorate	6	ug/L	8/4/2010	32	13	8.64	34
								3310031-030	Perchlorate	6	ug/L	10/27/2010	40	14	9.94	43
								3310031-031	Perchlorate	6	ug/L	9/10/2010	42	17	8.80	47
								3310031-032	Perchlorate	6	ug/L	9/16/2010	53	55	24.03	53
								3310031-034	Perchlorate	6	ug/L	5/8/2008	17	10	6.28	36
								3310031-036	Perchlorate	6	ug/L	7/8/2010	40	73	56.55	42
								3310031-037	Perchlorate	6	ug/L	5/25/2005	2	63	4.34	38
								3310031-038	Perchlorate	6	ug/L	8/10/2010	44	22	13.45	44
								3310031-044	Perchlorate	6	ug/L	9/15/2010	7	8.9	6.09	15
								3310031-045	Perchlorate	6	ug/L	6/23/2010	9	7.4	4.90	32
								3310031-051	Perchlorate	6	ug/L	3/30/2006	5	7.4	5.03	25
								3310031-052	Perchlorate	6	ug/L	4/12/2006	5	7.3	4.86	25
								3310031-067	Perchlorate	6	ug/L	4/24/2008	3	8.3	4.19	54
								3310031-074	Perchlorate	6	ug/L	11/8/2007	6	8	5.01	53
								3310031-077	Perchlorate	6	ug/L	5/21/2010	15	7.7	4.73	46
								3310031-080	Perchlorate	6	ug/L	11/18/2010	41	45	22.95	41
								3310031-081	Perchlorate	6	ug/L	5/20/2010	10	13	4.80	44
								3310031-085	Perchlorate	6	ug/L	11/18/2010	52	16	11.41	52
								3310031-093	Perchlorate	6	ug/L	7/7/2004	4	7.6	4.42	57
								3310031-100	Perchlorate	6	ug/L	2/20/2008	10	8.2	5.69	30
								3310031-111	Perchlorate	6	ug/L	10/27/2010	54	45	16.75	55
								3310031-154	Perchlorate	6	ug/L	9/17/2010	11	53	13.86	13
								3310031-164	Perchlorate	6	ug/L	8/4/2010	23	14	11.42	23
								3310031-165	Perchlorate	6	ug/L	8/12/2010	13	15	10.57	13
								3310031-167	Perchlorate	6	ug/L	11/18/2010	13	31	26.85	13
								3310031-027	Trichloroethylene (TCE)	5	ug/L	11/13/2003	13	8.7	3.39	44
								3310031-031	Trichloroethylene (TCE)	5	ug/L	9/10/2010	36	33	10.46	44
								3310031-032	Trichloroethylene (TCE)	5	ug/L	9/16/2010	41	19	8.28	48
								3310031-036	Trichloroethylene (TCE)	5	ug/L	7/8/2010	29	18	12.41	32
								3310031-081	Trichloroethylene (TCE)	5	ug/L	5/11/2006	37	11	5.20	71
								3310031-154	Trichloroethylene (TCE)	5	ug/L	6/25/2010	3	11	4.25	10
								3310031-027	Uranium	20	pCi/L	6/11/2010	35	54	39.98	35
								3310031-028	Uranium	20	pCi/L	8/10/2010	38	54.3	32.84	42
								3310031-031	Uranium	20	pCi/L	9/10/2010	38	67	34.31	38
								3310031-032	Uranium	20	pCi/L	9/16/2010	40	50.9	36.02	41
								3310031-033	Uranium	20	pCi/L	6/17/2010	12	43	34.77	13
								3310031-034	Uranium	20	pCi/L	8/20/2010	20	37	26.10	23
								3310031-037	Uranium	20	pCi/L	11/6/2008	2	30.2	10.54	21
								3310031-074	Uranium	20	pCi/L	8/26/2010	30	25	21.03	35

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								3310031-081	Uranium	20	pCi/L	9/16/2010	30	46	29.75	34
								3310031-154	Uranium	20	pCi/L	9/17/2010	20	52	35.10	21
								3310031-164	Uranium	20	pCi/L	8/4/2010	20	34	28.29	21
RIVERSIDE	Corona city, El Cerrito CDP, Temescal Valley CDP	CORONA, CITY OF	3310037	>50% GW Mixed	149928	25	17	3310037-028	Fluoride	2	mg/L	6/16/2010	20	3.4	2.12	26
								3310037-021	Gross alpha particle activity	15	pCi/L	7/22/2009	2	30.4	13.97	8
								3310037-025	Gross alpha particle activity	15	pCi/L	1/28/2010	2	28	14.78	5
								3310037-031	Gross alpha particle activity	15	pCi/L	12/11/2003	2	16.53	10.86	9
								3310037-011	Nitrate (as NO3)	45	mg/L	2/17/2010	145	81	57.47	165
								3310037-013	Nitrate (as NO3)	45	mg/L	11/17/2010	161	120	95.39	164
								3310037-014	Nitrate (as NO3)	45	mg/L	11/17/2010	169	110	71.65	172
								3310037-015	Nitrate (as NO3)	45	mg/L	8/7/2002	14	98	20.65	169
								3310037-021	Nitrate (as NO3)	45	mg/L	11/17/2010	176	92.1	64.56	184
								3310037-023	Nitrate (as NO3)	45	mg/L	6/18/2008	2	55	13.04	183
								3310037-024	Nitrate (as NO3)	45	mg/L	11/17/2010	127	84	52.70	175
								3310037-025	Nitrate (as NO3)	45	mg/L	3/22/2006	2	80	22.37	75
								3310037-026	Nitrate (as NO3)	45	mg/L	4/9/2008	2	71	10.28	134
								3310037-027	Nitrate (as NO3)	45	mg/L	11/17/2010	169	100	67.43	169
								3310037-029	Nitrate (as NO3)	45	mg/L	11/17/2010	180	100	70.02	179
								3310037-030	Nitrate (as NO3)	45	mg/L	10/20/2010	75	86	48.86	161
								3310037-031	Nitrate (as NO3)	45	mg/L	11/17/2010	131	75	52.45	152
								3310037-032	Nitrate (as NO3)	45	mg/L	11/17/2010	153	78	56.20	155
								3310037-033	Nitrate (as NO3)	45	mg/L	7/20/2005	16	64	28.43	160
								3310037-038	Nitrate (as NO3)	45	mg/L	3/17/2010	84	70	48.11	133
								3310037-011	Perchlorate	6	ug/L	9/12/2008	17	11.4	6.76	29
								3310037-013	Perchlorate	6	ug/L	9/1/2010	26	14	11.08	26
								3310037-014	Perchlorate	6	ug/L	9/1/2010	31	11	8.61	32
								3310037-015	Perchlorate	6	ug/L	3/17/2006	2	9.4	3.35	31
								3310037-021	Perchlorate	6	ug/L	6/10/2009	10	9	5.61	30
								3310037-024	Perchlorate	6	ug/L	9/1/2010	9	11	5.44	32
								3310037-025	Perchlorate	6	ug/L	12/6/2005	2	8.1	3.98	10
								3310037-027	Perchlorate	6	ug/L	3/3/2010	13	9.4	5.92	31
								3310037-029	Perchlorate	6	ug/L	9/1/2010	28	11	7.99	32
								3310037-030	Perchlorate	6	ug/L	12/11/2003	4	6.9	4.79	30
								3310037-031	Perchlorate	6	ug/L	6/18/2008	5	8.02	4.97	31
								3310037-032	Perchlorate	6	ug/L	6/18/2008	13	7.93	5.74	30
								3310037-038	Perchlorate	6	ug/L	3/14/2008	2	6.74	4.52	25
RIVERSIDE	East Hemet CDP, Hemet city, San Jacinto city, Valle Vista CDP	LAKE HEMET MWD	3310022	>50% GW Mixed	50001	14	1	3310022-029	Gross alpha particle activity	15	pCi/L	7/20/2004	4	19	10.76	21
RIVERSIDE	Hemet city, San Jacinto city	HEMET, CITY OF	3310016	>50% GW Mixed	20395	13	2	3310016-013	Fluoride	2	mg/L	9/1/2010	3	2.4	1.69	7
								3310016-004	Nitrate (as NO3)	45	mg/L	8/27/2008	2	79	30.59	67
RIVERSIDE	Moreno Valley city	BOX SPRINGS MUTUAL WC	3310004	>50% GW Mixed	3000	1	1	3310004-002	Nitrate (as NO3)	45	mg/L	10/21/2010	15	47	43.10	109
RIVERSIDE	Moreno Valley, San Jacinto, Hemet, Menifee, Murrieta, Temecula, Perris	EASTERN MUNICIPAL WD	3310009	Mixed <50%GW	446700	35	6	3310009-077	Barium	1000	ug/L	8/24/2009	2	2100	923.333333	2
								3310009-088	Barium	1000	ug/L	8/7/2008	2	1100	1100	2
								3310009-042	Nitrate (as NO3)	45	mg/L	11/29/2010	410	73	61.895122	407
								3310009-060	Nitrate (as NO3)	45	mg/L	11/22/2010	309	126	97.3624595	307
								3310009-074	Nitrate (as NO3)	45	mg/L	8/2/2010	4	51	38.5076923	3
								3310009-076	Nitrate (as NO3)	45	mg/L	8/2/2010	6	94	55.375	5
								3310009-088	Nitrate (as NO3)	45	mg/L	8/7/2008	3	53	47.8	3
								3310009-042	Perchlorate	6	ug/L	9/7/2010	11	7.8	5.45806452	11
								3310009-060	Perchlorate	6	ug/L	10/12/2010	27	13	9.45806452	27
								3310009-088	Perchlorate	6	ug/L	5/19/2010	6	7.4	5.375	6
								3310009-042	Tetrachloroethylene (PCE)	5	ug/L	10/11/2010	2	5.4	2.54	2
								3310009-060	Tetrachloroethylene (PCE)	5	ug/L	10/12/2010	23	9.4	5.97096774	23
RIVERSIDE	Lake Elsinore, Canyon Lake, Horsethief Canyon, Temescal,	ELSINORE VALLEY MWD	3310012	Mixed <50%GW	126495	10	5	3310012-004	Arsenic	10	ug/L	9/9/2008	4	16	7.15	4
								3310012-007	Arsenic	10	ug/L	8/5/2008	6	14	10.18	6
								3310012-021	Arsenic	10	ug/L	8/17/2010	23	42	27.826087	23
								3310012-022	Arsenic	10	ug/L	8/17/2010	19	27	19.9772727	19
								3310012-031	Arsenic	10	ug/L	6/8/2010	23	13	11.0142857	23
RIVERSIDE	Norco	NORCO, CITY OF	3310025	Mixed <50%GW	27160	4	5	3310025-012	Arsenic	10	ug/L	6/14/2010	4	21	6.23965517	4
								3310025-013	Arsenic	10	ug/L	9/10/2010	102	28	10.0393782	94

Table 8.1

List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								3310025-016	Arsenic	10	ug/L	5/5/2008	7	14	6.42037037	7
								3310025-016	Cyanide	150	ug/L	3/19/2007	4	450	38.3333333	4
								3310025-012	Fluoride	2	mg/L	9/27/2010	146	4.1	2.64807882	145
								3310025-013	Fluoride	2	mg/L	9/10/2010	81	2.8	1.71349727	80
								3310025-016	Fluoride	2	mg/L	5/3/2010	114	7.4	3.00389222	113
								3310025-013	Gross alpha particle activity	15	pCi/L	1/12/2009	4	19	9.9	4
								3310025-011	Nitrate (as NO3)	45	mg/L	4/3/2006	58	82	58.1323529	58
								3310025-012	Nitrate (as NO3)	45	mg/L	7/12/2010	14	73	10.9412017	14
								3310025-015	Nitrate (as NO3)	45	mg/L	7/24/2006	3	62	14.8362998	3
RIVERSIDE	Temecula, Murrieta	RANCHO CALIFORNIA WATER DISTRICT	3310038	Mixed <50%GW	102604	43	5	3310038-012	Arsenic	10	ug/L	9/1/2010	30	24	12.4607143	30
								3310038-029	Arsenic	10	ug/L	10/19/2010	4	12	7.85	4
								3310038-031	Arsenic	10	ug/L	11/4/2010	42	27	19.2093023	42
								3310038-045	Arsenic	10	ug/L	6/23/2010	4	12	8.72222222	4
								3310038-031	Fluoride	2	mg/L	11/4/2010	34	5.4	3.50243902	34
RIVERSIDE	Temecula, Murrieta	FARM MUTUAL W.C. (THE)	3310046	Mixed <50%GW	3335	1	1	3310046-002	Arsenic	10	ug/L	11/2/2010	16	16	11.275	16
RIVERSIDE	Homeland CDP, Lakeview CDP, Nuevo CDP	NUEVO WATER COMPANY	3310026	Undetermined	6000	3	1	3310026-002	Nitrate (as NO3)	45	mg/L	3/7/2007	61	83	50.99	111
RIVERSIDE	Idyllwild-Pine Cove CDP	FERN VALLEY WD	3310040	Undetermined	2500	10	2	3310040-021	Aluminum	1000	ug/L	9/12/2005	2	1700	466.63	8
								3310040-010	Gross alpha particle activity	15	pCi/L	8/27/2010	3	37.7	12.39	11
RIVERSIDE	Anza CDP	Ramona Water Company	3301529	100% GW	250	7	2	3301529-002	Nitrate (as NO3)	45	mg/L	10/28/2010	3	50	36.57	14
								3301529-005	Nitrate (as NO3)	45	mg/L	8/25/2010	7	62	49.89	9
RIVERSIDE	City of Riverside	Sunbird Mobile Home Park	3301755	100% GW	258	1	1	3301755-001	Arsenic	10	ug/L	10/25/2010	13	20	13.62	17
RIVERSIDE	Desert Center CDP	CSA #51	3301381	100% GW	350	1	1	3301381-001	Fluoride	2	mg/L	4/26/2010	5	7.8	7.50	5
RIVERSIDE	Glen Avon CDP, Mira Loma CDP, Pedley CDP, Rubidoux CDP	JURUPA COMMUNITY SD	3310021	100% GW	87846	22	1	3310021-034	Nitrate (as NO3)	45	mg/L	10/5/2009	8	50	29.38	302
RIVERSIDE	Mecca CDP	Saint Anthony Trailer Park	3301380	100% GW	250	1	1	3301380-001	Arsenic	10	ug/L	2/8/2010	6	23	18.89	7
RIVERSIDE	Thermal CDP	Desert View Trailer Park	3301209	100% GW	50	1	1	3301209-001	Fluoride	2	mg/L	9/3/2009	2	2.6	2.22	5
RIVERSIDE	Wildomar city	County Water of Riverside	3302093	100% GW	180	1	1	3302093-001	Nitrate (as NO3)	45	mg/L	9/3/2010	10	86	69.00	10
RIVERSIDE	City of Anza	Royal Carrizo HOA	3301588	>50% GW Mixed	25	2	2	3301588-001	Gross alpha particle activity	15	pCi/L	8/18/2008	14	47.2	22.50	18
								3301588-004	Gross alpha particle activity	15	pCi/L	2/22/2008	2	47.7	28.38	3
								3301588-001	Uranium	20	pCi/L	9/16/2010	16	61	22.88	25
								3301588-004	Uranium	20	pCi/L	11/18/2010	7	45.1	27.08	11
SACRAMENTO	Elk Grove city	ELK GROVE WATER SERVICE	3410008	100% GW	35567	17	1	3410008-013	Arsenic	10	ug/L	7/17/2008	7	16	9.53	16
SACRAMENTO	Fruitridge Pocket CDP, Lemon Hill CDP, Parkway CDP, Sacramento city	FRUITRIDGE VISTA WATER COMPANY	3410023	100% GW	15000	17	1	3410023-002	Tetrachloroethylene (PCE)	5	ug/L	10/17/2006	14	21	9.48	22
SACRAMENTO	Galt city	GALT, CITY OF	3410011	100% GW	22982	10	5	3410011-013	Arsenic	10	ug/L	4/20/2010	10	15	12.45	11
								3410011-018	Arsenic	10	ug/L	7/15/2010	11	21	13.98	14
								3410011-019	Arsenic	10	ug/L	8/18/2009	3	16	8.63	9
								3410011-021	Arsenic	10	ug/L	7/15/2010	11	18	15.09	11
								3410011-024	Arsenic	10	ug/L	7/15/2010	13	15	13.46	13
SACRAMENTO	Isleton city	CALAM - ISLETON	3410012	100% GW	1287	2	1	3410012-004	Arsenic	10	ug/L	7/30/2009	4	29	26.00	4
SACRAMENTO	Walnut Grove CDP	CALAM - WALNUT GROVE	3410047	100% GW	657	2	2	3410047-001	Arsenic	10	ug/L	11/12/2009	9	17	14.40	10
								3410047-003	Arsenic	10	ug/L	8/27/2009	3	12	10.40	5
								3410013-016	Tetrachloroethylene (PCE)	5	ug/L	8/9/2010	24	6.2	4.23	96
								3410013-022	Tetrachloroethylene (PCE)	5	ug/L	11/17/2010	41	6.7	4.71	91
SACRAMENTO	Elk Grove city, Vineyard CDP	SCWA - LAGUNA/VINEYARD	3410029	>50% GW Mixed	153701	52	9	3410029-001	Arsenic	10	ug/L	5/10/2007	4	16	12.75	4
								3410029-005	Arsenic	10	ug/L	3/28/2007	5	21	19.60	5
								3410029-006	Arsenic	10	ug/L	11/19/2007	2	17	10.43	7
								3410029-010	Arsenic	10	ug/L	3/28/2007	4	23	20.75	4
								3410029-012	Arsenic	10	ug/L	11/22/2006	6	13	9.17	9
								3410029-024	Arsenic	10	ug/L	10/21/2010	30	57	41.28	32
								3410029-025	Arsenic	10	ug/L	11/3/2010	17	28	10.38	56

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								3410029-028	Arsenic	10	ug/L	10/21/2010	24	47	21.81	35
								3410029-038	Arsenic	10	ug/L	10/21/2010	32	17	12.99	35
SACRAMENTO	Carmichael	CARMICHAEL WATER DISTRICT	3410004	Mixed <50%GW	40000	6	1	3410004-020	Tetrachloroethylene (PCE)	5	ug/L	4/16/2009	2	27	1.56451613	2
SACRAMENTO	Sacramento	CITY OF SACRAMENTO MAIN	3410020	Mixed <50%GW	407018	33	1	3410020-025	Tetrachloroethylene (PCE)	5	ug/L	12/15/2009	5	33	31	5
SACRAMENTO	Florin CDP, Parkway CDP	CALAM - PARKWAY	3410017	Undetermined	45187	18	2	3410017-006	Arsenic	10	ug/L	8/5/2009	8	21	17.13	8
								3410017-012	Tetrachloroethylene (PCE)	5	ug/L	8/26/2008	36	13.2	5.64	95
SACRAMENTO	City of Granite Bay	EDGEWATER MOBILE HOME PARK	3400433	100% GW	29	1	1	3400433-001	Arsenic	10	ug/L	10/13/2010	13	39	30.74	15
SACRAMENTO	City of Isleton	KORTHS PIRATES LAIR	3400135	100% GW	40	1	1	3400135-001	Arsenic	10	ug/L	8/9/2010	38	45	38.74	38
SACRAMENTO	City of Isleton	VIEIRA S RESORT, INC	3400164	100% GW	150	3	3	3400164-001	Arsenic	10	ug/L	12/9/2010	11	31	21.08	12
								3400164-002	Arsenic	10	ug/L	12/9/2010	10	32	24.43	12
								3400164-003	Arsenic	10	ug/L	12/9/2010	10	31	22.92	12
SACRAMENTO	City of Isleton	SPINDRIFT MARINA	3400169	100% GW	100	1	1	3400169-001	Arsenic	10	ug/L	9/27/2007	3	26	11.21	8
SACRAMENTO	City of Isleton	OXBOW MARINA	3400332	100% GW	200	2	2	3400332-001	Arsenic	10	ug/L	9/13/2010	20	37	27.40	20
								3400332-002	Arsenic	10	ug/L	12/14/2009	5	26	25.20	5
SACRAMENTO	Courtland CDP	GREGG WATER CO	3400130	100% GW	40	1	1	3400130-001	Arsenic	10	ug/L	11/19/2010	8	12	8.68	13
SACRAMENTO	Elk Grove city	ELK GROVE WATER SERVICE	3410008	100% GW	35567	17	5	3410008-005	Arsenic	10	ug/L	9/22/2007	4	43	29.00	4
								3410008-006	Arsenic	10	ug/L	9/25/2007	4	19	15.00	4
								3410008-007	Arsenic	10	ug/L	5/21/2007	3	31	23.65	4
								3410008-009	Arsenic	10	ug/L	3/17/2008	3	19	9.21	8
								3410008-010	Arsenic	10	ug/L	9/22/2007	4	52	36.25	4
SACRAMENTO	Walnut Grove CDP	MSA: EAST WALNUT GROVE WATER SYSTEM (W10	3400106	100% GW	300	2	1	3400106-001	Arsenic	10	ug/L	2/19/2008	5	18	15.40	5
SACRAMENTO	Walnut Grove CDP	LOCKE WATER WORKS CO [SWS]	3400138	100% GW	65	1	1	3400138-001	Arsenic	10	ug/L	12/9/2010	8	32	15.72	16
SACRAMENTO	Walnut Grove CDP	RANCHO MARINA	3400149	100% GW	75	1	1	3400149-001	Arsenic	10	ug/L	9/9/2010	5	59	25.81	8
SACRAMENTO	City of Isleton	WILLOW BERM MARINA	3400167	>50% GW Mixed	150	1	1	3400167-001	Arsenic	10	ug/L	7/12/2010	46	57	45.38	47
SACRAMENTO	Florin CDP, Parkway CDP	CALAM - PARKWAY	3410017	Undetermined	45187	18	1	3410017-003	Tetrachloroethylene (PCE)	5	ug/L	7/25/2002	4	6.3	1.00	106
SAN BENITO	City of Carmel Valley	WHISPERING PINES INN	3500810	100% GW	100	1	1	3500810-001	Arsenic	10	ug/L	11/2/2010	72	210	167.88	70
SAN BENITO	City of Hollister	ARNOLD PARK (O BANNON S MHP)	3500526	100% GW	28	1	1	3500526-001	Chromium, Total	50	ug/L	6/17/2008	9	75	45.57	21
								3500526-001	Nitrate (as NO3)	45	mg/L	6/17/2008	77	110	68.75	97
SAN BENITO	City of Oakland	VALENZUELA WATER SYSTEM	3500527	100% GW	55	1	1	3500527-001	Nitrate (as NO3)	45	mg/L	11/10/2010	36	126	49.34	59
SAN BENITO	Ridgemark	ASHFORD HIGHLANDS MWC	3500900	100% GW	85	2	1	3500900-001	Chromium, Total	50	ug/L	11/9/2010	2	477	98.67	6
SAN BENITO	City of Gilroy	HOLLISTER RANCH ESTATES	3500904	100% GW	150	2	1	3500904-002	Gross alpha particle activity	15	pCi/L	1/18/2010	8	39.6	20.95	13
								3500904-002	Uranium	20	pCi/L	1/18/2010	3	27.1	12.71	11
SAN BERNARDINO	Adelanto city, Victorville city	CITY OF ADELANTO	3610001	100% GW	19500	18	3	3610001-003	Arsenic	10	ug/L	4/12/2005	2	28.5	25.70	2
								3610001-007	Arsenic	10	ug/L	2/12/2009	2	32	30.80	2
								3610001-018	Arsenic	10	ug/L	3/12/2009	2	23.8	18.40	2
								3610001-003	Fluoride	2	mg/L	10/7/2010	67	7.5	6.14	67
								3610001-007	Fluoride	2	mg/L	11/2/2010	40	2.5	2.22	47
								3610001-018	Fluoride	2	mg/L	8/5/2008	34	3.03	2.23	61
SAN BERNARDINO	Apple Valley town	GOLDEN STATE WATER CO - APPLE VLY NORTH	3610105	100% GW	2257	2	1	3610105-003	Gross alpha particle activity	15	pCi/L	11/16/2005	2	19.2	9.91	15
SAN BERNARDINO	Apple Valley town, Mountain View Acres CDP, Victorville city	VICTORVILLE WATER DISTRICT	3610052	100% GW	120000	37	22	3610052-012	Arsenic	10	ug/L	10/25/2010	10	22	11.71	19
								3610052-022	Arsenic	10	ug/L	4/5/2004	2	11	8.28	10
								3610052-024	Arsenic	10	ug/L	1/13/2005	4	11	7.68	36
								3610052-025	Arsenic	10	ug/L	10/26/2010	34	17	12.07	37
								3610052-026	Arsenic	10	ug/L	10/1/2007	29	16	9.61	44
								3610052-027	Arsenic	10	ug/L	10/25/2010	9	21	10.24	28

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								3610052-031	Arsenic	10	ug/L	2/23/2010	7	13	9.33	34
								3610052-032	Arsenic	10	ug/L	1/21/2009	7	12	7.89	29
								3610052-033	Arsenic	10	ug/L	4/28/2010	12	14	10.77	19
								3610052-034	Arsenic	10	ug/L	7/7/2010	39	19	10.70	62
								3610052-038	Arsenic	10	ug/L	10/25/2010	13	28	17.26	14
								3610052-039	Arsenic	10	ug/L	4/19/2010	5	22	12.18	13
								3610052-044	Arsenic	10	ug/L	4/13/2004	6	12	7.87	36
								3610052-046	Arsenic	10	ug/L	7/13/2010	18	19.8	12.08	26
								3610052-047	Arsenic	10	ug/L	10/15/2009	19	19	12.78	24
								3610052-048	Arsenic	10	ug/L	10/19/2007	2	20	8.59	28
								3610052-049	Arsenic	10	ug/L	10/20/2010	24	22	16.53	25
								3610052-050	Arsenic	10	ug/L	1/29/2008	5	18.4	8.21	30
								3610052-051	Arsenic	10	ug/L	10/27/2010	21	16	11.76	27
								3610052-052	Arsenic	10	ug/L	10/26/2010	14	24	12.00	24
								3610052-057	Arsenic	10	ug/L	7/27/2010	6	19	11.99	7
								3610052-028	Fluoride	2	mg/L	1/25/2006	5	2.64	0.36	580
SAN BERNARDINO	Barstow city, Lenwood CDP	GOLDEN STATE WATER CO - BARSTOW	3610043	100% GW	25772	19	3	3610043-024	Gross alpha particle activity	15	pCi/L	11/16/2005	2	19.4	10.08	15
								3610043-025	Gross alpha particle activity	15	pCi/L	8/1/2009	2	17.7	8.38	17
								3610043-025	Nitrate (as NO3)	45	mg/L	1/4/2005	7	65	22.15	143
								3610043-024	Perchlorate	6	ug/L	11/20/2010	2	120	37.33	6
								3610043-025	Perchlorate	6	ug/L	11/20/2010	2	9.4	2.83	26
SAN BERNARDINO	Big Bear City CDP	BIG BEAR CITY CSD	3610008	100% GW	6000	14	5	3610008-012	Carbon tetrachloride	0.5	ug/L	11/3/2010	41	1	0.76	42
								3610008-005	Fluoride	2	mg/L	11/17/2010	341	7.3	3.41	427
								3610008-007	Fluoride	2	mg/L	11/17/2010	372	12	4.55	438
								3610008-008	Fluoride	2	mg/L	11/17/2010	423	5.3	2.66	440
								3610008-010	Fluoride	2	mg/L	10/8/2008	48	5.8	1.40	415
								3610008-007	Trichloroethylene (TCE)	5	ug/L	10/13/2010	41	29	16.07	41
SAN BERNARDINO	Big Bear City CDP, Big Bear Lake city	DWP - BIG BEAR LAKE/MOONRIDGE	3610044	100% GW	6869	39	1	3610044-036	Arsenic	10	ug/L	10/13/2005	2	22	20.00	2
SAN BERNARDINO	Chino city, Eastvale CDP, Ontario city	CHINO BASIN DESALTER AUTH. - DESALTER 1	3610075	100% GW	0	14	14	3610075-001	Arsenic	10	ug/L	4/20/2010	8	14	10.72	21
								3610075-002	Arsenic	10	ug/L	7/6/2010	8	13	10.42	21
								3610075-005	Gross alpha particle activity	15	pCi/L	7/9/2008	2	16.5	11.69	13
								3610075-008	Gross alpha particle activity	15	pCi/L	10/1/2008	7	21.6	14.62	14
								3610075-009	Gross alpha particle activity	15	pCi/L	7/13/2010	10	21.7	16.62	13
								3610075-010	Gross alpha particle activity	15	pCi/L	7/13/2010	4	22.3	12.71	13
								3610075-011	Gross alpha particle activity	15	pCi/L	7/13/2010	2	17.1	9.12	12
								3610075-003	Nitrate (as NO3)	45	mg/L	5/11/2010	2	68	26.43	94
								3610075-004	Nitrate (as NO3)	45	mg/L	10/12/2010	103	443	114.85	105
								3610075-005	Nitrate (as NO3)	45	mg/L	10/12/2010	99	302	249.66	101
								3610075-006	Nitrate (as NO3)	45	mg/L	10/12/2010	88	370	214.61	90
								3610075-007	Nitrate (as NO3)	45	mg/L	10/12/2010	102	364	196.47	104
								3610075-008	Nitrate (as NO3)	45	mg/L	10/12/2010	93	500	282.35	94
								3610075-009	Nitrate (as NO3)	45	mg/L	10/12/2010	102	400	264.50	104
								3610075-010	Nitrate (as NO3)	45	mg/L	10/12/2010	96	290	157.18	98
								3610075-011	Nitrate (as NO3)	45	mg/L	10/12/2010	101	195	132.63	102
								3610075-013	Nitrate (as NO3)	45	mg/L	10/12/2010	55	170	148.79	56
								3610075-014	Nitrate (as NO3)	45	mg/L	10/12/2010	59	207	164.44	59
								3610075-015	Nitrate (as NO3)	45	mg/L	10/12/2010	56	240	194.82	57
								3610075-002	Trichloroethylene (TCE)	5	ug/L	11/9/2005	22	16	3.89	92
								3610075-003	Trichloroethylene (TCE)	5	ug/L	11/10/2010	70	55	27.45	79
								3610075-008	Uranium	20	pCi/L	10/1/2008	2	22.6	15.80	10
SAN BERNARDINO	Chino city, Upland city	CALIFORNIA INSTITUTION FOR MEN	3610850	100% GW	12065	7	7	3610850-001	Nitrate (as NO3)	45	mg/L	8/4/2010	154	78.7	54.95	167
								3610850-002	Nitrate (as NO3)	45	mg/L	12/1/2010	169	110	56.99	176
								3610850-003	Nitrate (as NO3)	45	mg/L	12/1/2010	46	75	44.27	97
								3610850-004	Nitrate (as NO3)	45	mg/L	5/5/2010	7	60	31.81	163
								3610850-007	Nitrate (as NO3)	45	mg/L	6/2/2010	75	57.3	44.43	132
								3610850-008	Nitrate (as NO3)	45	mg/L	12/1/2010	139	720	96.20	144
								3610850-013	Nitrate (as NO3)	45	mg/L	12/1/2010	116	76	51.33	118
								3610850-001	Tetrachloroethylene (PCE)	5	ug/L	9/2/2009	6	8.2	2.24	148
								3610850-003	Tetrachloroethylene (PCE)	5	ug/L	8/13/2002	2	8.3	0.63	54
								3610850-004	Tetrachloroethylene (PCE)	5	ug/L	7/16/2008	53	8.4	4.54	135
								3610850-007	Tetrachloroethylene (PCE)	5	ug/L	5/16/2006	3	5.37	2.55	98

Table 8.1

List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								3610850-004	Trichloroethylene (TCE)	5	ug/L	12/31/2002	2	99.8	0.91	119
SAN BERNARDINO	City of Arrowbear Lake	ARROWBEAR PARK CWD	3610110	100% GW	580	4	4	3610110-001	Gross alpha particle activity	15	pCi/L	10/27/2010	115	140	77.51	116
								3610110-003	Gross alpha particle activity	15	pCi/L	11/4/2010	114	146	63.47	114
								3610110-004	Gross alpha particle activity	15	pCi/L	11/10/2010	110	180	88.59	110
								3610110-006	Gross alpha particle activity	15	pCi/L	10/20/2010	109	170	79.33	109
								3610110-001	Uranium	20	pCi/L	9/1/2010	26	120	78.87	27
								3610110-003	Uranium	20	pCi/L	11/4/2010	30	90	67.50	30
								3610110-004	Uranium	20	pCi/L	3/3/2010	20	150	95.90	21
								3610110-006	Uranium	20	pCi/L	6/2/2010	25	99	73.38	25
SAN BERNARDINO	Colton city, Grand Terrace city, San Bernardino city	RIVERSIDE HIGHLAND WATER CO	3610057	100% GW	14500	6	1	3610057-009	Nitrate (as NO3)	45	mg/L	1/8/2009	2	51	30.96	23
SAN BERNARDINO	Colton city, San Bernardino city	CITY OF COLTON	3610014	100% GW	51350	16	2	3610014-025	Arsenic	10	ug/L	9/1/2010	7	27	15.17	12
								3610014-012	Perchlorate	6	ug/L	11/10/2010	8	10	3.91	20
SAN BERNARDINO	Crestline City	CDF-PILOT ROCK CONSERVATION CAMP	3610801	100% GW	85	3	1	3610801-002	Gross alpha particle activity	15	pCi/L	5/22/2008	3	25.3	19.10	4
SAN BERNARDINO	Fort Irwin CDP	US ARMY FORT IRWIN	3610705	100% GW	16000	7	6	3610705-001	Arsenic	10	ug/L	12/13/2009	6	11	9.07	19
								3610705-009	Arsenic	10	ug/L	2/18/2010	18	38	33.22	18
								3610705-012	Arsenic	10	ug/L	2/18/2010	5	34	28.40	5
								3610705-015	Arsenic	10	ug/L	2/18/2010	21	18	16.76	21
								3610705-001	Fluoride	2	mg/L	2/18/2010	19	7.8	7.21	19
								3610705-002	Fluoride	2	mg/L	2/18/2010	19	15	8.70	19
								3610705-003	Fluoride	2	mg/L	2/18/2010	5	4.4	3.50	6
								3610705-009	Fluoride	2	mg/L	2/18/2010	18	12	9.31	18
								3610705-012	Fluoride	2	mg/L	2/18/2010	4	2.5	2.26	5
								3610705-015	Fluoride	2	mg/L	2/18/2010	21	3.9	3.33	21
								3610705-002	Gross alpha particle activity	15	pCi/L	3/21/2008	4	25	15.65	10
SAN BERNARDINO	Highland city, Homestead Valley CDP, Yucaipa city, Yucca Valley town	HI DESERT WD	3610073	100% GW	21268	13	5	3610073-020	Arsenic	10	ug/L	9/2/2010	20	17	11.12	28
								3610073-022	Arsenic	10	ug/L	4/7/2010	18	15	9.53	35
								3610073-016	Fluoride	2	mg/L	2/19/2003	2	2.3	1.50	25
								3610073-008	Nitrate (as NO3)	45	mg/L	9/25/2002	7	53	21.91	164
								3610073-021	Nitrate (as NO3)	45	mg/L	3/31/2004	21	56	26.01	172
SAN BERNARDINO	Homestead Valley CDP	BIGHORN - DESERT VIEW WATER AGENCY	3610009	100% GW	2575	8	2	3610009-003	Gross alpha particle activity	15	pCi/L	9/8/2010	6	18	14.60	12
								3610009-004	Gross alpha particle activity	15	pCi/L	6/7/2010	2	18.9	13.11	11
SAN BERNARDINO	Loma Linda city, Redlands city, San Bernardino city	CITY OF LOMA LINDA	3610013	100% GW	22451	9	4	3610013-009	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	8/3/2010	9	0.37	0.06	411
								3610013-017	Arsenic	10	ug/L	11/2/2010	40	39	20.32	41
								3610013-018	Arsenic	10	ug/L	10/5/2010	232	44	32.55	222
								3610013-024	Arsenic	10	ug/L	11/3/2010	38	33	20.97	38
								3610013-018	Fluoride	2	mg/L	10/5/2010	326	3	2.22	457
								3610013-009	Perchlorate	6	ug/L	10/5/2010	115	26	4.74	441
SAN BERNARDINO	Morongo Valley CDP	GOLDEN STATE WATER CO - MORONGO DEL SUR	3610063	100% GW	2458	3	3	3610063-004	Gross alpha particle activity	15	pCi/L	11/9/2010	15	24.2	16.67	23
								3610063-006	Gross alpha particle activity	15	pCi/L	11/23/2010	16	24.9	16.06	26
								3610063-007	Gross alpha particle activity	15	pCi/L	8/3/2010	2	27.9	25.05	2
								3610063-004	Uranium	20	pCi/L	5/13/2008	11	23	18.78	30
								3610063-006	Uranium	20	pCi/L	5/13/2008	10	23	17.93	30
SAN BERNARDINO	Muscoy CDP, Rialto city, San Bernardino city	SAN BERNARDINO CITY	3610039	100% GW	180315	55	18	3610039-126	Gross alpha particle activity	15	pCi/L	10/28/2008	2	16.8	13.15	4
								3610039-014	Nitrate (as NO3)	45	mg/L	10/6/2010	246	77.3	50.31	403
								3610039-023	Nitrate (as NO3)	45	mg/L	7/13/2010	4	47	32.32	50
								3610039-012	Perchlorate	6	ug/L	7/2/2009	5	9.2	4.36	22
								3610039-030	Perchlorate	6	ug/L	7/20/2010	2	7.7	3.87	10
								3610039-047	Perchlorate	6	ug/L	5/10/2004	7	9.04	4.30	19
								3610039-048	Perchlorate	6	ug/L	10/2/2007	3	8.1	4.53	15
								3610039-005	Tetrachloroethylene (PCE)	5	ug/L	7/14/2010	48	10	6.96	57
								3610039-007	Tetrachloroethylene (PCE)	5	ug/L	6/3/2010	45	7.9	2.80	330
								3610039-008	Tetrachloroethylene (PCE)	5	ug/L	7/21/2009	27	9	6.00	34
								3610039-009	Tetrachloroethylene (PCE)	5	ug/L	4/14/2010	28	9.3	6.63	33

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								3610039-031	Tetrachloroethylene (PCE)	5	ug/L	10/27/2005	7	7.6	4.04	36
								3610039-040	Tetrachloroethylene (PCE)	5	ug/L	10/13/2004	7	9	3.27	34
								3610039-069	Tetrachloroethylene (PCE)	5	ug/L	10/13/2010	19	13	8.47	19
								3610039-113	Tetrachloroethylene (PCE)	5	ug/L	10/13/2010	21	7.8	5.09	39
								3610039-114	Tetrachloroethylene (PCE)	5	ug/L	10/13/2010	29	8.8	5.66	39
								3610039-119	Tetrachloroethylene (PCE)	5	ug/L	10/9/2003	6	6.7	3.67	36
SAN BERNARDINO	Ontario city, Rancho Cucamonga city, San Antonio Heights CDP, Upland city	SAN ANTONIO WATER COMPANY	3610085	100% GW	3165	10	3	3610085-004	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	4/15/2005	9	0.82	0.10	176
								3610085-010	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	8/24/2010	3	0.26	0.12	117
								3610085-011	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	6/9/2005	43	0.33	0.13	172
SAN BERNARDINO	Ridgecrest city	SEARLES VALLEY MINERALS OPERATIONS INC	3610854	100% GW	2100	5	3	3610854-003	Arsenic	10	ug/L	9/14/2010	15	24	20.95	16
								3610854-006	Arsenic	10	ug/L	12/8/2009	3	13	8.46	16
								3610854-007	Arsenic	10	ug/L	9/14/2010	14	39	24.66	16
SAN BERNARDINO	San Bernardino city	BASELINE GARDENS MWC	3610007	100% GW	1300	2	1	3610007-003	Nitrate (as NO3)	45	mg/L	7/29/2010	6	63	49.11	7
								3610007-003	Perchlorate	6	ug/L	7/29/2010	6	17	12.69	5
SAN BERNARDINO	Silver Lakes CDP	HELENDALE COMMUNITY SERVICE DISTRICT	3610112	100% GW	8646	7	3	3610112-003	Arsenic	10	ug/L	8/25/2010	32	25	16.95	35
								3610112-006	Arsenic	10	ug/L	8/25/2010	37	30	20.54	37
								3610112-007	Arsenic	10	ug/L	8/31/2010	30	23	13.65	36
								3610112-006	Gross alpha particle activity	15	pCi/L	3/2/2007	2	16	9.65	10
								3610112-007	Gross alpha particle activity	15	pCi/L	11/17/2010	11	46	16.31	23
SAN BERNARDINO	Twentynine Palms city	TWENTYNINE PALMS WATER DIST	3610049	100% GW	17500	12	4	3610049-011	Arsenic	10	ug/L	10/4/2010	42	21	15.00	43
								3610049-009	Fluoride	2	mg/L	11/1/2010	102	2.8	2.37	108
								3610049-011	Fluoride	2	mg/L	11/1/2010	88	2.7	2.32	94
								3610049-018	Fluoride	2	mg/L	10/31/2010	68	6.7	5.85	68
								3610049-015	Gross alpha particle activity	15	pCi/L	11/28/2007	7	19.5	18.00	8
SAN BERNARDINO	Twentynine Palms city	USMC - 29 PALMS	3610703	100% GW	24373	11	1	3610703-004	Arsenic	10	ug/L	6/8/2006	9	13	10.18	17
SAN BERNARDINO	Victorville city	FEDERAL CORRECTIONAL INSTITUTION	3610707	100% GW	4756	3	2	3610707-002	Arsenic	10	ug/L	4/1/2009	7	15	5.36	37
								3610707-003	Arsenic	10	ug/L	4/1/2009	3	50.4	5.56	38
SAN BERNARDINO	Bloomington CDP, Colton city, Fontana city, Muscoy CDP, Rialto city, San Bernardino city	WEST VALLEY WATER DISTRICT	3610004	>50% GW Mixed	65283	18	4	3610004-002	Arsenic	10	ug/L	12/12/2006	3	12	7.56	43
								3610004-008	Nitrate (as NO3)	45	mg/L	2/26/2004	3	53	38.35	32
								3610004-008	Perchlorate	6	ug/L	7/7/2010	3	13	2.72	41
								3610004-031	Perchlorate	6	ug/L	12/27/2004	7	7.3	4.05	64
								3610004-034	Perchlorate	6	ug/L	10/7/2008	8	9.4	4.09	305
SAN BERNARDINO	Chino city	CITY OF CHINO	3610012	>50% GW Mixed	62000	9	2	3610012-009	Nitrate (as NO3)	45	mg/L	9/16/2010	17	96	75.8	17
								3610012-009	Perchlorate	6	ug/L	9/16/2010	14	24	18	17
SAN BERNARDINO	Chino city, Montclair city, Ontario city, Upland city	MONTE VISTA CWD	3610029	>50% GW Mixed	54415	13	7	3610029-003	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	7/7/2010	70	0.5	0.26	104
								3610029-025	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	3/19/2009	16	0.32	0.16	93
								3610029-036	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	11/1/2010	30	0.55	0.23	39
								3610029-038	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	1/7/2010	2	0.23	0.12	33
								3610029-039	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	9/22/2010	9	0.36	0.24	15
								3610029-003	Nitrate (as NO3)	45	mg/L	10/7/2010	101	81	63.01	107
								3610029-005	Nitrate (as NO3)	45	mg/L	12/1/2009	66	62	44.82	106
								3610029-009	Nitrate (as NO3)	45	mg/L	11/3/2010	91	66	55.10	101
								3610029-025	Nitrate (as NO3)	45	mg/L	11/5/2010	88	85	56.95	93
								3610029-036	Nitrate (as NO3)	45	mg/L	11/1/2010	30	90	52.20	44
								3610029-038	Nitrate (as NO3)	45	mg/L	11/1/2010	39	76	56.62	46
								3610029-039	Nitrate (as NO3)	45	mg/L	11/16/2010	33	80	69.56	34
								3610029-039	Perchlorate	6	ug/L	10/20/2010	5	8	5.42	15
								3610029-038	Total Trihalomethanes	80	ug/L	6/11/2008	2	85.5	23.54	33
SAN BERNARDINO	Claremont city, Montclair city, Ontario city, San Antonio Heights CDP, Upland city	CITY OF UPLAND	3610050	>50% GW Mixed	73000	12	3	3610050-023	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	9/15/2009	14	0.4	0.20	30
								3610050-026	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	9/15/2009	16	0.39	0.20	30
								3610050-045	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	10/8/2009	2	0.31	0.26	3
								3610050-023	Nitrate (as NO3)	45	mg/L	4/28/2010	34	78	66.83	35
								3610050-026	Nitrate (as NO3)	45	mg/L	4/28/2010	34	81	65.90	36
								3610050-045	Perchlorate	6	ug/L	10/8/2009	2	7.5	7.50	2
SAN BERNARDINO	Crestline CDP	CEDARPINES PARK MWC	3610011	>50% GW Mixed	2418	18	1	3610011-018	Gross alpha particle activity	15	pCi/L	1/4/2010	11	33	15.92	18

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
SAN BERNARDINO	Crestline CDP, Los Angeles city	VALLEY OF ENCHANTMENT MWC	3610051	>50% GW Mixed	1280	20	1	3610051-018	Gross alpha particle activity	15	pCi/L	11/1/2010	24	22.2	15.89	31
SAN BERNARDINO	Ontario city, Rancho Cucamonga city	ONTARIO MUNICIPAL UTILITIES COMPANY	3610034	>50% GW Mixed	174536	24	3	3610034-043	Nitrate (as NO3)	45	mg/L	11/1/2010	10	61	54.50	10
								3610034-044	Nitrate (as NO3)	45	mg/L	11/1/2010	10	56	50.70	10
								3610034-045	Nitrate (as NO3)	45	mg/L	12/20/2009	5	52	37.25	8
								3610034-043	Perchlorate	6	ug/L	10/25/2010	2	6.5	5.53	6
SAN BERNARDINO	Rialto city, San Bernardino city	RIALTO-CITY	3610038	>50% GW Mixed	48623	13	5	3610038-015	Nitrate (as NO3)	45	mg/L	1/7/2008	66	53	34.93	208
								3610038-001	Perchlorate	6	ug/L	10/15/2010	134	45	13.14	169
								3610038-003	Perchlorate	6	ug/L	1/4/2010	2	7.9	3.13	12
								3610038-009	Perchlorate	6	ug/L	10/4/2010	40	94	12.72	73
								3610038-015	Perchlorate	6	ug/L	9/15/2010	137	25	7.41	186
								3610038-017	Perchlorate	6	ug/L	5/3/2010	15	8	2.48	273
SAN BERNARDINO	Running Springs CDP, Yucaipa city	RUNNING SPRINGS WATER DISTRICT	3610062	>50% GW Mixed	4475	26	4	3610062-011	Gross alpha particle activity	15	pCi/L	8/24/2010	34	56	28.19	37
								3610062-022	Gross alpha particle activity	15	pCi/L	9/8/2010	8	35	15.94	16
								3610062-034	Gross alpha particle activity	15	pCi/L	8/18/2010	20	44	32.52	21
								3610062-101	Gross alpha particle activity	15	pCi/L	4/18/2007	2	19	11.90	8
								3610062-011	Uranium	20	pCi/L	8/24/2010	20	72	25.21	38
								3610062-022	Uranium	20	pCi/L	9/8/2010	8	44	19.30	16
								3610062-034	Uranium	20	pCi/L	8/18/2010	23	39	29.41	25
SAN BERNARDINO	Twin Peaks	ALPINE WATER USERS ASSOCIATION	3610002	Mixed <50%GW	3000	7	7	3610002-001	Gross alpha particle activity	15	pCi/L	10/20/2010	81	37	21.6407767	81
								3610002-003	Gross alpha particle activity	15	pCi/L	10/20/2010	103	58	39.6875	103
								3610002-004	Gross alpha particle activity	15	pCi/L	1/20/2010	22	43.2	12.050381	22
								3610002-005	Gross alpha particle activity	15	pCi/L	9/14/2005	9	29	6.93174419	9
								3610002-006	Gross alpha particle activity	15	pCi/L	2/18/2004	2	120	4.98571429	2
								3610002-007	Gross alpha particle activity	15	pCi/L	10/20/2010	95	98	37.4929293	95
								3610002-009	Gross alpha particle activity	15	pCi/L	10/20/2010	83	53	24.1067308	83
								3610002-001	Uranium	20	pCi/L	10/20/2010	70	40	22.9961905	70
								3610002-003	Uranium	20	pCi/L	10/20/2010	103	67	39.9134615	102
								3610002-004	Uranium	20	pCi/L	2/17/2010	17	37	14.3486792	16
								3610002-005	Uranium	20	pCi/L	9/14/2005	5	27	7.37850575	5
								3610002-006	Uranium	20	pCi/L	2/18/2004	2	81.5	5.39644231	2
								3610002-007	Uranium	20	pCi/L	10/20/2010	92	110	39.084	90
								3610002-009	Uranium	20	pCi/L	10/20/2010	60	56	24.0885714	58
SAN BERNARDINO	Lake Arrowhead	LAKE ARROWHEAD CSD	3610005	Mixed <50%GW	4292	5	6	3610005-006	Gross alpha particle activity	15	pCi/L	10/25/2010	47	200	135.829787	47
								3610005-007	Gross alpha particle activity	15	pCi/L	10/25/2010	40	130	67.2642857	40
								3610005-009	Gross alpha particle activity	15	pCi/L	10/25/2010	51	42	20.0462963	51
								3610005-012	Gross alpha particle activity	15	pCi/L	10/25/2010	12	110	46.6666667	12
								3610005-013	Gross alpha particle activity	15	pCi/L	10/25/2010	12	130	93.25	12
								3610005-006	Uranium	20	pCi/L	10/25/2010	45	240	131.111111	45
								3610005-007	Uranium	20	pCi/L	10/25/2010	38	130	65.902439	38
								3610005-009	Uranium	20	pCi/L	10/25/2010	41	34	23.6365385	41
								3610005-012	Uranium	20	pCi/L	10/25/2010	12	75	58.25	12
								3610005-013	Uranium	20	pCi/L	10/25/2010	12	130	98.1666667	12
SAN BERNARDINO	Rancho Cucamonga, Upland, Ontario, Fontana	CUCAMONGA VALLEY WATER DISTRICT	3610018	Mixed <50%GW	185534	28	10	3610018-005	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	8/3/2010	24	0.35	0.09732168	24
								3610018-006	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	12/3/2009	36	0.58	0.19145283	36
								3610018-007	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	8/3/2010	67	0.83	0.28110811	67
								3610018-029	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	9/13/2010	182	0.94	0.24955921	182
								3610018-032	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	8/3/2010	73	0.69	0.25520168	73
								3610018-039	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	8/3/2010	47	0.89	0.24279167	46
								3610018-002	Nitrate (as NO3)	45	mg/L	3/30/2010	34	59	19.1585492	34
								3610018-005	Nitrate (as NO3)	45	mg/L	8/3/2010	35	89	40.6013514	35
								3610018-006	Nitrate (as NO3)	45	mg/L	8/3/2010	50	82	48.2222222	50
								3610018-007	Nitrate (as NO3)	45	mg/L	8/3/2010	38	71	42.6551724	38
								3610018-010	Nitrate (as NO3)	45	mg/L	11/22/2010	269	66	47.6862259	269
								3610018-029	Nitrate (as NO3)	45	mg/L	10/12/2004	5	78	25.4993548	5
								3610018-032	Nitrate (as NO3)	45	mg/L	8/6/2009	12	55	36.0731707	12
								3610018-037	Nitrate (as NO3)	45	mg/L	4/9/2008	8	49	24.9860825	8
								3610018-038	Nitrate (as NO3)	45	mg/L	8/3/2010	125	93	75.7874016	124
								3610018-039	Nitrate (as NO3)	45	mg/L	8/3/2010	93	79	55.5793651	88
								3610018-002	Perchlorate	6	ug/L	3/30/2010	18	9.8	1.52222222	18
								3610018-037	Perchlorate	6	ug/L	6/14/2010	15	8.6	3.92959184	15

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
SAN BERNARDINO	Green Valley Lake	GREEN VALLEY MWC	3610023	Mixed <50%GW	700	24	2	3610023-034	Gross alpha particle activity	15	pCi/L	10/15/2010	6	36	22	6
								3610023-035	Gross alpha particle activity	15	pCi/L	4/15/2010	4	23	14.5625	4
								3610023-034	Uranium	20	pCi/L	1/6/2006	2	22	17.6666667	2
SAN BERNARDINO	Chino Hills	CITY OF CHINO HILLS	3610036	Mixed <50%GW	78725	5	1	3610036-017	Arsenic	10	ug/L	11/16/2010	25	17	8.56851852	25
SAN BERNARDINO	Redlands	REDLANDS CITY MUD-WATER DIV	3610037	Mixed <50%GW	80000	25	4	3610037-037	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	6/5/2002	2	0.97	0.08528205	2
								3610037-037	Nitrate (as NO3)	45	mg/L	12/16/2008	29	57	47.9230769	28
								3610037-039	Nitrate (as NO3)	45	mg/L	6/5/2002	2	49	41.8235294	2
								3610037-031	Perchlorate	6	ug/L	10/9/2002	4	9	3.7484386	3
								3610037-037	Perchlorate	6	ug/L	4/7/2009	28	8.8	6.60232558	25
								3610037-039	Perchlorate	6	ug/L	12/16/2008	9	7.6	5.80952381	8
								3610037-060	Perchlorate	6	ug/L	10/20/2010	14	9	5.16046	14
SAN BERNARDINO	Yucaipa	WESTERN HEIGHTS WATER COMPANY	3610053	Mixed <50%GW	7120	5	1	3610053-011	Nitrate (as NO3)	45	mg/L	7/13/2009	7	46	22.3240566	5
SAN BERNARDINO	San Bernardino	EAST VALLEY WATER DISTRICT	3610064	Mixed <50%GW	70000	22	7	3610064-022	Fluoride	2	mg/L	11/16/2010	6	2.2	1.83625	6
								3610064-024	Fluoride	2	mg/L	11/16/2010	583	3.6	2.66393162	569
								3610064-025	Gross alpha particle activity	15	pCi/L	11/2/2010	30	57.89	25.9180645	25
								3610064-046	Gross alpha particle activity	15	pCi/L	10/28/2009	6	22.1	13.5333333	6
								3610064-022	Nitrate (as NO3)	45	mg/L	9/10/2010	115	62	47.9830189	114
								3610064-025	Nitrate (as NO3)	45	mg/L	11/16/2010	30	60	39.2149533	28
								3610064-028	Nitrate (as NO3)	45	mg/L	11/18/2010	189	52	44.3974227	189
								3610064-018	Perchlorate	6	ug/L	8/19/2008	12	12	7.1826087	12
								3610064-022	Perchlorate	6	ug/L	11/21/2003	3	6.6	3.39277108	3
								3610064-023	Perchlorate	6	ug/L	11/21/2003	2	7.1	3.97692308	2
								3610064-028	Perchlorate	6	ug/L	11/4/2010	98	10	7.76796117	94
								3610064-023	Tetrachloroethylene (PCE)	5	ug/L	7/3/2007	6	7	3.88454545	6
								3610064-025	Uranium	20	pCi/L	10/7/2010	30	48.47	28.6037143	26
								3610064-046	Uranium	20	pCi/L	8/18/2006	2	23	14.5112	2
SAN BERNARDINO	Chino city	CITY OF CHINO	3610012	Mixed <50%GW	62000	9	4	3610012-004	Nitrate (as NO3)	45	mg/L	9/16/2010	12	61	45.5333333	12
								3610012-008	Nitrate (as NO3)	45	mg/L	9/16/2010	25	91	68.6923077	25
								3610012-009	Nitrate (as NO3)	45	mg/L	9/16/2010	17	96	75.8235294	17
								3610012-012	Nitrate (as NO3)	45	mg/L	11/2/2010	87	79	58.7111111	87
								3610012-004	Perchlorate	6	ug/L	9/16/2010	20	16	11.2190476	20
								3610012-008	Perchlorate	6	ug/L	9/16/2010	22	18	12.8565217	22
								3610012-009	Perchlorate	6	ug/L	9/16/2010	14	24	18.1428571	14
SAN BERNARDINO	Fontana city, Rialto city	SAN GABRIEL VALLEY WC - FONTANA	3610041	Undetermined	155460	35	6	3610041-014	Nitrate (as NO3)	45	mg/L	7/15/2009	5	64	34.05	56
								3610041-033	Nitrate (as NO3)	45	mg/L	3/12/2008	24	77	36.73	48
								3610041-036	Nitrate (as NO3)	45	mg/L	10/20/2010	43	74	62.57	43
								3610041-042	Nitrate (as NO3)	45	mg/L	3/28/2007	41	78	36.54	78
								3610041-033	Perchlorate	6	ug/L	10/12/2010	163	24	16.45	22
								3610041-036	Perchlorate	6	ug/L	10/20/2010	17	14	11.24	17
								3610041-042	Perchlorate	6	ug/L	1/11/2010	97	21	9.18	44
								3610041-063	Tetrachloroethylene (PCE)	5	ug/L	4/2/2008	30	11	3.84	130
								3610041-064	Tetrachloroethylene (PCE)	5	ug/L	5/24/2006	8	7.7	2.41	363
SAN BERNARDINO	Big Bear City CDP	Dept of Water & Power/Lake Williams	3600283	100% GW	147	3	1	3600283-003	Fluoride	2	mg/L	10/19/2005	2	2.8	2.47	3
SAN BERNARDINO	City of Apple Valley	Apple Valley View MWC	3600012	100% GW	200	3	1	3600012-002	Fluoride	2	mg/L	1/13/2004	2	2.8	2.75	2
SAN BERNARDINO	City of Apple Valley	THUNDERBIRD CWD	3600306	100% GW	720	3	2	3600306-001	Fluoride	2	mg/L	11/3/2010	45	2.4	2.14	53
								3600306-003	Fluoride	2	mg/L	10/5/2010	46	2.5	2.15	53
SAN BERNARDINO	City of Daggett	Daggett Comm Svcs Dist	3600086	100% GW	795	3	2	3600086-002	Arsenic	10	ug/L	2/7/2006	2	41	40.00	2
								3600086-007	Gross alpha particle activity	15	pCi/L	9/29/2004	3	21	9.41	12
SAN BERNARDINO	City of Hesperia	Calico Lakes Homeowners	3601036	100% GW	25	2	1	3601036-001	Gross alpha particle activity	15	pCi/L	9/7/2010	7	22.5	17.39	8
SAN BERNARDINO	City of Mount Baldy	Snowcrest Hts. Imp.	3600262	100% GW	600	5	2	3600262-002	Arsenic	10	ug/L	3/22/2010	4	86	34.25	4

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
		Assoc						3600262-003	Arsenic	10	ug/L	3/22/2010	3	23	16.00	3
SAN BERNARDINO	City of Pioneertown	CSA 70 W-4	3600196	100% GW	625	7	7	3600196-001	Arsenic	10	ug/L	1/15/2009	23	36	20.88	30
								3600196-002	Arsenic	10	ug/L	8/18/2010	25	96	55.32	25
								3600196-003	Arsenic	10	ug/L	8/18/2010	37	130	73.76	37
								3600196-004	Arsenic	10	ug/L	8/18/2010	37	160	95.03	36
								3600196-007	Arsenic	10	ug/L	8/18/2010	14	59	45.43	14
								3600196-001	Chromium, Total	50	ug/L	8/31/2006	2	88	49.00	3
								3600196-002	Fluoride	2	mg/L	8/24/2007	2	8.2	5.30	3
								3600196-003	Fluoride	2	mg/L	8/18/2010	23	11	6.43	25
								3600196-002	Gross alpha particle activity	15	pCi/L	9/13/2010	4	31	18.30	7
								3600196-003	Gross alpha particle activity	15	pCi/L	10/23/2008	4	28	16.08	8
								3600196-005	Uranium	20	pCi/L	11/2/2010	33	59	33.12	36
								3600196-006	Uranium	20	ug/L	4/6/2005	11	48	29.08	14
SAN BERNARDINO	Lake Arrowhead CDP	Deer Lodge Water System	3600087	100% GW	745	2	2	3600087-001	Gross alpha particle activity	15	pCi/L	7/22/2010	3	34	23.67	3
								3600087-002	Gross alpha particle activity	15	pCi/L	7/22/2010	4	27	19.17	6
SAN BERNARDINO	Morongo Valley CDP	CSA 70 W-3 (Hacienda)	3600114	100% GW	695	2	2	3600114-001	Gross alpha particle activity	15	pCi/L	5/20/2010	5	37	22.17	6
								3600114-002	Gross alpha particle activity	15	pCi/L	3/26/2008	4	20	14.81	14
								3600114-001	Uranium	20	pCi/L	8/9/2010	18	36	20.91	34
								3600114-002	Uranium	20	pCi/L	10/20/2009	6	24	17.16	29
SAN BERNARDINO	Morongo Valley CDP	CSA 70F, Morongo Valley	3600226	100% GW	450	3	3	3600226-001	Gross alpha particle activity	15	pCi/L	10/8/2009	2	46	40.00	2
								3600226-002	Gross alpha particle activity	15	pCi/L	10/4/2005	2	33	26.33	3
								3600226-003	Gross alpha particle activity	15	pCi/L	12/11/2009	5	44	28.17	6
								3600226-001	Uranium	20	pCi/L	5/19/2010	20	57	26.68	27
								3600226-002	Uranium	20	pCi/L	8/19/2010	26	47	27.36	32
								3600226-003	Uranium	20	pCi/L	8/19/2010	24	50	28.81	32
SAN BERNARDINO	Morongo Valley CDP	Golden State Water-Mor Del Norte	3600270	100% GW	870	3	3	3600270-001	Gross alpha particle activity	15	pCi/L	11/9/2010	13	32.1	15.99	26
								3600270-002	Gross alpha particle activity	15	pCi/L	8/3/2010	15	31.6	18.09	24
								3600270-001	Uranium	20	ug/L	11/14/2006	2	26	15.35	28
								3600270-002	Uranium	20	pCi/L	8/12/2008	6	29	17.31	27
SAN BERNARDINO	Morongo Valley CDP	Roadrunner Mobile Home Pk	3601055	100% GW	150	1	1	3601055-001	Gross alpha particle activity	15	pCi/L	10/18/2010	2	28.4	28.10	2
								3601055-001	Uranium	20	pCi/L	9/28/2010	21	34.6	23.67	26
SAN BERNARDINO	Muscoy CDP, Rialto city, San Bernardino city	SAN BERNARDINO CITY	3610039	100% GW	180315	55	3	3610039-065	Tetrachloroethylene (PCE)	5	ug/L	7/27/2005	4	10	3.65	25
								3610039-066	Tetrachloroethylene (PCE)	5	ug/L	1/20/2010	8	12	4.62	25
								3610039-067	Tetrachloroethylene (PCE)	5	ug/L	1/18/2006	6	8.9	4.01	25
SAN BERNARDINO	Crestline CDP	CRESTLINE VILLAGE CWD - DIVISION 10	3610015	>50% GW Mixed	7400	44	3	3610015-013	Gross alpha particle activity	15	pCi/L	3/31/2004	2	17.2	12.24	8
								3610015-062	Gross alpha particle activity	15	pCi/L	1/31/2005	8	29	17.25	17
								3610015-070	Gross alpha particle activity	15	pCi/L	3/31/2010	5	48.6	24.40	10
								3610015-062	Uranium	20	pCi/L	6/30/2005	6	47	18.55	16
								3610015-070	Uranium	20	pCi/L	3/31/2010	23	47	20.92	56
SAN BERNARDINO	Lake Arrowhead	Sky Forest MWC	3600258	Mixed <50%GW	605	7	1	3600258-002	Gross alpha particle activity	15	pCi/L	9/29/2006	5	26	17.75	5
SAN BERNARDINO	Chino Hills	CITY OF CHINO HILLS	3610036	Mixed <50%GW	78725	5	1	3610036-024	Nitrate (as NO3)	45	mg/L	7/12/2010	5	67	54.5714286	5
SAN BERNARDINO	Sky Forest	ARROWHEAD VILLAS MUTUTUAL SERV. CO.	3610093	Mixed <50%GW	500	2	2	3610093-001	Gross alpha particle activity	15	pCi/L	4/2/2008	6	25	19.1111111	6
								3610093-004	Gross alpha particle activity	15	pCi/L	4/1/2008	2	18	13.05	2
								3610093-001	Uranium	20	pCi/L	8/16/2006	2	23	17.6	2
SAN DIEGO	City of Pauma Valley	YUIMA MUNICIPAL WATER DISTRICT IDA	3700938	100% GW	400	19	3	3700938-005	Nitrate (as NO3)	45	mg/L	10/12/2010	18	57	49.22	24
								3700938-031	Nitrate (as NO3)	45	mg/L	10/12/2010	2	62	62.00	2
								3700938-005	Perchlorate	6	ug/L	10/12/2010	10	8.3	6.41	14
								3700938-006	Perchlorate	6	ug/L	3/19/2008	3	7.5	4.77	13
								3700938-031	Perchlorate	6	ug/L	10/12/2010	2	7.2	6.65	2

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
SAN DIEGO	City of Pauma Valley	RANCHO PAUMA MUTUAL WC	3710012	100% GW	500	7	1	3710012-002	Nitrate (as NO3)	45	mg/L	12/16/2004	10	70	12.25	325
SAN DIEGO	Julian CDP	MAJESTIC PINES COMMUNITY SD	3710041	100% GW	1964	3	1	3710041-004	Arsenic	10	ug/L	6/1/2010	3	23	18.33	3
SAN DIEGO	Pine Valley CDP	PINE VALLEY MUTUAL WC	3710039	100% GW	1500	8	1	3710039-010	Gross alpha particle activity	15	pCi/L	8/10/2007	4	18.7	14.93	8
SAN DIEGO	Camp Pendleton North CDP	CAMP PENDLETON (SOUTH)	3710702	>50% GW Mixed	35000	19	2	3710702-014	Gross alpha particle activity	15	pCi/L	7/14/2005	7	17.4	12.42	25
								3710702-031	Gross alpha particle activity	15	pCi/L	8/19/2010	6	22	15.80	10
SAN DIEGO	Pauma Valley	YUIMA MUNICIPAL WATER DISTRICT	3701408	Mixed <50%GW	260	5	2	3701408-002	Nitrate (as NO3)	45	mg/L	10/12/2010	26	86	64.6703704	26
								3701408-004	Nitrate (as NO3)	45	mg/L	1/16/2008	4	63	35.8928571	3
								3701408-002	Perchlorate	6	ug/L	9/17/2008	2	8.7	5.57142857	2
SAN DIEGO	San Diego	SAN DIEGO - CITY OF	3710020	Mixed <50%GW	1266731	3	1	3710020-019	Arsenic	10	ug/L	2/3/2004	2	14.2	8.325	2
								3710020-019	Gross alpha particle activity	15	pCi/L	7/14/2009	8	83.7	64.7625	8
								3710020-019	Tetrachloroethylene (PCE)	5	ug/L	11/1/2010	37	14.4	7.925	37
								3710020-019	Trichloroethylene (TCE)	5	ug/L	10/2/2008	17	9.42	5.2475	17
								3710020-019	Uranium	20	pCi/L	7/14/2009	8	79.6	65.1875	8
SAN DIEGO	Campo CDP	LAKE MORENA OAK SHORE MW CO.	3700923	100% GW	700	6	5	3700923-007	Gross alpha particle activity	15	pCi/L	12/17/2008	2	65.7	63.85	2
								3700923-008	Gross alpha particle activity	15	pCi/L	12/17/2008	2	43	30.85	2
								3700923-001	Nitrate (as NO3)	45	mg/L	5/16/2007	15	71.9	38.73	35
								3700923-002	Nitrate (as NO3)	45	mg/L	5/16/2007	10	118	40.68	33
								3700923-002	Uranium	20	pCi/L	3/31/2010	3	65	17.47	12
								3700923-005	Uranium	20	ug/L	3/28/2010	7	55.4	25.09	13
								3700923-007	Uranium	20	pCi/L	7/1/2010	10	90	49.68	10
								3700923-008	Uranium	20	pCi/L	7/1/2010	9	97	32.32	14
SAN DIEGO	Campo CDP	LAKE MORENA VIEWS MW CO.	3700924	100% GW	360	3	2	3700924-005	Gross alpha particle activity	15	pCi/L	10/2/2005	2	73.1	63.41	2
								3700924-001	Nitrate (as NO3)	45	mg/L	10/25/2005	2	82.6	57.30	3
SAN DIEGO	Campo CDP	LAKE MORENA TRAILER RESORT	3701760	100% GW	60	1	1	3701760-003	Gross alpha particle activity	15	pCi/L	10/21/2010	8	920	575.00	8
								3701760-003	Uranium	20	pCi/L	10/21/2010	9	710	433.64	11
SAN DIEGO	City of Escondido	OAKVALE PARK	3700962	100% GW	100	2	2	3700962-001	Gross alpha particle activity	15	pCi/L	6/17/2010	6	57	38.34	7
								3700962-002	Gross alpha particle activity	15	pCi/L	2/11/2010	5	110	39.86	7
								3700962-001	Uranium	20	pCi/L	6/17/2010	3	45	28.75	4
SAN DIEGO	City of Warner Springs	LOS TULES MUTUAL WATER COMPANY	3700958	100% GW	140	3	2	3700958-003	Gross alpha particle activity	15	pCi/L	10/14/2010	8	57	19.52	15
								3700958-006	Gross alpha particle activity	15	pCi/L	10/14/2010	3	57	26.42	5
								3700958-003	Uranium	20	pCi/L	10/14/2010	3	80	23.67	12
								3700958-006	Uranium	20	pCi/L	10/14/2010	2	80	28.92	5
SAN DIEGO	Guatay City	GUATAY MUTUAL BENEFIT CORPORATION	3700897	100% GW	100	2	1	3700897-001	Gross alpha particle activity	15	pCi/L	1/4/2009	5	110	46.64	5
								3700897-001	Uranium	20	pCi/L	1/4/2009	5	160	77.60	5
SAN DIEGO	Pine Valley CDP	PINE VALLEY MUTUAL WC	3710039	100% GW	1500	8	2	3710039-003	Fluoride	2	mg/L	9/23/2008	3	3.5	3.13	3
								3710039-007	Fluoride	2	mg/L	9/30/2008	2	2.4	1.87	3
								3710039-007	Gross alpha particle activity	15	pCi/L	2/13/2008	4	24	15.69	8
								3700859-003	Gross alpha particle activity	15	pCi/L	11/3/2010	3	18.8	17.57	3
								3700859-003	Uranium	20	pCi/L	11/3/2010	2	25	20.67	3
SAN JOAQUIN	Lathrop city	DEFENSE DISTRIB. DEPOT, SHARPE SITE	3910701	100% GW	1650	2	2	3910701-003	Arsenic	10	ug/L	11/2/2010	31	23	17.03	32
								3910701-005	Arsenic	10	ug/L	11/2/2010	32	35	26.45	32
SAN JOAQUIN	Lathrop city, Patterson city	OAKWOOD LAKE WATER DISTRICT-SUBDIVISION	3910023	100% GW	43	2	2	3910023-004RW3	Arsenic	10	ug/L	9/29/2010	11	26	22.64	11
								3910023-006RW4	Arsenic	10	ug/L	9/29/2010	12	24	21.42	12
SAN JOAQUIN	Morada CDP	SAN JOAQUIN COUNTY - WILKINSON MANOR	3910024	100% GW	861	2	1	3910024-002	Tetrachloroethylene (PCE)	5	ug/L	10/12/2010	3	8.3	2.77	18
SAN JOAQUIN	Ripon city	RIPON, CITY OF	3910007	100% GW	14915	9	3	3910007-009	Arsenic	10	ug/L	6/24/2010	12	13	10.97	19
								3910007-009	cis-1,2-Dichloroethylene	6	ug/L	2/28/2005	3	6.6	4.57	32
								3910007-003	Gross alpha particle activity	15	pCi/L	6/24/2010	2	20.4	14.70	7
								3910007-014	Nitrate (as NO3)	45	mg/L	7/28/2010	14	68	48.64	25
								3910007-009	Vinyl chloride	0.5	ug/L	5/18/2005	4	5	0.36	23

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
SAN JOAQUIN	Woodbridge CDP	SAN JOAQUIN COUNTY-MOKELUMNE ACRES	3910017	100% GW	3640	5	1	3910017-008	Gross alpha particle activity	15	pCi/L	12/18/2003	4	28.4	28.40	4
SAN JOAQUIN	Lodi city	LODI, CITY OF	3910004	100% GW	63395	27	6	3910004-020	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	10/19/2010	96	0.82	0.57	100
								3910004-022	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	10/14/2010	52	0.39	0.22	75
								3910004-024	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	10/7/2010	98	0.74	0.47	102
								3910004-026	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	9/8/2008	71	0.43	0.25	100
								3910004-027	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	10/14/2010	99	0.66	0.44	101
								3910004-032	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	10/19/2010	90	0.86	0.62	93
SAN JOAQUIN	Manteca city	MANTECA, CITY OF	3910005	100% GW	66451	18	12	3910005-013	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	2/11/2008	2	0.27	0.14	70
								3910005-012	Arsenic	10	ug/L	11/2/2010	8	12	10.01	15
								3910005-013	Arsenic	10	ug/L	11/2/2010	25	15	12.57	27
								3910005-014RW1	Arsenic	10	ug/L	11/2/2010	36	23	18.61	34
								3910005-015	Arsenic	10	ug/L	11/2/2010	21	16	13.00	22
								3910005-016	Arsenic	10	ug/L	11/2/2010	24	19	12.54	29
								3910005-032019	Arsenic	10	ug/L	8/3/2010	11	17	11.69	17
								3910005-034020	Arsenic	10	ug/L	11/2/2010	24	23	18.95	24
								3910005-036023	Arsenic	10	ug/L	11/2/2010	19	15	12.47	20
								3910005-038021F	Arsenic	10	ug/L	5/18/2010	4	13	11.42	6
								3910005-040022F	Arsenic	10	ug/L	11/2/2010	15	15	11.28	19
								3910005-042RW2	Arsenic	10	ug/L	11/2/2010	45	20	16.94	45
								3910005-044RW2	Arsenic	10	ug/L	11/2/2010	39	15	12.87	41
								3910005-013	Ethylene dibromide (EDB)	0.05	ug/L	1/6/2009	6	0.077	0.03	71
								3910005-036023	Nitrate (as NO3)	45	mg/L	12/4/2007	3	66.7	32.74	222
								3910005-038021F	Nitrate (as NO3)	45	mg/L	5/18/2010	2	51	35.26	18
								3910005-044RW2	Nitrate (as NO3)	45	mg/L	12/19/2006	3	63	26.93	128
SAN JOAQUIN	August CDP, Country Club CDP, Garden Acres CDP, Kennedy CDP, Stockton city	CALIFORNIA WATER SERVICE - STOCKTON	3910001	>50% GW Mixed	171777	25	8	3910001-007	Arsenic	10	ug/L	11/20/2004	2	17.615	8.81	11
								3910001-029	Arsenic	10	ug/L	12/14/2009	2	21	6.48	9
								3910001-045	Arsenic	10	ug/L	9/21/2010	102	24	19.96	103
								3910001-053	Arsenic	10	ug/L	9/21/2010	108	26	19.65	110
								3910001-057	Arsenic	10	ug/L	10/9/2007	54	19	14.44	55
								3910001-059	Arsenic	10	ug/L	9/21/2010	123	24.11	19.44	124
								3910001-060	Arsenic	10	ug/L	9/21/2010	117	22.875	19.59	118
								3910001-061	Arsenic	10	ug/L	9/30/2004	4	16	13.25	4
								3910001-053	Nitrate (as NO3)	45	mg/L	8/22/2007	12	61.954	14.89	162
SAN JOAQUIN	Lathrop city, Manteca city	CITY OF LATHROP	3910015	>50% GW Mixed	12427	5	5	3910015-005	Arsenic	10	ug/L	9/13/2010	32	19	15.72	32
								3910015-006	Arsenic	10	ug/L	9/13/2010	33	26	22.55	33
								3910015-007	Arsenic	10	ug/L	9/13/2010	29	20	17.48	29
								3910015-008	Arsenic	10	ug/L	9/13/2010	29	46	19.41	29
								3910015-016RW1	Arsenic	10	ug/L	11/1/2010	5	20	19.00	5
SAN JOAQUIN	Stockton city	SAN JOAQUIN COUNTY - COLONIAL HEIGHTS	3910002	>50% GW Mixed	1851	2	1	3910002-001	Tetrachloroethylene (PCE)	5	ug/L	11/15/2010	3	8.6	4.45	6
SAN JOAQUIN	Stockton	STOCKTON EAST WATER DISTRICT	3910006	Mixed <50%GW	50	2	1	3910006-004	Arsenic	10	ug/L	6/19/2007	2	11	9.16666667	2
SAN JOAQUIN	Stockton	CITY OF STOCKTON	3910012	Mixed <50%GW	158113	24	1	3910012-083	Arsenic	10	ug/L	2/26/2003	2	19	10.1666667	2
SAN JOAQUIN	City of Lodi	COUNTRY MANOR MHP	3900844	100% GW	75	2	2	3900844-001	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	3/16/2010	7	1.42	0.90	8
								3900844-002	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	1/21/2009	2	0.64	0.30	4
SAN JOAQUIN	City of Millbrae	AVALOS, SILVIA	3901213	100% GW	30	1	1	3901213-007	Arsenic	10	ug/L	10/4/2010	17	15	12.89	18
SAN JOAQUIN	City of San Joaquin	FINNLEES TRAILER PARK	3900705	100% GW	55	1	1	3900705-001	Gross alpha particle activity	15	pCi/L	9/22/2010	2	24	13.75	11
SAN JOAQUIN	City of Stockton	CENTURY MOBILE HOME PARK	3900579	100% GW	50	1	1	3900579-011	Arsenic	10	ug/L	9/29/2010	13	15	13.69	13
SAN JOAQUIN	City of Stockton	GLENWOOD MOBILE HOME PARK	3900649	100% GW	100	1	1	3900649-007	Nitrate (as NO3)	45	mg/L	5/17/2010	4	52.5	36.60	28
SAN JOAQUIN	City of Stockton	ELKHORN ESTATES WATER SYSTEM	3900724	100% GW	200	1	1	3900724-001	Gross alpha particle activity	15	pCi/L	4/26/2007	3	18.9	9.80	20
SAN JOAQUIN	City of Stockton	BEL AIR MOBILE ESTATE	3900907	100% GW	150	3	1	3900907-002	Gross alpha particle activity	15	pCi/L	5/29/2008	3	30.8	14.35	9

Table 8.1

List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
SAN JOAQUIN	French Camp CDP	SIDHU MOBILE PARK WATER SYSTEM	3900711	100% GW	75	1	1	3900711-001	Arsenic	10	ug/L	7/30/2010	14	14	12.86	14
SAN JOAQUIN	Kennedy CDP	V & P TRAILER COURT WATER SYSTEM	3900732	100% GW	35	1	1	3900732-001	Arsenic	10	ug/L	6/30/2010	11	13	10.80	15
SAN JOAQUIN	Stockton city	SAN JUAN VISTA	3901215	100% GW	100	1	1	3901215-001	Arsenic	10	ug/L	7/28/2008	3	12	10.43	8
SAN JOAQUIN	Undetermined	WEST LANE MOBILE HOME PARK	3900624	100% GW	160	1	1	3900624-001	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	6/10/2009	12	0.59	0.29	18
SAN JOAQUIN	Undetermined	ISLANDER MARINA	3900653	100% GW	150	2	2	3900653-001	Gross alpha particle activity	15	pCi/L	12/26/2007	10	41.4	17.54	22
								3900653-002	Gross alpha particle activity	15	pCi/L	5/7/2007	2	38.7	6.26	19
								3900653-001	Uranium	20	pCi/L	8/27/2007	7	51.2	17.24	24
SAN JOAQUIN	Lodi city	LODI, CITY OF	3910004	100% GW	63395	27	4	3910004-007	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	10/19/2010	8	0.42	0.16	41
								3910004-011	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	8/14/2009	56	0.35	0.21	103
								3910004-021	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	8/9/2010	20	0.31	0.19	52
								3910004-023	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	6/19/2003	5	0.35	0.11	81
								3910004-011	Gross alpha particle activity	15	pCi/L	11/17/2010	8	20.6	13.97	16
SAN JOAQUIN	City of San Joaquin	ARBOR MOBILE HOME PARK WS	3900831	>50% GW Mixed	340	1	1	3900831-007	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	8/4/2010	18	1.5	0.81	19
SAN JOAQUIN	Undetermined	WINE COUNTRY APARTMENTS	3900559	>50% GW Mixed	40	1	1	3900559-001	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	3/26/2010	4	0.58	0.19	8
SAN LUIS OBISPO	City of Santa Maria	RURAL WATER COMPANY	4010040	100% GW	1850	11	2	4010040-003	Nitrate (as NO3)	45	mg/L	3/7/2007	4	60	31.07	44
								4010040-009	Nitrate (as NO3)	45	mg/L	4/23/2010	9	71.4	31.73	49
								4010017-006	Nitrate (as NO3)	45	mg/L	1/9/2008	3	50	24.41	46
SAN LUIS OBISPO	Los Ranchos CDP	GOLDEN STATE WATER COMPANY - EDNA	4010023	100% GW	1940	2	2	4010023-008	Selenium	50	ug/L	4/8/2009	12	120	35.71	76
								4010023-011	Selenium	50	ug/L	8/8/2007	9	61	38.83	69
SAN LUIS OBISPO	Nipomo CDP	GOLDEN STATE WATER COMPANY - NIPOMO	4010018	100% GW	4937	5	1	4010018-003	Nitrate (as NO3)	45	mg/L	12/8/2010	8	58	34.90	27
SAN LUIS OBISPO	San Miguel CDP	SAN MIGUEL COMMUNITY SERVICES DISTRICT	4010010	100% GW	1500	2	1	4010010-004	Gross alpha particle activity	15	pCi/L	10/7/2008	2	17	9.65	17
SAN LUIS OBISPO	El Paso de Robles (Paso Robles) city, Templeton CDP	TEMPLETON CSD	4010019	100% GW	6500	12	3	4010019-014	Arsenic	10	ug/L	4/29/2010	12	42	17.53	13
								4010019-036	Arsenic	10	ug/L	4/27/2010	14	32	11.13	47
								4010019-015	Nitrate (as NO3)	45	mg/L	9/22/2009	13	60	42.98	112
SAN LUIS OBISPO	El Paso de Robles (Paso Robles) city	PASO ROBLES WATER DEPARTMENT	4010007	>50% GW Mixed	29500	19	4	4010007-010	Arsenic	10	ug/L	8/26/2010	5	22	12.32	10
								4010007-012	Arsenic	10	ug/L	10/1/2009	26	16	10.24	57
								4010007-013	Arsenic	10	ug/L	10/28/2010	65	46	21.68	65
								4010007-014	Selenium	50	ug/L	8/26/2008	2	66	32.59	17
SAN LUIS OBISPO	Grover Beach city	GROVER BEACH WATER DEPARTMENT	4010004	>50% GW Mixed	13248	4	4	4010004-002	Nitrate (as NO3)	45	mg/L	12/14/2010	168	72	46.94	295
								4010004-003	Nitrate (as NO3)	45	mg/L	10/4/2010	111	100	62.96	115
								4010004-004	Nitrate (as NO3)	45	mg/L	12/7/2010	6	130	59.27	11
SAN LUIS OBISPO	Arroyo Grande	ARROYO GRANDE, WATER DEPARTMENT	4010001	Mixed <50%GW	16682	8	2	4010001-003	Nitrate (as NO3)	45	mg/L	10/26/2004	35	55	41.8571429	35
								4010001-004	Nitrate (as NO3)	45	mg/L	9/14/2010	181	110	65.7213115	180
SAN LUIS OBISPO	Oceano	OCEANO COMM SERVICES DIST.	4010005	Mixed <50%GW	7600	4	2	4010005-002	Selenium	50	ug/L	7/13/2010	76	350	98.2079208	76
								4010005-003	Selenium	50	ug/L	6/1/2010	74	190	100.342593	73
SAN LUIS OBISPO	Morro Bay	MORRO BAY WATER DEPARTMENT	4010011	Mixed <50%GW	10270	8	4	4010011-005	Nitrate (as NO3)	45	mg/L	12/7/2010	36	110	67.452381	36
								4010011-006	Nitrate (as NO3)	45	mg/L	11/2/2010	25	96	45.6355556	25
								4010011-019	Nitrate (as NO3)	45	mg/L	10/6/2009	7	80	33.3631579	7
								4010011-020	Nitrate (as NO3)	45	mg/L	10/6/2009	14	53	29.0619048	14
SAN LUIS OBISPO	Avilla Beach CDP	BASSI RANCH MUTUAL WATER CO.	4000200	100% GW	85	3	1	4000200-001	Bromate	10	ug/L	1/8/2007	2	29	20.00	2
SAN LUIS OBISPO	Callender CDP	WOODLAND PARK MUTUAL WATER CO	4000506	100% GW	500	4	1	4000506-013	Nitrate (as NO3)	45	mg/L	11/3/2010	20	61	47.07	33

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
SAN LUIS OBISPO	Cayucos CDP	BELLA VISTA MOBILE LODGE	4000512	100% GW	200	1	1	4000512-001	Arsenic	10	ug/L	10/13/2010	8	26	13.27	11
SAN LUIS OBISPO	City of Arroyo Grande	COUNTRY HILLS ESTATES	4000637	100% GW	60	2	2	4000637-001	Arsenic	10	ug/L	10/12/2010	14	30	23.56	16
								4000637-012	Arsenic	10	ug/L	10/12/2010	8	37	22.00	9
SAN LUIS OBISPO	City of Arroyo Grande	H2O, INC	4000741	100% GW	60	2	1	4000741-002	Arsenic	10	ug/L	1/12/2009	2	13	10.04	7
SAN LUIS OBISPO	City of Grover Beach	EDNA RANCH MUTUAL WATER CO-EAST	4000202	100% GW	60	3	1	4000202-001	Arsenic	10	ug/L	10/11/2010	3	22	12.50	6
SAN LUIS OBISPO	City of Morro Bay	RANCHO COLINA MOBILE HOME PARK	4000653	100% GW	250	1	1	4000653-002	Nitrate (as NO3)	45	mg/L	8/23/2010	6	61.1	28.48	44
SAN LUIS OBISPO	City of Paso Robles	RESTHAVEN MOBILE HOME PARK	4000654	100% GW	75	2	2	4000654-001	Selenium	50	ug/L	10/7/2010	6	490	229.67	6
								4000654-012	Selenium	50	ug/L	10/7/2010	3	64	54.50	4
SAN LUIS OBISPO	City of Templeton	ALMIRA WATER ASSOCIATION	4000631	100% GW	40	1	1	4000631-001	Arsenic	10	ug/L	8/16/2010	11	17	13.63	12
SAN LUIS OBISPO	Oceano CDP	HALCYON WATER SYSTEM	4000501	100% GW	105	1	1	4000501-001	Selenium	50	ug/L	12/9/2009	7	88	73.57	7
SAN LUIS OBISPO	Oceano CDP	KEN MAR GARDENS	4000648	100% GW	84	1	1	4000648-001	Selenium	50	ug/L	1/13/2010	3	71	39.82	11
SAN LUIS OBISPO	San Luis Obispo city	HIGUERA APARTMENTS	4000563	100% GW	30	1	1	4000563-001	Nitrate (as NO3)	45	mg/L	12/13/2006	4	52	49.80	5
SAN LUIS OBISPO	Paso Robles	MUSTANG SPRINGS MUTUAL WATER	4000775	>50% GW Mixed	30	1	1	4000775-001	Fluoride	2	mg/L	1/28/2009	12	3.8	2.91	12
SAN MATEO	Moss Beach CDP, Santa Cruz city	PILLAR RIDGE MHP (FORMER EL GRANADA MHP)	4110028	100% GW	1000	3	2	4110028-002	Trichloroethylene (TCE)	5	ug/L	10/18/2007	20	9.5	5.62	29
								4110028-004	Trichloroethylene (TCE)	5	ug/L	5/13/2002	2	7.1	0.59	36
SAN MATEO	Broadmoor CDP, Daly City city, San Francisco city	CITY OF DALY CITY	4110013	>50% GW Mixed	103000	6	3	4110013-004	Nitrate (as NO3)	45	mg/L	9/1/2010	44	71	41.66	60
								4110013-011	Nitrate (as NO3)	45	mg/L	5/19/2010	2	46	28.90	73
								4110013-014	Nitrate (as NO3)	45	mg/L	10/6/2010	37	170	85.17	50
								4110009-006	Nitrate (as NO3)	45	mg/L	1/9/2008	27	60	45.7154474	20
								4110009-007	Nitrate (as NO3)	45	mg/L	10/18/2006	17	66	28.5796667	11
SAN MATEO	Montara CDP, Moss Beach CDP	MONTARA WATER AND SANITARY DISTRICT	4110010	Undetermined	5412	9	2	4110010-001	Nitrate (as NO3)	45	mg/L	9/7/2010	3	48	31.65	100
								4110010-015	Nitrate (as NO3)	45	mg/L	2/10/2010	46	60	43.71	94
SAN MATEO	Skylonda	SKYLONDA MUTUAL	4100533	Mixed <50%GW	431	3	1	4100533-003	Barium	1000	ug/L	6/2/2010	6	1700	1383.33333	6
SANTA BARBARA	City of New Cuyama	CUYAMA COMMUNITY SERVICES DISTRICT	4210009	100% GW	820	2	2	4210009-002	Arsenic	10	ug/L	1/27/2005	3	64	50.33	3
								4210009-003	Arsenic	10	ug/L	10/10/2008	3	37	34.00	3
SANTA BARBARA	Orcutt CDP, Santa Maria city	GOLDEN STATE WATER COMPANY - ORCUTT	4210016	100% GW	35212	12	1	4210016-005	Nitrate (as NO3)	45	mg/L	9/1/2010	55	61	47.44	95
SANTA BARBARA	Lompoc city	LOMPOC-CITY WATER UTILITY DIV	4210006	>50% GW Mixed	38311	11	4	4210006-007	Arsenic	10	ug/L	1/5/2010	4	14	10.57	7
								4210006-009	Arsenic	10	ug/L	1/5/2010	10	22	17.80	10
								4210006-011	Arsenic	10	ug/L	1/6/2010	7	22	16.50	8
								4210006-013	Arsenic	10	ug/L	1/5/2010	6	13	10.88	8
SANTA BARBARA	Santa Maria city	SANTA MARIA WATER DEPARTMENT	4210011	>50% GW Mixed	83756	8	5	4210011-007	Nitrate (as NO3)	45	mg/L	11/2/2010	21	83.4	51.35	35
								4210011-009	Nitrate (as NO3)	45	mg/L	11/2/2010	34	84	56.86	46
								4210011-010	Nitrate (as NO3)	45	mg/L	11/2/2010	14	73	30.98	44
								4210011-013	Nitrate (as NO3)	45	mg/L	10/5/2010	4	51	21.88	39
								4210011-014	Nitrate (as NO3)	45	mg/L	11/2/2010	20	88	38.36	55
SANTA BARBARA	Guadalupe	GUADALUPE WATER DEPARTMENT	4210003	Mixed <50%GW	5659	2	1	4210003-001	Nitrate (as NO3)	45	mg/L	9/15/2010	23	77	38.3150685	19
SANTA BARBARA	Solvang city	SOLVANG WATER DEPARTMENT	4210013	Undetermined	5383	3	2	4210013-001	Gross alpha particle activity	15	pCi/L	7/12/2004	4	16	13.70	5
								4210013-007	Gross alpha particle activity	15	pCi/L	7/12/2004	8	18	16.61	5
SANTA BARBARA	City of Buellton	BOBCAT SPRINGS M WC OS	4200891	100% GW	120	3	2	4200891-001	Arsenic	10	ug/L	4/24/2007	10	20	12.21	8
								4200891-016	Arsenic	10	ug/L	7/13/2010	2	14	13.00	2

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
SANTA BARBARA	Santa Barbara city	LINCOLNWOOD MUTUAL WATER	4200684	100% GW	186	2	1	4200684-003	Nitrate (as NO3)	45	mg/L	11/26/2008	2	75	40.10	10
SANTA BARBARA	Santa Ynez CDP	RANCHO MARCELINO WATER & SERV.	4200531	100% GW	240	3	2	4200531-001	Nitrate (as NO3)	45	mg/L	5/12/2010	5	51.6	38.89	25
								4200531-010	Nitrate (as NO3)	45	mg/L	11/11/2010	14	54	45.62	16
SANTA CLARA	Gilroy city	FARMERS LABOR EXCHANGE	4300943	100% GW	150	1	1	4300943-001	Nitrate (as NO3)	45	mg/L	7/28/2008	43	193	47.89	102
SANTA CLARA	Morgan Hill city, San Jose city	CITY OF MORGAN HILL	4310006	100% GW	34600	17	1	4310006-014	Perchlorate	6	ug/L	7/13/2010	25	10	4.54	346
SANTA CLARA	San Jose city	GREEN ACRES MUTUAL WATER	4300573	100% GW	53	2	1	4300573-002	Asbestos	7	ug/L	8/29/2007	3	93	6.15	42
SANTA CLARA	San Jose city	FOOTHILL MUTUAL WATER	4300630	100% GW	30	1	1	4300630-002	Nitrate (as NO3)	45	mg/L	9/23/2009	8	59	38.27	75
SANTA CLARA	San Jose city	SANTA TERESA MEADOWS WATER COMPANY	4300760	100% GW	68	2	1	4300760-002	Aluminum	1000	ug/L	3/31/2009	2	5300	926.67	9
SANTA CLARA	San Martin CDP	SAN MARTIN COUNTY WATER DISTRICT	4300542	100% GW	600	1	1	4300542-003	Perchlorate	6	ug/L	4/23/2009	9	7.7	4.40	55
SANTA CLARA	San Martin CDP	WEST SAN MARTIN WATER WORKS, INC.	4300543	100% GW	1500	3	1	4300543-004	Perchlorate	6	ug/L	4/1/2010	19	8	5.49	58
SANTA CLARA	Gilroy city	VALLEY VIEW RANCHES	4300996	100% GW	45	1	1	4300996-002	Nitrate (as NO3)	45	mg/L	11/9/2010	24	140	113.63	24
SANTA CLARA	Evergreen, Edenvale	CITY OF SAN JOSE - EVERGREEN/EDENVALE	4310020	Mixed <50%GW	88196	6	1	4310020-011	Aluminum	1000	ug/L	9/14/2010	2	1900	825	2
SANTA CRUZ	Felton CDP, Scotts Valley city	FOREST LAKES MWC	4410016	100% GW	1145	11	1	4410016-006	Fluoride	2	mg/L	9/16/2008	3	3.9	3.87	3
SANTA CRUZ	Santa Cruz city, Scotts Valley city	SCOTTS VALLEY WATER DISTRICT	4410013	100% GW	11301	7	1	4410013-021	Arsenic	10	ug/L	9/12/2007	2	16	6.88	44
SANTA CRUZ	Watsonville	WATSONVILLE, CITY OF	4410011	Mixed <50%GW	51703	14	1	4410011-005	Nitrate (as NO3)	45	mg/L	7/9/2003	5	59	34.1568889	5
SANTA CRUZ	Boulder Creek, Brookdale, Ben Lomond, Zayante, Scotts Valley, Manana Woods, Felton	SAN LORENZO VALLEY WATER DIST	4410014	Mixed <50%GW	19000	6	1	4410014-023	Arsenic	10	ug/L	1/23/2007	6	15	8.74603175	6
SANTA CRUZ	City of Scotts Valley	MANANA WOODS MUTUAL WATER CO	4400539	100% GW	350	1	1	4400539-001	Benzene	1	ug/L	8/6/2008	9	5.8	1.04	39
								4400539-001	Methyl tertiary butyl ether (MTBE)	13	ug/L	2/4/2009	9	37	10.18	39
SANTA CRUZ	Felton CDP, Scotts Valley city	FOREST LAKES MWC	4410016	100% GW	1145	11	1	4410016-013	Arsenic	10	ug/L	1/29/2008	5	94	14.25	15
SANTA CRUZ	La Selva Beach CDP	SAN ANDREAS MUTUAL WATER CO	4400558	100% GW	350	3	1	4400558-003	Nitrate (as NO3)	45	mg/L	8/17/2010	6	61	56.50	6
SHASTA	Redding	CITY OF REDDING	4510005	Mixed <50%GW	85703	17	2	4510005-026	Arsenic	10	ug/L	8/6/2008	3	21	7.14347826	3
								4510005-067	Arsenic	10	ug/L	10/7/2010	13	27	9.25555556	13
SIERRA	Calpine CDP	SIERRA CO. W.W.D #1 CALPINE	4600019	100% GW	225	2	2	4600019-001	Arsenic	10	ug/L	10/18/2010	10	22	18.27	11
								4600019-002	Arsenic	10	ug/L	3/17/2010	3	12	8.67	11
SOLANO	City of Vacaville	RURAL NORTH VACAVILLE WATER DISTRICT	4810013	100% GW	900	2	2	4810013-001	Arsenic	10	ug/L	8/9/2004	2	13	6.11	31
								4810013-002	Arsenic	10	ug/L	5/19/2008	23	25	16.45	26
								4810002-004	Nitrate (as NO3)	45	mg/L	9/2/2007	2	66	35.31	143
SOLANO	Rio Vista city	CITY OF RIO VISTA	4810004	100% GW	7376	7	4	4810004-002	Arsenic	10	ug/L	5/12/2008	2	15	8.72	25
								4810004-004	Arsenic	10	ug/L	11/2/2010	36	20	16.00	35
								4810004-006	Arsenic	10	ug/L	11/12/2007	2	13	8.64	14
								4810004-003	Benzene	1	ug/L	7/10/2002	3	1.3	0.47	64
SOLANO	City of Vacaville	DANA RANCH	4800574	100% GW	34	1	1	4800574-001	Arsenic	10	ug/L	11/16/2005	2	17	11.25	4
SONOMA	City of Penngrove	GEORGE RANCH MUTUAL WATER COMPANY	4900973	100% GW	75	3	1	4900973-001	Arsenic	10	ug/L	5/19/2010	2	19	12.13	3

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
SONOMA	City of Petaluma	BOULEVARD HEIGHTS MUTUAL WATER	4901071	100% GW	51	2	1	4901071-005	Arsenic	10	ug/L	9/1/2009	5	14	8.04	14
SONOMA	City of Santa Rosa	WESTERN MOBILE HOME PARK	4900791	100% GW	225	2	1	4900791-001	Trichloroethylene (TCE)	5	ug/L	12/23/2008	3	6.2	3.37	26
SONOMA	City of Santa Rosa	SEQUOIA GARDENS MOBILE HOME PARK	4900676	100% GW	300	1	1	4900676-001	Arsenic	10	ug/L	9/21/2010	14	18	12.07	19
SONOMA	City of Windsor	MOUNT WESKE ESTATES MUTUAL WATER COMPANY	4900643	100% GW	62	1	1	4900643-001	Arsenic	10	ug/L	6/28/2010	24	94	55.83	24
SONOMA	Larkfield-Wikiup CDP	CALIFORNIA-AMERICAN LARKFIELD (PUC)	4910023	100% GW	7775	6	2	4910023-006	Arsenic	10	ug/L	11/8/2010	41	51	13.50	48
								4910023-007	Arsenic	10	ug/L	7/9/2003	2	12	9.27	46
SONOMA	Larkfield-Wikiup CDP, Windsor town	WINDSOR, TOWN OF	4910017	100% GW	26432	7	1	4910017-008	Arsenic	10	ug/L	3/12/2008	4	22	19.00	4
SONOMA	Rohnert Park city	ROHNERT PARK, CITY OF	4910014	100% GW	42650	31	2	4910014-015	Arsenic	10	ug/L	1/16/2008	4	19	11.06	10
								4910014-041	Arsenic	10	ug/L	3/31/2009	3	15	9.35	11
SONOMA	Sebastopol city	RANCHO SANTA ROSA MHP	4900786	100% GW	175	1	1	4900786-001	Arsenic	10	ug/L	7/27/2010	17	30	14.27	20
SONOMA	Sebastopol city	MOUNTAIN VIEW MOBILE ESTATES, LLC	4900798	100% GW	200	2	1	4900798-002	1,1-Dichloroethylene (1,1-DCE)	6	ug/L	11/16/2010	14	13	3.09	43
								4900798-002	Trichloroethylene (TCE)	5	ug/L	11/16/2010	18	64	14.93	44
SONOMA	Sebastopol city	WEST FIELD COMMUNITY	4900855	100% GW	75	1	1	4900855-001	Arsenic	10	ug/L	6/23/2010	13	28	13.90	19
SONOMA	Sebastopol city	MOORLAND AVENUE APARTMENTS	4901195	100% GW	64	1	1	4901195-002	Arsenic	10	ug/L	9/24/2010	9	48	15.89	13
SONOMA	Sebastopol city	SEBASTOPOL, CITY OF	4910011	100% GW	7750	4	2	4910011-004	Arsenic	10	ug/L	2/2/2009	16	24	16.54	17
								4910011-005	Arsenic	10	ug/L	9/23/2009	7	49	9.31	26
SONOMA	Sonoma city	RANCHO DE SONOMA	4900845	100% GW	130	1	1	4900845-001	Arsenic	10	ug/L	10/12/2010	16	27	16.74	17
SONOMA	Valley Ford CDP	VALLEY FORD WATER ASSOCIATION	4900568	100% GW	40	3	3	4900568-001	Nitrate (as NO3)	45	mg/L	9/28/2010	11	92	48.49	21
								4900568-002	Nitrate (as NO3)	45	mg/L	9/28/2010	15	73	53.35	20
								4900568-003	Nitrate (as NO3)	45	mg/L	9/28/2010	8	69	37.54	19
SONOMA	City of Petaluma	LOCH HAVEN MUTUAL WATER COMPANY	4900575	100% GW	50	1	1	4900575-002	Arsenic	10	ug/L	9/19/2010	13	37	16.98	17
SONOMA	Windsor town	SHAMROCK MOBILE HOME PARK	4900723	100% GW	188	1	1	4900723-001	Arsenic	10	ug/L	11/3/2010	8	40	16.19	12
STANISLAUS	Ceres city	CERES, CITY OF	5010028	100% GW	40943	15	3	5010028-032	Arsenic	10	ug/L	9/8/2010	17	18	12.66	19
								5010028-022	Gross alpha particle activity	15	pCi/L	8/14/2006	7	31.2	24.04	7
								5010028-025	Gross alpha particle activity	15	pCi/L	2/13/2006	5	24.3	22.62	5
								5010028-025	Nitrate (as NO3)	45	mg/L	9/8/2010	35	54	45.45	60
								5010028-022	Uranium	20	pCi/L	6/7/2010	20	39	15.54	55
								5010028-025	Uranium	20	pCi/L	10/6/2010	17	30	25.26	17
STANISLAUS	Grayson CDP	CITY OF MODESTO, DE GRAYSON	5010033	100% GW	1100	2	2	5010033-001	Nitrate (as NO3)	45	mg/L	11/3/2010	177	76.1	52.46	219
								5010033-002	Nitrate (as NO3)	45	mg/L	11/3/2010	184	86.3	59.26	194
STANISLAUS	Hughson city	HUGHSON, CITY OF	5010008	100% GW	6082	6	4	5010008-006	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	11/9/2010	5	0.27	0.12	22
								5010008-003	Arsenic	10	ug/L	3/28/2006	3	17	9.00	25
								5010008-005	Arsenic	10	ug/L	10/14/2010	30	16	13.00	34
								5010008-006	Arsenic	10	ug/L	7/8/2010	15	17	10.50	34
								5010008-007RAW	Arsenic	10	ug/L	10/14/2010	29	26	16.13	32
STANISLAUS	Keyes CDP	KEYES COMMUNITY SERVICES DIST.	5010009	100% GW	4575	4	4	5010009-005	Arsenic	10	ug/L	7/17/2007	3	16	9.84	17
								5010009-006	Arsenic	10	ug/L	10/19/2010	26	18	14.75	26
								5010009-007	Arsenic	10	ug/L	10/19/2010	26	19	12.94	27
								5010009-012RW1	Arsenic	10	ug/L	10/19/2010	26	16	14.12	26
STANISLAUS	Waterford city	CITY OF MODESTO, DE WATERFORD	5010006	100% GW	7897	6	1	5010006-006	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	4/7/2009	22	0.5	0.21	45
STANISLAUS	Bret Harte CDP, Bystrom CDP,	MODESTO, CITY OF	5010010	>50% GW Mixed	212000	75	27	5010010-040	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	4/11/2002	4	0.28	0.11	34

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
	Ceres city, Empire CDP, Modesto city, Shackelford CDP, West Modesto CDP							5010010-151	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	2/5/2004	14	0.67	0.31	22
								5010010-178	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	11/3/2010	41	1.1	0.64	50
								5010010-180	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	4/7/2010	32	0.42	0.25	41
								5010010-184	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	11/3/2010	60	0.91	0.45	64
								5010010-191	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	5/2/2007	15	0.24	0.17	61
								5010010-194	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	2/3/2010	35	0.44	0.21	65
								5010010-051	Arsenic	10	ug/L	9/5/2006	4	14	11.00	6
								5010010-003	Gross alpha particle activity	15	pCi/L	6/6/2007	4	30	14.50	11
								5010010-006	Gross alpha particle activity	15	pCi/L	6/10/2008	2	18	12.23	9
								5010010-008	Gross alpha particle activity	15	pCi/L	6/10/2008	5	17.1	12.50	14
								5010010-018	Gross alpha particle activity	15	pCi/L	6/11/2008	8	21.7	15.43	12
								5010010-019	Gross alpha particle activity	15	pCi/L	6/11/2008	5	28	12.20	13
								5010010-020	Gross alpha particle activity	15	pCi/L	7/8/2004	5	19	13.74	8
								5010010-027	Gross alpha particle activity	15	pCi/L	11/12/2008	12	25.8	13.33	29
								5010010-031	Gross alpha particle activity	15	pCi/L	7/7/2010	4	27.8	11.88	18
								5010010-032	Gross alpha particle activity	15	pCi/L	7/7/2010	3	23.9	11.71	13
								5010010-038	Gross alpha particle activity	15	pCi/L	6/12/2008	8	23.2	15.35	17
								5010010-040	Gross alpha particle activity	15	pCi/L	9/4/2007	8	29.1	19.84	11
								5010010-059	Gross alpha particle activity	15	pCi/L	6/7/2005	2	15.9	11.80	12
								5010010-070	Gross alpha particle activity	15	pCi/L	6/10/2008	2	16	11.63	16
								5010010-135	Gross alpha particle activity	15	pCi/L	6/10/2008	7	40.9	24.90	9
								5010010-146	Gross alpha particle activity	15	pCi/L	9/30/2010	4	27.7	25.30	4
								5010010-147	Gross alpha particle activity	15	pCi/L	6/23/2010	2	19	12.85	11
								5010010-148	Gross alpha particle activity	15	pCi/L	10/19/2005	4	23.96	18.47	5
								5010010-171	Gross alpha particle activity	15	pCi/L	6/16/2010	2	17.2	9.97	11
								5010010-192	Gross alpha particle activity	15	pCi/L	7/5/2006	3	24.2	14.11	8
								5010010-020	Nitrate (as NO3)	45	mg/L	11/16/2007	8	51.4	40.59	14
								5010010-031	Nitrate (as NO3)	45	mg/L	11/17/2010	49	76	34.57	132
								5010010-040	Nitrate (as NO3)	45	mg/L	9/8/2010	4	57	38.64	24
								5010010-059	Nitrate (as NO3)	45	mg/L	8/20/2008	10	50.5	35.85	112
								5010010-135	Nitrate (as NO3)	45	mg/L	11/10/2010	37	73.9	48.71	52
								5010010-192	Tetrachloroethylene (PCE)	5	ug/L	10/6/2010	34	19	6.65	68
								5010010-052	Trichloroethylene (TCE)	5	ug/L	7/7/2010	21	9	5.83	35
								5010010-192	Trichloroethylene (TCE)	5	ug/L	9/8/2009	18	9	3.44	64
								5010010-003	Uranium	20	pCi/L	7/7/2009	4	31.4	14.28	21
								5010010-019	Uranium	20	pCi/L	9/3/2008	2	29	13.48	17
								5010010-027	Uranium	20	pCi/L	11/12/2008	5	25	11.80	40
								5010010-038	Uranium	20	pCi/L	6/12/2008	5	23	13.91	37
								5010010-040	Uranium	20	pCi/L	10/1/2008	13	29	18.14	58
								5010010-135	Uranium	20	pCi/L	8/11/2010	20	37	27.04	23
								5010010-146	Uranium	20	pCi/L	7/22/2004	3	27.8	23.15	4
								5010010-148	Uranium	20	pCi/L	11/6/2002	2	24.1	17.88	5
STANISLAUS	Ceres city	CERES, CITY OF	5010028	100% GW	40943	15	2	5010028-001	Gross alpha particle activity	15	pCi/L	12/14/2004	5	23.6	20.38	6
								5010028-016	Nitrate (as NO3)	45	mg/L	9/18/2007	5	55	29.08	25
								5010028-001	Uranium	20	pCi/L	10/6/2010	21	35.7	23.66	26
STANISLAUS	City of Ceres	CERES WEST MHP	5000077	100% GW	161	1	1	5000077-001	Arsenic	10	ug/L	9/17/2010	17	22	17.42	17
STANISLAUS	City of Hughson	COUNTRY VILLA APTS	5000218	100% GW	30	1	1	5000218-004	Arsenic	10	ug/L	9/30/2010	12	24	20.42	12
STANISLAUS	City of Modesto	COBLES CORNER	5000033	100% GW	50	1	1	5000033-002	Arsenic	10	ug/L	9/2/2010	17	32	13.75	19
STANISLAUS	City of Modesto	TULLY MOBILE ESTATES	5000067	100% GW	40	1	1	5000067-001	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	11/10/2010	8	0.6	0.29	11
STANISLAUS	City of Modesto	COUNTRY WESTERN MOBILE HOME PARK	5000080	100% GW	120	1	1	5000080-003	Arsenic	10	ug/L	10/22/2010	15	31	23.06	15
STANISLAUS	City of Turlock	COUNTRYSIDE MOBILEHOME ESTATES - ADULT P	5000086	100% GW	60	1	1	5000086-001	Arsenic	10	ug/L	10/4/2010	17	16	13.00	18
STANISLAUS	City of Turlock	FAITH HOME TEEN RANCH	5000217	100% GW	50	2	1	5000217-001	Nitrate (as NO3)	45	mg/L	12/1/2010	19	70.5	43.61	39
STANISLAUS	Keyes CDP	MOBILE PLAZA PARK	5000051	100% GW	125	2	1	5000051-001	Arsenic	10	ug/L	9/7/2010	10	15	9.93	15

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
STANISLAUS	Keyes CDP	GREEN RUN MOBILE ESTATES	5000085	100% GW	100	1	1	5000085-002	Arsenic	10	ug/L	9/3/2010	15	19	14.25	16
STANISLAUS	Monterey Park Tract CDP	MONTEREY PARK TRACT COMMUNITY SERVICE DI	5000389	100% GW	186	1	1	5000389-002	Arsenic	10	ug/L	9/1/2010	22	44	33.40	22
								5000389-002	Nitrate (as NO3)	45	mg/L	10/6/2010	4	71.8	28.78	35
STANISLAUS	Riverdale Park CDP	RIVERDALE PARK TRACT COMMUNITY	5000019	100% GW	300	1	1	5000019-003	Gross alpha particle activity	15	pCi/L	6/26/2008	12	24.6	18.87	15
								5000019-003	Uranium	20	pCi/L	3/27/2007	3	21	17.63	12
STANISLAUS	Turlock city	CURTIS INVESTMENTS	5000316	100% GW	42	1	1	5000316-001	Arsenic	10	ug/L	10/21/2010	14	16.1	12.06	15
STANISLAUS	Turlock city	TURLOCK, CITY OF	5010019	100% GW	64215	25	6	5010019-028 M	Arsenic	10	ug/L	7/8/2010	10	11	10.56	17
								5010019-031	Arsenic	10	ug/L	7/7/2010	4	12	9.92	10
								5010019-035	Arsenic	10	ug/L	7/29/2009	5	12	10.25	17
								5010019-038RW3	Arsenic	10	ug/L	12/2/2010	5	12	10.43	9
								5010019-004	Carbon tetrachloride	0.5	ug/L	7/11/2002	5	0.63	0.20	19
								5010019-024	Nitrate (as NO3)	45	mg/L	2/4/2009	4	56.4	32.94	35
STANISLAUS	Undetermined	FOSTER FARMS #5	5000579	100% GW	26	2	1	5000579-001	Gross alpha particle activity	15	pCi/L	7/1/2010	2	24	13.41	8
SUTTER	Live Oak city	CITY OF LIVE OAK	5110001	100% GW	7475	4	4	5110001-003	Arsenic	10	ug/L	11/17/2010	22	19.1	14.07	24
								5110001-004	Arsenic	10	ug/L	11/17/2010	19	43	13.86	24
								5110001-011	Arsenic	10	ug/L	11/17/2010	13	40	25.31	13
								5110001-013	Arsenic	10	ug/L	11/17/2010	11	73	46.91	11
SUTTER	Robbins CDP	SUTTER CO. WWD#1 (ROBBINS)	5100107	100% GW	336	1	1	5100107-004	Arsenic	10	ug/L	11/10/2004	3	43.6	21.45	4
SUTTER	Yuba City city	YUBA CITY GROUNDWATER-REGION 2-3	5110003	100% GW	10200	3	3	5110003-004	Arsenic	10	ug/L	7/13/2010	38	38.48	20.06	40
								5110003-007	Arsenic	10	ug/L	9/8/2010	49	40	24.02	51
								5110003-009	Arsenic	10	ug/L	9/8/2010	39	140	33.71	40
SUTTER	Yuba City city	YUBA CITY GROUNDWATER REGION 1	5115001	100% GW			2	5115001-005	Arsenic	10	ug/L	4/13/2010	41	23.2	16.13	43
								5115001-006	Arsenic	10	ug/L	4/13/2010	32	21.4	12.66	39
SUTTER	Yuba City city	EL MARGARITA MUTUAL WATER CO.	5100102	100% GW	246	1	1	5100102-001	Perchlorate	6	ug/L	4/14/2010	2	6.6	5.55	10
SUTTER	Yuba City city	WILDWOOD MUTUAL WATER COMPANY	5100109	100% GW	255	1	1	5100109-002	Arsenic	10	ug/L	7/5/2010	17	33	26.45	17
SUTTER	Yuba City city	COUNTRY VILLAGE SOUTH MHP	5101006	100% GW	33	1	1	5101006-002	Arsenic	10	ug/L	9/9/2009	3	12	10.55	4
TEHAMA	Los Molinos CDP	LOS MOLINOS COMM. SERVICES DIST.	5210003	100% GW	1500	3	1	5210003-003	Arsenic	10	ug/L	7/21/2010	10	12.5	11.59	10
TEHAMA	Los Molinos CDP	ORCHARD MOBILE HOME PARK	5200550	100% GW	56	2	2	5200550-001	Arsenic	10	ug/L	10/20/2010	17	28	21.88	17
								5200550-002	Arsenic	10	ug/L	10/20/2010	17	20	16.88	17
TEHAMA	Los Molinos CDP	MILLSTREAM MOBILE HOME PARK	5201137	100% GW	53	1	1	5201137-001	Arsenic	10	ug/L	10/20/2010	16	22	17.41	18
TULARE	City of Porterville	LAKE SUCCESS MOBILE LODGE	5400660	100% GW	20	1	1	5400660-001	Nitrate (as NO3)	45	mg/L	10/19/2010	30	76	59.71	33
TULARE	Springville CDP	TRACT 327 MUTUAL WATER CO	5403103	100% GW	24	1	1	5403103-001	Gross alpha particle activity	15	pCi/L	3/9/2007	2	71	64.50	2
								5403103-001	Uranium	20	pCi/L	2/3/2010	2	101	86.00	2
TULARE	Alpaugh	ALPAUGH JOINT POWERS AUTHORITY	5410050	100% GW	910	2	2	5410050-003	Arsenic	10	ug/L	9/3/2008	3	29	10.72	10
								5410050-004	Arsenic	10	ug/L	9/1/2010	17	18	14.25	19
TULARE	City of Bakersville	CWS - MULLEN WATER COMPANY	5400935	100% GW	139	1	1	5400935-001	Perchlorate	6	ug/L	5/6/2008	25	24	5.02	92
TULARE	Cutler CDP	CUTLER PUD	5410001	100% GW	6200	3	1	5410001-004	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	8/3/2010	53	0.36	0.22	91
								5410001-004	Nitrate (as NO3)	45	mg/L	11/19/2009	17	54	37.81	113
TULARE	Dinuba city	DINUBA, CITY OF	5410002	100% GW	21237	8	1	5410002-013	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	6/16/2009	11	0.27	0.16	93
TULARE	East Tulare Villa CDP	CWS - TULCO WATER COMPANY	5410041	100% GW	799	2	1	5410041-002	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	12/1/2004	7	0.3	0.16	101
								5410041-002	Nitrate (as NO3)	45	mg/L	7/8/2010	2	129	34.29	29
TULARE	Exeter city	EXETER, CITY OF	5410003	100% GW	10730	7	2	5410003-002	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	9/11/2009	29	0.53	0.26	43
								5410003-006	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	11/30/2007	5	0.33	0.14	36

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								5410003-006	Perchlorate	6	ug/L	8/5/2010	6	8.3	6.94	7
TULARE	Goshen CDP, Patterson Tract CDP, Visalia city	CWS - VISALIA	5410016	100% GW	133749	74	5	5410016-016	1,2-Dibromo-3-chloropropane (DBCP)	0.2	ug/L	6/16/2009	5	0.24	0.16	107
								5410016-085	Nitrate (as NO3)	45	mg/L	10/12/2010	17	84.887	32.05	148
								5410016-151	Nitrate (as NO3)	45	mg/L	7/10/2002	10	49	28.43	45
								5410016-016	Tetrachloroethylene (PCE)	5	ug/L	10/6/2010	46	7.78	4.94	108
								5410016-037	Tetrachloroethylene (PCE)	5	ug/L	11/14/2010	97	66.61	39.01	106
TULARE	Pine Flat CDP	PINE FLAT WATER COMPANY	5410034	100% GW	200	4	2	5410034-007	Gross alpha particle activity	15	pCi/L	9/23/2010	6	26.9	24.32	6
								5410034-009	Gross alpha particle activity	15	pCi/L	11/21/2006	4	29.1	18.70	5
								5410034-007	Uranium	20	pCi/L	10/22/2010	8	29.7	22.41	10
								5410034-009	Uranium	20	pCi/L	9/22/2009	5	29.5	15.95	9
TULARE	Porterville city	PORTERVILLE DEVELOPMENTAL CENTER	5410801	100% GW	2567	7	2	5410801-006	Nitrate (as NO3)	45	mg/L	9/29/2009	33	100	54.11	58
								5410801-009	Nitrate (as NO3)	45	mg/L	9/1/2009	114	81	57.99	145
TULARE	Richgrove CDP	RICHGROVE COMMUNITY SERVICES DISTRICT	5410024	100% GW	3330	2	1	5410024-004	Arsenic	10	ug/L	7/20/2010	11	17	10.41	18
TULARE	Strathmore, Porterville	STRATHMORE PUBLIC UTIL DIST	5410012	Mixed <50%GW	1904	1	1	5410012-002	Nitrate (as NO3)	45	mg/L	11/8/2010	198	83	65.8838384	193
TULARE	City of Porterville	DEL ORO RIVER ISLAND SERV TERR #1	5400665	100% GW	810	14	6	5400665-002	Gross alpha particle activity	15	pCi/L	9/28/2010	6	60.4	41.52	6
								5400665-005	Gross alpha particle activity	15	pCi/L	9/28/2010	6	49.9	36.44	8
								5400665-008	Gross alpha particle activity	15	pCi/L	10/23/2008	6	25.3	19.70	7
								5400665-018	Gross alpha particle activity	15	pCi/L	9/28/2010	2	15.6	10.14	9
								5400665-021	Gross alpha particle activity	15	pCi/L	6/17/2010	5	28.2	15.18	9
								5400665-025	Gross alpha particle activity	15	pCi/L	6/17/2010	7	25.6	20.98	8
								5400665-002	Nitrate (as NO3)	45	mg/L	7/21/2009	12	99	46.70	28
								5400665-005	Nitrate (as NO3)	45	mg/L	9/21/2005	4	64.1	37.18	23
								5400665-002	Uranium	20	pCi/L	10/26/2010	14	55.2	31.26	16
								5400665-005	Uranium	20	pCi/L	10/26/2010	5	44.8	25.38	8
								5400665-008	Uranium	20	pCi/L	9/28/2010	7	23.4	19.03	12
								5400665-025	Uranium	20	pCi/L	3/22/2010	3	24.2	19.37	6
TULARE	City of Springville	DEL ORO RIVER ISLAND SERV TERR #2	5402048	100% GW	87	2	2	5402048-002	Gross alpha particle activity	15	pCi/L	10/13/2008	2	56.4	20.09	6
								5402048-001	Nitrate (as NO3)	45	mg/L	6/17/2010	6	85	39.13	26
								5402048-002	Nitrate (as NO3)	45	mg/L	6/17/2010	14	105	74.00	20
								5402048-002	Uranium	20	pCi/L	10/13/2008	2	55.8	21.43	6
TULARE	City of Dinuba	EL MONTE VILLAGE M H P	5400523	100% GW	100	1	1	5400523-001	Nitrate (as NO3)	45	mg/L	11/22/2010	14	77.9	45.37	29
TULARE	City of Dinuba	GLEANINGS FOR THE HUNGRY	5402047	100% GW	31	3	1	5402047-001	Nitrate (as NO3)	45	mg/L	10/11/2010	24	115	83.14	26
TULARE	City of Porterville	BEVERLY GRAND MUTUAL WATER	5400651	100% GW	108	1	1	5400651-001	Nitrate (as NO3)	45	mg/L	5/7/2010	18	91	69.39	18
TULARE	City of Porterville	FAIRWAYS TRACT MUTUAL	5400663	100% GW	250	1	1	5400663-002	Gross alpha particle activity	15	pCi/L	10/25/2005	2	19	13.06	5
								5400663-002	Nitrate (as NO3)	45	mg/L	11/13/2009	8	148	105.61	9
TULARE	City of Porterville	SIERRA MUTUAL WATER CO	5403110	100% GW	39	2	2	5403110-001	Nitrate (as NO3)	45	mg/L	11/23/2009	4	100	96.75	4
								5403110-002	Nitrate (as NO3)	45	mg/L	6/19/2008	3	110	77.50	4
TULARE	City of Springville	TRIPLE R MUTUAL WATER CO	5400670	100% GW	400	10	6	5400670-002	Gross alpha particle activity	15	pCi/L	9/21/2004	6	20.5	16.73	7
								5400670-004	Gross alpha particle activity	15	pCi/L	10/20/2008	2	18.3	13.16	7
								5400670-005	Gross alpha particle activity	15	pCi/L	10/20/2008	3	17.7	15.13	7
								5400670-006	Gross alpha particle activity	15	pCi/L	10/20/2008	6	25	19.92	6
								5400670-008	Gross alpha particle activity	15	pCi/L	12/16/2003	2	16.1	10.73	7
								5400670-001	Nitrate (as NO3)	45	mg/L	10/4/2010	25	61	54.06	27
								5400670-006	Nitrate (as NO3)	45	mg/L	10/4/2010	26	70.9	56.26	27

Table 8.1

List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								5400670-006	Uranium	20	pCi/L	10/20/2008	2	22.3	20.20	4
TULARE	City of Tulare	ALLENSWORTH C S D	5400544	100% GW	400	2	2	5400544-002	Arsenic	10	ug/L	11/30/2010	8	13	11.30	10
								5400544-003	Arsenic	10	ug/L	11/30/2010	3	13	9.25	8
TULARE	City of Tulare	SOULTS MUTUAL WATER CO	5400805	100% GW	100	1	1	5400805-001	Gross alpha particle activity	15	pCi/L	11/20/2007	6	35.5	24.35	6
								5400805-001	Nitrate (as NO3)	45	mg/L	9/2/2010	23	118	76.14	24
								5400805-001	Uranium	20	pCi/L	11/20/2007	4	36.9	34.00	4
TULARE	City of Visalia	WOODVILLE FARM LABOR CENTER	5400792	100% GW	725	2	1	5400792-001	Nitrate (as NO3)	45	mg/L	3/17/2009	5	52	27.27	49
TULARE	Ducor CDP	DUCOR CSD	5400542	100% GW	850	2	1	5400542-004	Nitrate (as NO3)	45	mg/L	1/5/2009	2	48	23.79	7
TULARE	East Orosi CDP	EAST OROSI CSD	5401003	100% GW	700	2	2	5401003-001	Nitrate (as NO3)	45	mg/L	2/10/2010	6	61.3	38.50	25
								5401003-002	Nitrate (as NO3)	45	mg/L	2/10/2010	6	59.9	39.68	26
TULARE	Ivanhoe CDP	IVANHOE PUBLIC UTILITY DIST	5410019	100% GW	4474	4	1	5410019-007	Nitrate (as NO3)	45	mg/L	6/24/2008	3	52	33.49	37
TULARE	Lemon Cove CDP	LEMON COVE WATER CO	5400616	100% GW	200	1	1	5400616-001	Nitrate (as NO3)	45	mg/L	8/26/2010	16	57.3	51.81	17
TULARE	Matheny CDP	PRATT MUTUAL WATER CO	5410033	100% GW	1500	2	2	5410033-001	Arsenic	10	ug/L	10/14/2010	7	21	15.00	8
								5410033-003	Arsenic	10	ug/L	10/14/2010	8	15	11.87	12
TULARE	Orosi CDP	OROSI PUBLIC UTILITY DISTRICT	5410008	100% GW	7318	4	1	5410008-008	Nitrate (as NO3)	45	mg/L	3/10/2003	2	50	29.27	37
TULARE	Pixley CDP	PIXLEY PUBLIC UTIL DIST	5410009	100% GW	2793	4	3	5410009-001	Arsenic	10	ug/L	10/18/2010	13	27	23.54	13
								5410009-005	Arsenic	10	ug/L	10/18/2010	12	24	19.15	13
								5410009-006	Arsenic	10	ug/L	4/29/2010	10	24	13.92	13
TULARE	Plainview CDP	CENTRAL WATER CO	5400682	100% GW	170	1	1	5400682-001	Nitrate (as NO3)	45	mg/L	6/11/2010	2	52	33.20	5
TULARE	Porterville city	AKIN WATER CO	5401038	100% GW	50	2	2	5401038-001	Gross alpha particle activity	15	pCi/L	3/12/2007	2	17.2	14.85	4
								5401038-002	Gross alpha particle activity	15	pCi/L	3/12/2007	2	17.8	14.10	3
								5401038-001	Nitrate (as NO3)	45	mg/L	2/8/2006	3	50	41.30	10
TULARE	Rodriguez Camp CDP	RODRIGUEZ LABOR CAMP	5400735	100% GW	110	1	1	5400735-001	Nitrate (as NO3)	45	mg/L	3/4/2010	7	130	125.86	7
TULARE	Seville CDP	SEVILLE WATER CO	5400550	100% GW	400	1	1	5400550-001	Nitrate (as NO3)	45	mg/L	12/14/2009	2	46	43.83	6
TULARE	Three Rivers CDP	SEQUOIA RV RANCH	5400629	100% GW	22	1	1	5400629-002	Arsenic	10	ug/L	9/8/2009	13	49	17.00	14
								5400629-002	Gross alpha particle activity	15	pCi/L	7/30/2007	4	22.9	18.32	5
								5400629-002	Uranium	pCi/L	ug/L	3/21/2008	4	26.13	21.93	5
TULARE	Three Rivers CDP	SO KAWEAH MUTUAL WATER CO	5400754	100% GW	300	3	3	5400754-001	Arsenic	10	ug/L	5/27/2010	7	19	9.72	18
								5400754-002	Arsenic	10	ug/L	11/4/2009	9	17	11.18	22
								5400754-003	Arsenic	10	ug/L	8/31/2010	15	98	19.38	21
TULARE	Tooleville CDP	TOOLEVILLE WATER COMPANY	5400567	100% GW	300	2	2	5400567-001	Nitrate (as NO3)	45	mg/L	11/29/2006	3	67.1	46.04	9
								5400567-002	Nitrate (as NO3)	45	mg/L	6/5/2009	5	68	42.06	12
TULARE	Traver CDP	TRAVER WATER LLC	5400553	100% GW	500	3	1	5400553-001	Nitrate (as NO3)	45	mg/L	2/4/2009	2	58.7	24.21	18
TULARE	Visalia city	WESTLAKE VILLAGE M H P	5400966	100% GW	350	1	1	5400966-001	Nitrate (as NO3)	45	mg/L	10/12/2010	4	51	43.79	19
TULARE	Yettem CDP	YETTEM WATER SYSTEM	5403043	100% GW	350	2	1	5403043-001	Nitrate (as NO3)	45	mg/L	4/2/2010	24	67	42.34	71
TUOLUMNE	Mono Village	TUD - MONO VILLAGE WATER SYSTEM	5510019	Mixed <50%GW	649	2	1	5510019-002	Arsenic	10	ug/L	12/6/2006	2	23	11.475	2
TUOLUMNE	Standard City	BLUEBELL VALLEY MWC	5500040	100% GW	230	4	1	5500040-005	Gross alpha particle activity	15	pCi/L	7/26/2010	2	22.5	13.01	7
TUOLUMNE	Scenic View, Scenic Brook	TUD-SCENIC VIEW/SCENIC BROOK	5510033	Mixed <50%GW	625	2	1	5510033-001	Gross alpha particle activity	15	pCi/L	4/15/2010	4	23	16.3875	4
VENTURA	City of Fillmore	SAN CAYETANO MUTUAL WATER CO	5601116	100% GW	45	4	1	5601116-001	Nitrate (as NO3)	45	mg/L	10/26/2006	2	51	28.34	14
VENTURA	City of Santa Paula	SOUTH MOUNTAIN MUTUAL WATER CO	5601141	100% GW	45	1	1	5601141-001	Gross alpha particle activity	15	pCi/L	9/3/2010	2	29.7	14.99	5
VENTURA	El Rio CDP	RIO MANOR MUTUAL WATER CO	5610035	100% GW	1500	2	2	5610035-001	Gross alpha particle activity	15	pCi/L	7/14/2005	4	23.3	11.73	17
								5610035-002	Gross alpha particle activity	15	pCi/L	7/14/2005	2	21.21	10.68	9

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
								5610035-001	Uranium	pCi/L	ug/L	11/11/2004	3	33.3	12.49	16
VENTURA	San Buenaventura (Ventura) city	SATICOY COUNTRY CLUB-CITY OF VENTURA	5602140	100% GW	150	2	1	5602140-001	Gross alpha particle activity	15	pCi/L	7/12/2010	5	16.7	14.50	6
VENTURA	El Rio CDP	UNITED WTR CONS DIST	5610046	100% GW	0	8	5	5610046-006	Nitrate (as NO3)	45	mg/L	2/16/2010	50	124	21.29	394
								5610046-007	Nitrate (as NO3)	45	mg/L	9/18/2008	3	53.4	16.10	420
								5610046-008	Nitrate (as NO3)	45	mg/L	9/25/2008	2	86.7	13.74	430
								5610046-009	Nitrate (as NO3)	45	mg/L	12/29/2009	2	48.4	9.03	429
								5610046-013	Nitrate (as NO3)	45	mg/L	3/8/2010	28	75.2	19.48	415
VENTURA	Camarillo city	CAMARILLO WATER DEPT	5610019	>50% GW Mixed	44831	4	2	5610019-005	Gross alpha particle activity	15	pCi/L	12/7/2009	3	20.4	17.70	4
								5610019-007	Gross alpha particle activity	15	pCi/L	1/15/2008	2	19.2	10.81	6
VENTURA	Camarillo city, Santa Rosa Valley CDP	CAMROSA WATER DISTRICT	5610063	>50% GW Mixed	30000	6	4	5610063-011	Gross alpha particle activity	15	pCi/L	1/22/2004	2	33.7	8.59	9
								5610063-001	Nitrate (as NO3)	45	mg/L	2/27/2009	35	133	98.73	36
								5610063-006	Nitrate (as NO3)	45	mg/L	12/5/2008	33	139	101.24	34
								5610063-007	Nitrate (as NO3)	45	mg/L	12/2/2010	4	83.7	66.93	4
								5610063-011	Nitrate (as NO3)	45	mg/L	3/22/2007	24	71	48.62	40
VENTURA	Mira Monte CDP	TICO MUTUAL WATER CO	5601122	>50% GW Mixed	95	1	1	5601122-001	Nitrate (as NO3)	45	mg/L	9/28/2010	269	64	48.62	429
VENTURA	Mira Monte CDP	VENTURA RIVER CWD	5610022	>50% GW Mixed	6400	5	1	5610022-006	Nickel	100	ug/L	11/24/2009	6	605	251.44	5
VENTURA	Oxnard city	OXNARD WATER DEPT	5610007	>50% GW Mixed	192000	12	5	5610007-038	Gross alpha particle activity	15	pCi/L	9/1/2010	6	24.8	21.48	6
								5610007-021	Nitrate (as NO3)	45	mg/L	11/7/2007	15	58.9	35.01	50
								5610007-037	Nitrate (as NO3)	45	mg/L	6/2/2010	10	53	45.31	17
								5610007-038	Nitrate (as NO3)	45	mg/L	4/7/2010	13	200	61.35	25
								5610007-039	Nitrate (as NO3)	45	mg/L	12/1/2010	90	76	59.58	92
								5610007-041	Nitrate (as NO3)	45	mg/L	3/11/2009	10	60	30.13	55
VENTURA	Moorpark, Piru, Bell Canyon, Somis, North Coast, Nyeland Acres, El Rio, Camarillo Airport, Lake Sherwood, Todd Road Jail	VENTURA WATER DEPARTMENT	5610017	Mixed <50%GW	107490	9	1	5610017-031	Gross alpha particle activity	15	pCi/L	9/16/2010	11	27.6	13.3852381	11
								5610017-031	Uranium	20	pCi/L	9/15/2008	5	25.9	15.4341176	5
VENTURA	Ojai, Upper Ojai, Ventura River Valley, Ventura, Rincon	CASITAS MUNICIPAL WATER DIST	5610024	Mixed <50%GW	65000	1	1	5610024-003	Nitrate (as NO3)	45	mg/L	12/6/2010	52	97	63.412963	52
VENTURA	Oxnard, Port Hueneme, Point Mugu, Camarillo, Newbury Park, Thousand Oaks, Noorpark, Simi, Lake Bard, Westlake	CALLEGUAS MUNICIPAL WATER DIST	5610050	Mixed <50%GW	0	18	5	5610050-006	Gross alpha particle activity	15	pCi/L	11/20/2008	2	27.1	15.0866667	2
								5610050-009	Gross alpha particle activity	15	pCi/L	2/21/2008	3	28.4	13.1944444	3
								5610050-017	Gross alpha particle activity	15	pCi/L	5/18/2009	3	21.3	12.3685556	3
								5610050-022	Gross alpha particle activity	15	pCi/L	11/15/2010	3	37.6	15.3811111	3
								5610050-009	Uranium	20	pCi/L	8/9/2006	2	26.4	11.7166667	2
								5610050-017	Uranium	20	pCi/L	5/18/2009	2	25.5	12.6802222	2
VENTURA	Oxnard	VINEYARD AVE ESTATES MWC	5610056	Mixed <50%GW	1200	1	1	5610056-002	Nitrate (as NO3)	45	mg/L	10/4/2010	22	93.9	30.3126316	22
VENTURA	Simi	GOLDEN STATE WATER COMPANY - SIMI	5610059	Mixed <50%GW	42717	2	2	5610059-001	Gross alpha particle activity	15	pCi/L	7/8/2009	2	20.9	10.728	2
								5610059-001	Nitrate (as NO3)	45	mg/L	12/1/2010	47	74	56.4211538	47
								5610059-002	Nitrate (as NO3)	45	mg/L	9/1/2010	21	63	41.5794118	21
YOLO	Woodland city	CITY OF WOODLAND	5710006	100% GW	56000	24	1	5710006-019	Nitrate (as NO3)	45	mg/L	2/28/2002	3	51	26.53	31
YOLO	Woodland city	WILD WINGS GOLF COMMUNITY	5710011	100% GW	1187	2	1	5710011-001	Arsenic	10	ug/L	8/13/2009	8	15	10.01	20
YOLO	Madison CDP	MADISON SERVICE DIST	5700571	100% GW	876	4	1	5700571-002	Nitrate (as NO3)	45	mg/L	4/15/2003	3	50	32.00	10
YUBA	Linda CDP, Olivehurst CDP	LINDA COUNTY WATER DISTRICT	5810002	100% GW	10000	6	1	5810002-007	Benzene	1	ug/L	9/1/2010	62	11	1.39	102
YUBA	City of Marysville	COUNTRY VILLAGE MOBILE HM PRK	5800824	100% GW	30	1	1	5800824-001	Arsenic	10	ug/L	9/25/2007	4	15	13.00	4
YUBA	City of Olivehurst	FEATHER RIVER MANOR	5800851	100% GW	35	1	1	5800851-001	Nitrate (as NO3)	45	mg/L	6/24/2009	5	58.5	44.16	8

Table 8.1
List of Community Water Systems that Rely on a Contaminated Groundwater Source for Drinking Water

County	Primary City	Public Water System Name	PWS Number	Source of PWS Supply	Population Served	System Wells	Wells with Princ. Cont.	Well Number	Princ. Contaminant	MCL	Units	Most Recent Det. >MCL	Det. >MCL	Max Conc.	Avg. Conc.	Sampling Events
YUBA	Linda CDP	CHRISTOPHER SIMS RENTALS	5800852	100% GW	30	1	1	5800852-001	Nitrate (as NO3)	45	mg/L	6/13/2006	3	50.9	25.43	10
YUBA	Olivehurst CDP	GEORGE AVENUE APARTMENTS	5800878	100% GW	40	1	1	5800878-001	Arsenic	10	ug/L	3/24/2010	8	34.9	13.98	9