Safe Drinking Water Plan for California

REPORT TO THE LEGISLATURE

In Compliance with Health & Safety Code Section 116365

STATE WATER RESOURCES CONTROL BOARD

June 2015

CALIFORNIA Water Boards

STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS

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ABBREVIATIONS AND ACRONYMS

1,2,3-TCP	1,2,3-Trichloropropane
AB	Assembly Bill
ACR	Annual Compliance Report
ANSI	American National Standards Institute
AWWA	American Water Works Association
BASIC	Bay Area Security Information Collaborative (BASIC)
BWN	Boil Water Notice
CAHAN	California Health Alert Network
CalEPA	California Environmental Protection Agency
CAMAL Net	California Mutual Aid Laboratory Network
CCR	California Code of Regulations
CCR	Consumer Confidence Report
CDHS	California Department of Health Services
CDPH	California Department of Public Health
CEC	Constituents of Emerging Concern
CEHTP	California Environmental Health Tracking Program
CERC	Crisis Emergency Risk Communication
CSD	Community Services District
CSTI	California Specialized Training Institute
CWS	Community Water Systems
DBCP	1,2-Dibromo-3-chloropropane
DBP	Disinfection Byproduct
DBPR	Disinfection and Disinfection Byproduct Rule
DDW	Division of Drinking Water, State Water Resources Control Board
DE	Diatomaceous Earth
DEODC	Division of Environmental and Occupational Disease Control
DFA	Division of Financial Assistance, State Water Resources Control Board
DFW	Department of Fish and Wildlife
DHCD	Department of Housing and Community Development
DHS	Department of Homeland Security
DOC	Division of Corporations
DPR	Department of Pesticide Regulation
DWQ	Division of Water Quality, State Water Resources Control Board
DWR	Department of Water Resources
DWSAP	Drinking Water Source Water Assessment Program
DWSRF	Drinking Water State Revolving Fund
DWW	Drinking Water Watch
e-AR	Electronic Annual Report
ED	Electrodialysis
EDB	Ethylene dibromide
EDT	Electronic Data Transfer
EHIB	Environmental Health Investigations Branch
ELAP	Environmental Laboratory Accreditation Program
EOC	Emergency Operations Center

EPIC	Environmental Protection Indicators in California
ERNIE	Emergency Response Network Inland Empire
ERP	Emergency Response Plan
FA	Funding Agreement
FEMA	Federal Emergency Management Agency
GAMA	Groundwater Ambient Monitoring and Assessment Program
GC/MS	Gas Chromatography/Mass Spectrometry
GIS	Geographical Information System
GRP	Groundwater Replenishment Project
HAA5	Haloacetic Acids (five)
HPC	Heterotrophic bacteria
H&S Code	Health and Safety Code
HUD	Department of Housing and Urban Development
ICE	Information Center for the Environment
ICS	Incident Command System
IESWTR	Interim Enhanced Surface Water Treatment Rule
IRWM	Integrated Regional Water Management
ISAC	Information Sharing and Analysis Center
IX	Ion Exchange
LAFCOs	Local Agency Formation Commissions
LCR	Lead and Copper Rule
LEHJ	Local Environmental Health Jurisdiction
LEJ	Local Enforcement Jurisdiction
LPA	Local Primacy Agency
LT	Long-Term
MCL	Maximum Contaminant Level
MHP	Mobile Home Park
M/R	Monitoring and Reporting
MRDL	Maximum Residual Disinfectant Level
MRS	Municipal Service Review
MTBE	Methyl tertiary butyl ether
NDMA	N-Nitrosodimethylamine
NIMS	National Incident Management System
NO3	Nitrate
NO2-N	Nitrite-Nitrogen
NO3-N	Nitrate-Nitrogen
NTNCWS	Nontransient Noncommunity Water System
OEHHA	Office of Environmental Health Hazard Assessment
OES	Governor's Office of Emergency Services
OU	Operable Unit
PCE	Perchloroethylene (tetrachloroethylene)
PHG	Public Health Goal
PICME	Permits, Inspections, Compliance, Monitoring, and Enforcement
POE	Point of Entry
POU	Point of Use
PPD	Presidential Policy Directive

PUC	Public Utilities Commission
PWS	Public Water System (see Appendix 2 for definition)
RO	Reverse Osmosis
SB	Senate Bill
SC	Service Connection
SCADA	Supervisory Control and Data Acquisition
SCWS	Small Community Water Systems
SDWA	Safe Drinking Water Act
SEMS	Standardized Emergency Management System
SDWIS	Safe Drinking Water Information System
SUVA	Specific Ultraviolet Absorption
SWS	Small Water System
SWTR	Surface Water Treatment Rule
TCA	Trichloroethane
TCE	Trichloroethylene
TCR	Total Coliform Rule
THMs	Trihalomethanes
TIC	Toxic Industrial Chemical
TMF	Technical, Managerial, and Financial (refers to PWS's capacity)
TNCWS	Transient Noncommunity Water System
TTHMs	Total Trihalomethanes
UCMR	Unregulated Chemicals for which Monitoring is Required
USEPA	U.S. Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
UV	Ultraviolet
VA	Vulnerability Assessment
WARN	Water/Wastewater Agency Response Network
WCIT	Water Contaminant Information Tool
WQI	Water Quality Inquiry
WQM	Water Quality Monitoring

EXECUTIVE SUMMARY

BACKGROUND

In 1993, the California Department of Health Services (CDHS) (now the California Department of Public Health (CDPH) submitted to the Legislature the report entitled, "Drinking Water into the 21st Century: Safe Drinking Water Plan for California" (1993 Plan). In 1996, the California Legislature enacted Senate Bill (SB) 1307 (Chapter 755, Statutes of 1996). SB 1307 amended Health and Safety (H&S) Code Section 116355 to require a periodic update of the original Plan. The issues that were to be addressed were essentially the same as those included in the 1993 Plan. CDPH assembled a team of experts that conducted extensive reviews and analyses, resulting in a draft plan that included an overview of drinking water regulation, reviews and plans for drinking water quality/monitoring and threats, treatment technologies, funding aspects and financial assistance, and a focus on the challenges faced by small drinking water systems. Following the July 1, 2014 transition of the Drinking Water Program to the State Water Board, the draft plan's recommendations and implementation plan has been enhanced based on the synergies and resources resulting from incorporation of the program into the State Water Board.

California continues to be dependent on a mixture of surface water and groundwater supplies for drinking water. The degree to which each type of supply is used in a given year is dependent upon the region of the state, water needs, water resource availability, and climatologic conditions within the state. During periods of normal to high rainfall, surface water sources make up a higher percentage of the overall drinking water supplies across the state. However, during periods of lower than average rainfall, use of groundwater increases and surface water supplies are strained. As California's population has grown since the 1993 Plan was published, the demand on the State's limited water resources have increased. To meet this demand, many public water systems (PWS) have promoted conservation measures as well as looked to other potential sources of supply such as recycled water and desalination.

Mirroring the regulatory scope of the Division of Drinking Water, the scope of this Plan focuses on the state's public water systems (PWS), as defined in Health and Safety Code 116275(h). These are systems that either have (a) 15 or more service connections or (b) systems that serve at least 25 individuals daily at least 60 days out of the year. There are currently more than 7,600 PWS in the state. This is a significant reduction from the more than 10,000 that were in existence in 1993. However, California's population has grown from approximately 29 million to over 38 million. Of those 7,600 PWS, approximately seven percent serve communities with more than 10,000 service connections (approximately 33,000 people). The majority of PWS serve smaller communities with more than 63 percent of PWS serving communities with less than 200 service connections (approximately 660 people). Many of the small PWS are challenged

by lack of technical, managerial, and financial (TMF) capacity; many do not serve drinking water that meets standards ("safe drinking water").

In 2012, California became the first state to enact a Human Right to Water law, AB 685 (Chapter 524, Statutes of 2012). Public policy continues to be focused on the right of every human being to have safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitation. Water supply, contaminants, costs of treatment and distribution systems, the number and nature of small PWSs, especially in disadvantaged communities, and many other factors will continue to challenge progress in addressing the Human Right to Water. The State Water Board is committed to actively pursuing initiatives to address the Human Right to Water, beginning with the state's residents who are served by PWS but who do not receive safe drinking water.

REGULATION OF DRINKING WATER

Until July 2014, the regulation of drinking water was primarily the responsibility of CDPH This responsibility has now been transferred to the State Water Resources Control Board (State Water Board), which receives the majority of its statutory authority from the California H&S Code. However, the regulation of water supply, water quality[1], and the various types of water systems that serve drinking water remains fragmented in California. There are several state agencies that have a role in regulating certain types of PWS, including PWS formation, design, construction, and how they operate, including the rates that they can charge their customers. Along with the regulation of drinking water, the State Water Board and the Regional Water Quality Control Boards (Regional Water Boards; collectively the "Water Board") are responsible for protecting the waters of the state, including drinking water sources, both surface water and groundwater supplies. The Department of Pesticide Regulation is responsible for ensuring that pesticides do not pollute groundwater. In addition to the State Water Board's role in ensuring that drinking water standards are protective of public health, the Office of Environmental Health Hazard Assessment (OEHHA) is responsible for providing the State Water Board with health-based risk assessments for contaminants – these assessments are used to develop primary drinking water standards. The California Public Utilities Commission shares regulatory responsibility for ensuring the quality of water supplied by investor-owned water utilities subject to its jurisdiction.

The principal federal agency involved in drinking water regulation is the U.S. Environmental Protection Agency (USEPA). USEPA is responsible for implementing federal drinking water law, setting national drinking water requirements, and overseeing the State Water Board's enforcement of the federal law.

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[1] The term "water quality" as used in the Executive Summary refers to drinking water quality

Local agencies also have a role in drinking water regulation both through direct oversight of certain PWS and through activities that affect a PWS service area. Local county health departments can be delegated the authority to regulate small PWS serving less than 200 service connections. In addition to other functions, Local Agency Formation Commissions oversee the expansion of service areas of public agencies that are PWS and can review to determine if an agency is providing municipal services in a satisfactory manner, including the delivery of safe drinking water.

WATER QUALITY AND REGULATORY COMPLIANCE

The DDW has been successful in ensuring that, at any given time, more than 98 percent of California's drinking water consumers served by PWS receive drinking water that meets federal and state drinking water standards ("safe drinking water"). However, still too many Californians do not receive safe drinking water. Those who are served by domestic wells or by water systems that are not PWS are outside the scope of the current regulatory program; these wells and water systems are not addressed in this Plan. The State Water Board will look for future opportunities to partner with local agencies as they address the drinking water needs of those residents who are not served by PWS. More immediately, many residents who are served by PWS – often paying high and unaffordable rates -- still do not receive safe drinking water. The State Water Board will pursue initiatives to ensure that California's small PWS customers receive affordable, safe, and reliable drinking water.

There are various categories of water quality contaminants identified in the 1993 Plan that remain a serious issue in California. In addition, new MCLs have been developed since then to address specific contaminants. In general, PWS with adequate Technical, Managerial and Financial capacity have been able to address drinking water quality contamination issues and concerns in a much more timely and complete manner than PWS without adequate TMF capacity. Some of the contamination issues and categories are as follows:

- Chemical contaminants that were discussed as issues in the 1993 Plan. These included including industrial chemicals, pesticides, and water-treatment byproducts.
- More recently recognized contaminants, such as perchlorate, MTBE, *Giardia*, and *Cryptosporidium*,
- Various other emerging contaminants for which MCLs will likely be adopted including 1,2,3-TCP, and NDMA.
- Standards for some regulated chemicals, such as hexavalent chromium, arsenic and disinfection byproducts, have been newly established or have become more stringent.
- Constituents of Emerging Concern, such as pharmaceuticals and personal health care products, are the next group of chemicals that may require regulation.

Although the vast majority of Californians are served drinking water that meets water quality standards, many small water systems, both those that serve residential communities as well as noncommunity facilities, such as places of employment and schools with their own water supply, struggle to achieve compliance. For small water systems that use groundwater sources, certain chemical and radionuclide contaminants, namely arsenic, nitrate, and uranium, have posed significant compliance problems. For small water systems that use surface water sources, compliance with the Surface Water Treatment Rule and the standards for disinfection byproducts pose the greatest challenge. Treatment technologies to address these water quality issues are available. However, while some financing may be available to build or upgrade treatment facilities, the cost to operate and maintain these facilities is generally beyond the technical, financial, and managerial (TMF) capacity of many small water systems, particularly those that serve disadvantaged communities. Taken together, these limitations result in serious challenges to the ability of small water systems to provide drinking water that meets water quality standards.

DRINKING WATER INFORMATION SYSTEMS

Since the 1993 Plan, a comprehensive database on drinking water quality has been developed including electronic data reporting of analytical results by environmental laboratories, which has allowed for the expeditious review of PWS compliance monitoring results and better public health protection. State agencies have made great strides in the sharing of water quality data. PWS's water quality data are used by several agencies, including the Department of Water Resources, the Department of Pesticide Regulation, and USEPA. State agencies are also making water quality data available to the public. The State Water Board has developed public portals that not only allow the public to access drinking water quality data but also to obtain other information about the water systems that serve them.

The State Water Board uses a data information system to track permits, inspections, compliance, monitoring, and enforcement (PICME) actions associated with individual water systems. PICME is being replaced by the federal Safe Drinking Water Information System (SDWIS) that will have the same functions as PICME and will allow for the seamless reporting of data to USEPA as required by federal law.

DRINKING WATER FINANCING

Over the last two decades, water costs have, on average, increased about 45 percent within all size groups of water systems (range of 42 to 47 percent). Average water costs remain highest in the San Francisco Bay Area, Central Coast, and Southern California, and lowest in the Central Valley/Agricultural (including Imperial County), Foothill, and Mountain/Desert regions. On average, customers of small water systems (PWS serving less than 200 service connections) pay approximately 20 percent more for water than those customers served by larger systems. Many disadvantaged communities are

served by small water systems. As a result, water affordability has become a significant issue among residents in these communities.

Over the past two decades a significant investment has been made at the federal and state level to provide funding for water system infrastructure improvements intended to achieve compliance with regulatory requirements. The federal/state Drinking Water State Revolving Fund, the American Recovery and Reinvestment Act, and the State Propositions 50 and 84 have combined to provide approximately two billion dollars to eligible water systems. And some of this funding has been specifically allocated to grants for disadvantaged communities. At the same time, in Fiscal Year 2011-12, the unfunded demand by eligible water systems was more than 12 billion dollars.

DRINKING WATER SECURITY

The drought that continues into 2014 and the early effects of climate change, along with the events of September 11, 2001, demonstrate the importance of ensuring the reliability of high quality drinking water sources and the need to prevent deliberate contamination of drinking water supplies. The 2014 State Water Action Plan announced by the Governor in January is a comprehensive strategy to address the issues of drinking water source reliability. Over the past decade state and federal agencies, and water systems have collaborated in developing strategies and implementing programs to ensure the security of drinking water supplies from deliberate contamination. These collaborative efforts are ongoing.

PROBLEMS AND SOLUTIONS

Small water systems continue to have the largest proportion of water quality problems and the highest rate of noncompliance with drinking water standards. In particular, small water systems serving between 15 and 200 service connections have the greatest noncompliance rates, especially those that serve disadvantaged communities. Although there are state and federal funding sources available to make capital improvements for treatment facilities to bring them into compliance, small water systems may lack the TMF capacity to operate and maintain the facilities. In addition, this report recognizes that land use planning is important in controlling the proliferation of new nonviable small water systems, as well as addressing those areas with poor water quality not served by a public water system. This report also provides recommendations for creation of viable systems through consolidation or regionalization of water systems that serve disadvantaged communities.

Meeting the safe drinking water needs of all Californians will require a multi-agency effort at the state and local level. California's population has increased from approximately 30 million in 1993 to about 38 million by January 2013. Housing also continues to grow with an increase in housing units of 27 percent from 2011 to 2012. The current drought also highlights the fact that water resource availability has a direct impact on the provision of

safe drinking water. The state needs to ensure that the quality of drinking water supplies is protected and that new sources are identified to meet the demands of California's increasing population.

The State Water Board is committed to actively pursuing initiatives to address the Human Right to Water, beginning with the state's residents who are served by PWS but who do not receive safe drinking water. The State Water Board recognizes that to fulfill the Human Right to Water in California, every resident should have access to affordable, safe drinking water regardless of the water system size. Provided data become available on this topic, in a future update of the Safe Drinking Water Plan the Water Board could expand the scope to include systems below 15 service connections, but to do that would require new and expanded authority, significantly more resources, as well as commitment and involvement of other local and state agency partners. At this time, this report contains 32 practical recommendations in 9 areas that would expand the State Water Board's efforts to bring a greater number of systems into compliance and contribute to realizing the Human Right to Water in California. Each chapter provides a background discussion covering the areas mandated by the Legislature including a description of problems and issues and a set of conclusions and recommendations with the basis and justification for them. A detailed five-year implementation plan addressing the major recommendations is provided in Appendix 10.

CHAPTER 1. INTRODUCTION

1.1. REQUIREMENT FOR REPORT

In 1989, the California Legislature enacted Assembly Bill (AB) 21 (Chapter 823, Statutes of 1989). Among other things, AB 21 directed the CDHS to undertake a comprehensive assessment of drinking water in California: its quality and safety, types of problems, overall health risks, current and projected costs, and current regulatory programs. From this assessment, CDHS was directed to develop a plan containing specific recommendations to resolve any problems and improve the overall quality and safety of California's drinking water.

In 1993, CDHS (now CDPH) completed and submitted to the Legislature the report entitled, "Drinking Water into the 21st Century: Safe Drinking Water Plan for California (1993 Plan)." The 1993 Plan Executive Summary is contained in Appendix 1. The complete 1993 Plan can be accessed at the CDPH website: http://www.cdph.ca.gov/certlic/drinkingwater/Documents/DWdocuments/DrinkingWaterintothe21stCenturySafeDrinkingWaterPlanforCA.pdf.

In 1996, the California Legislature enacted Senate Bill (SB) 1307 (Chapter 755, Statutes of 1996) amending Health and Safety (H&S) Code Section 116355 to require a periodic update of the 1993 Plan. As with the 1993 Plan, the Legislature mandated that the update include, but not be limited to:

(1) An analysis of the overall quality of California's drinking water and the identification of specific water quality problems.

(2) Types and levels of contaminants found in public drinking water systems that have less than 10,000 service connections. The discussion of these water systems shall include the following:

(A) Estimated costs of requiring these systems to meet primary drinking water standards and public health goals.

(B) Recommendations for actions that could be taken by the Legislature, the department, and these systems to improve water quality.

(3) A discussion and analysis of the known and potential health risks that may be associated with drinking water contamination in California.

(4) An evaluation of how existing water quality information systems currently maintained by local or state agencies can be more effectively used to protect drinking water.

(5) An evaluation of the research needed to develop inexpensive methods and instruments to ensure better screening and detection of waterborne chemicals, and inexpensive detection methods that could be used by small utilities and consumers to detect harmful microbial agents in drinking water.

(6) An analysis of the technical and economic viability and the health benefits of various treatment techniques that can be used to reduce levels of trihalomethanes, lead, nitrates, synthetic organic chemicals, micro-organisms, and other contaminants in drinking water.

(7) A discussion of alternative methods of financing the construction, installation, and operation of new treatment technologies including, but not limited to, user charges, state or local taxes, state planning and construction grants, loans, and loan guarantees.

(8) A discussion of sources of revenue presently available, and projected to be available, to public water systems to meet current and future expenses.

(9) An analysis of the current cost of drinking water paid by residential, business, and industrial consumers based on a statewide survey of large, medium, and small public water systems.

(10) Specific recommendations, including recommendations developed pursuant to paragraph (6), to improve the quality of drinking water in California and a detailed five-year implementation program.

CDPH assembled a team of experts that conducted extensive reviews and analyses, resulting in a draft plan that included all of the reviews, analyses, evaluations and recommendations listed above. CDPH included the draft plan as part of the July 1, 2014 transfer of the drinking water regulatory program to the State Water Board, which is now responsible for updating the Plan. That draft plan has been enhanced based on the synergies and resources resulting from incorporation of the program into the State Water Board, including revisions and expansions of all recommendations, and an all-new implementation plan. Consistent with the 1993 Plan, the updated Plan will address issues related to drinking water served by public water systems as defined in Health and Safety (H&S) Code Section 116275(h).

As would be expected, the past two decades have seen many new issues associated with California's drinking water quality[1] as well as changes to the state and federal programs that are designed to ensure drinking water quality and safety. This updated

[1] Unless otherwise indicated, the term "water quality" as used in the Plan refers to drinking water quality.

Plan highlights those issues and changes, and provides recommendations to improve the quality of drinking water in California.

CHAPTER 2. CURRENT REGULATION OF DRINKING WATER

2.1. GOVERNMENT AGENCIES INVOLVED IN DRINKING WATER

2.1.1. State Agencies

The regulation of water supply, water quality, and the various types of water systems that serve drinking water is shared among several agencies, including local agencies, in California. However, California took a major step forward in integrating the regulation of water quality when it transferred the state-level Drinking Water Program from CDPH to the State Water Board on July 1, 2014. One of the Administration's goals in transferring the program was to promote safe drinking water through more integrated water quality management, from source to tap.

Most of the statutory authority for regulation of drinking water is in the California H&S Code. Under the H&S Code, the State Water Board has primary responsibility for regulating all public water systems. There are three other state agencies that also regulate certain aspects of specific classes of systems including: (1) the Public Utilities Commission (PUC) for investor-owned systems, (2) the Division of Corporations (DOC) for mutual water companies, and (3) the Department of Housing and Community Development (DHCD) for mobile home parks. Additionally, the Department of Water Resources (DWR), the Office of Environmental Health Hazard Assessment (OEHHA), the Secretary of State, and the Department of Real Estate are also involved in activities impacting public water systems. A brief description is provided below for each of the regulatory agencies including their authority and responsibilities related to the regulation of public water systems (PWS). The definition of a PWS is provided in Appendix 2.

2.1.1.1. State Water Resources Control Board

Division of Drinking Water

The State Water Board, as the federally designated primacy agency for the drinking water program in California, is responsible for the implementation of the federal Safe Drinking Water Act (SDWA) and has overall responsibility for implementation of the California SDWA as defined in the California H&S Code and Titles 17 and 22, California Code of Regulations (CCR). The Division of Drinking Water (DDW) within the State Water Board carries out the drinking water regulatory responsibilities; the Division of Financial Assistance (DFA) carries out the financial assistance responsibilities.

The Drinking Water Program has adopted regulations for Drinking Water Standards, Monitoring Requirements, Cross-Connections, Design and Operational Standards, and Operator Certification. The implementation of the program involves: (1) establishment of drinking water standards, (2) certification of operators and point-of-use treatment devices, and (3) direct regulation of public water systems with the authority to delegate oversight responsibility of small water systems (PWS with less than 200 service

connections) to local county health departments. The regulation of public water systems includes: (1) issuance of permits covering the approval of water system design and operation procedures, (2) inspection of water systems, (3) the enforcement of laws and regulations to assure that all public water systems routinely monitor water quality and meet current standards, and (4) assuring notification is provided to consumers when standards are not being met.

DDW, through the Environmental Laboratory Accreditation Program (ELAP), is responsible for accreditation of drinking water laboratories performing analyses pursuant to the California SDWA.

DDW is responsible for adopting uniform criteria for the use of recycled water that is protective of public health. The Regional Water Boards or the Division of Water Quality (DWQ) within the State Water Board incorporate the DDW criteria in Water Reclamation Permits or Waste Discharge Requirements that define the requirements that a water recycling project must meet. The DDW and the Regional Water Boards/DWQ work cooperatively on regulating water recycling projects that are designed to augment drinking water supplies including recharging groundwater supplies and augmenting surface water supplies such as reservoirs, as well as implementing SB 918 (Chapter 700, Statutes of 2010) requirements on direct potable reuse.

Division of Financial Assistance (DFA)

DFA is responsible for the administration of the Drinking Water State Revolving Fund (DWSRF) Program. It also administers the Prop 50 and 84 funding programs, as well as drought funding that the Legislature recently made available to assist PWS. It also administers the Drinking Water Operator Certification program.

Division of Water Quality (DWQ) and Regional Water Boards

DWQ and the Regional Water Boards are responsible for the protection of the quality of ambient surface and groundwater (i.e., lakes, rivers, and groundwater basins) up to the point where the water enters a drinking water well or surface water intake.

DWQ has water quality monitoring programs that coordinate with and share monitoring data with DDW to avoid duplication of effort and to enable a greater sharing of monitoring results. For example, DWQ's Groundwater Ambient Monitoring and Assessment (GAMA) Program is able to gather information on private wells and increase the information on groundwater basins, which assists DDW in advising water systems about the underlying groundwater quality.

2.1.1.2. Public Utilities Commission (PUC)

The PUC regulates investor-owned water utilities with particular attention to rates and quality of service. These utilities are owned by investors expecting a return on investments. Small utilities are generally owned by a single individual, corporation, or a

partnership. Owners of large utilities are generally investors holding financial interest in the utility or its parent company. There are several large investor-owned utilities in California that own and operate multiple water systems across a region or across the State.

The PUC's five commissioners are appointed by the Governor and confirmed by the State Senate. The PUC's primary source of funding is from a "user fee" that is assessed on utility customers as a percentage of each regulated utility's gross operating revenues.

In brief, the PUC ensures that customers of regulated water utilities receive safe and reliable water service while allowing the utility a fair opportunity to earn a reasonable return on its investment. In this regard, its functions can be categorized as: (1) authorizing utility service within defined service areas, (2) setting rates, and (3) regulating the quality of service.

As a result of shared responsibility for the regulation of investor-owned utilities with respect to water quality, the PUC and the State Water Board's Division of Drinking Water (DDW) have maintained a formal memorandum of understanding to ensure consistency and coordination between the agencies' two programs. This memorandum defines common objectives, principles, agency responsibilities, and project coordination. The large (Class A) investor-owned utilities have acknowledged the coordination between the two organizations and may participate in joint meetings with the staff of both agencies. The PUC can impose stricter water quality requirements, an example being the PUC requirement that Class A utilities implement the distribution system operations plan of the California Water Works Standards, which is a more stringent requirement than that which DDW mandates.

Issues related to the small investor-owned utilities continue to be difficult to resolve because these systems may lack the Technical, Managerial and Financial ("TMF") capacity to secure rate relief and have an insufficient number of customers to properly fund infrastructure improvements. Incentives offered by the PUC to encourage large investor-owned utilities (Class A companies) to acquire small investor-owned utilities have included allowing them: 1) to apply a consolidated water rate structure across their water systems within a defined region, which allows the Class A company to apply revenue generated from a sustainable system for improvements and the operation at a less sustainable system; and 2) an opportunity to earn a higher rate of return on the small system assets if it is willing to purchase such Class C and Class D systems, which are generally in need of improvements and, in some cases, serve disadvantaged communities. These incentives have had very limited success. Many of the small investor-owned utilities experience significant infrastructure problems, such as leaking water pipes, undersized water storage facilities, inadequate fire service, and their revenue from water sales is insufficient to address these problems. In addition, present state infrastructure funding opportunities generally prohibit investor-owned utilities from receiving grants. Thus, the small companies are limited to seeking loans, for which they may have difficulty meeting the TMF capacity requirements.

In 2012, the Legislature passed AB 1830 (Chapter 539, Statutes of 2012), which allowed complaints to be filed by tenants of mobile home parks claiming that their water rates are not just and reasonable or that the service is inadequate. The PUC reported to State Water Board staff that they had received no AB 1830 complaints as of August 27, 2014.

2.1.1.3. Division of Corporations

The Division of Corporations (DOC, formerly the Department of Corporations) within the Department of Business Oversight has responsibility under the Corporate Securities Law of 1968 (Corporations Code Section 25000 et seq.) to approve and register the security offering of mutual water companies. Mutual water companies are privately owned water companies in which each lot owner is entitled to one share per lot that they own. They are managed and operated in accordance with Articles of Incorporation and bylaws approved by the DOC and filed with the Secretary of State. Title 10, CCR, Subarticle 7.1 of Article 4 of Subchapter 3 sets forth the standards governing the regulation of mutual water companies. These regulations do not deal with the quality of the drinking water served. DOC regulations for incorporated mutual water companies require compliance with DOC standards and financial responsibility requirements before DOC will approve the security offering.

DOC regulations require a mutual water company to contact the State Water Board when it is being formed. Compliance with this requirement has been questionable in the past due to a history of conflicting and duplicative requirements on the regulated water systems. There has been no agreement to coordinate the State Water Board and DOC programs and provide for an effective means of conflict resolution. AB 54 (Chapter 512, Statutes of 2011) requires that mutual water companies meet the California Waterworks Standards and that mutual water companies that operate as PWS maintain a financial reserve fund for repairs and replacement to their water production, transmission, and distribution facilities at a level sufficient for continuous operation of facilities in compliance with the California SDWA. In addition, AB 54 requires that board members of a mutual water company, within six months of taking office, complete a two-hour training course on their fiduciary duties, duties of PWS, and long-term management of a PWS. Additional legislation enacted in 2013, the Mutual Water Company Open Meeting Act (AB 240, Chapter 633, Statutes of 2013), permits an eligible person to attend a meeting of a mutual water company and to speak during the meeting; requires the board of the mutual water company that operates a public water system to adopt, in an open meeting, an annual budget on or before the start of each fiscal year; requires the board of a mutual water company that operates a public water system to contract with a certified public accountant or public accountant to conduct an annual review of the financial records and reports of the mutual water company; and requires the board of directors of a mutual water company that operates a public water system to make specified documents available to an eligible person upon payment of fees covering the direct costs of duplication.

2.1.1.4. Secretary of State

The role of the Secretary of State with respect to water suppliers deals with the manner by which certain water utilities are incorporated. All non-profit, non-stock corporations organized under the Non-Profit Corporation Law are required to have Articles of Incorporation certified by and on file with the Secretary of State. This includes all mutual water companies as well as homeowners associations, religious, charitable, social, educational, and recreational associations.

2.1.1.5. Department of Housing and Community Development

DHCD is responsible for the regulation of the construction and maintenance of mobile home parks (MHPs) and employee housing facilities, such as labor camps, many of which have independent water systems. The authorizing statutes for DHCD's regulations are the Mobile Home Parks Act (H&S Code Sections 18200 – 18700) and Employee Housing Act (H&S Code Sections 17000 – 17062) with regulations adopted under these statutes included in Title 25, CCR.

Construction standards require MHPs to comply with the state's uniform building codes that are less strict than DDW's Waterworks Standards. Because of this, The State Water Board is unable to approve a water system operating permit for MHPs as required by the H&S Code if the system does not comply with the California Waterworks Standards. This also hinders consolidation or other regional solutions involving MHPs because of the costs to retroactively bring these systems into compliance.

DHCD requires owners of employee housing with its own water system to conduct an annual test of the potability of the water delivered to the facility. DHCD has not, however, defined the term "potability" and relies upon certification from Local Enforcement Health Jurisdictions (LEHJs), which by law may assume responsibility for enforcement of the act. By regulation, the responsibility for testing the water supply falls to local county health departments (Title 25, CCR, Section 772) to assure compliance with this requirement. DHCD also has the authority under law to enforce the potability requirement, but DHCD does not require a demonstration that the facility has a water system that has received the State Water Board permit approval. This is a problem because LEHJs have not had the resources to seek out these facilities to ensure they are inventoried and have been permitted. As such, the LEHJ does not inspect or regulate employee housing facilities unless they have been delegated the housing authority from DHCD. As a result, many water systems for such facilities may be unregulated even if they meet PWS criteria.

2.1.1.6. Department of Real Estate

The Department of Real Estate, operating under the authority of the Subdivision Law, is involved in the regulation of water systems through its approval process for the sale of subdivided lands. Subdivision laws were enacted to ensure that subdividers deliver to buyers what was agreed to at the time of sale. Before real property that has been

subdivided can be marketed in California, a public report from the Department of Real Estate must be obtained by the subdivider disclosing pertinent information about a particular subdivision, including the details of the water system serving the area. Prior to the issuance of a public report, the subdivider must file an application along with supporting documents with respect to representations made in the application.

2.1.1.7. Department of Public Health

The California Department of Public Health (CDPH) maintains the State's Drinking Water and Radiation Laboratory, which serves as the State's principal laboratory as required for primacy under the federal SDWA. The State Water Board has an Interagency Agreement with CDPH to provide laboratory services and technical support to DDW including analyzing of drinking water samples collected for special studies or enforcement cases and the development of analytical methods for measuring chemical contaminants as well as to provide support to ELAP.

DDW interacts with a number of entities within CDPH including the Oral Health Unit, which oversees the Community Water Fluoridation Program and the Food and Drug Branch, which is responsible for the regulation of bottled water and water sold through vending machines as well as the licensing of water haulers that transport drinking water. DDW also collaborates with the Division of Communicable Disease Control in the investigation of suspected drinking water infectious disease outbreaks.

2.1.1.8. Department of Water Resources

DWR has the responsibility to manage the water resources of California in cooperation with other agencies. Most important is the operation of the State Water Project, which supplies water to PWS that serve the majority of California's citizens. DWR is responsible for the development of the California Water Plan, which serves as a guide to the development and management of the State's water resources. The California Water Plan is required to be updated every five years. The Draft 2013 Update of the California Water Plan includes a Report entitled "Californians without Safe Drinking Water and Sanitation." DWR has directly funded drinking water related projects under Propositions 50 and 84, primarily through Integrated Regional Water Management (IRWM) funds.

2.1.1.9. Office of Environmental Health Hazard Assessment

OEHHA is responsible for providing to state and local government agencies toxicological and medical information relevant to decisions involving public health. OEHHA has the statutory responsibility for assessing the public health risks of chemical and radiologic contaminants in drinking water. That responsibility includes establishing Public Health Goals (PHGs), which are the health-based limits that the State Water Board uses in the development of state primary drinking water standards.

2.1.1.10. Department of Pesticide Regulation

DPR is responsible for identifying agricultural pesticides with the potential to pollute groundwater. DPR obtains reports and analyzes the results of well sampling for pesticides conducted by public agencies and, if a pesticide is detected, reviews the detected pesticide to determine if its continued use can be allowed. DPR adopts use modifications to protect groundwater from pollution if the formal review indicates that continued use can be allowed. The State Water Board provides public drinking water quality monitoring data to DPR for its groundwater protection program.

2.1.1.11. Department of Fish and Wildlife

The State Water Board and DFW collaborate on projects dealing with the protection of drinking water quality and the maintenance of native fish species in surface waters that are used as a drinking water supply. H&S Code Section 116751 states that DFW may not introduce a poison to a drinking water supply for purposes of fisheries management unless the State Water Board determines that the activity will not have a permanent adverse impact on the quality of the drinking water supply or wells connected to the drinking water supply. In making this determination, The State Water Board must 1) evaluate the short- and long-term health effects of the poison on the drinking water; 2) ensure that an alternative supply of drinking water is provided to the users of the drinking water supply while the activity takes place; and 3) in cooperation with DFW, develop and implement a monitoring program to ensure that no detectable residuals of the poison, breakdown products, and other components of the poison formulation remain in the drinking water supply or adjoining wells after the activity is completed.

2.1.2. Federal Agency

2.1.2.1. United States Environmental Protection Agency

USEPA administers the nationwide drinking water program as authorized under the 1974 federal SDWA and substantially amended in 1986 and 1996. The federal program consists of the establishment of drinking water standards, monitoring and reporting requirements, and public notification, which are applicable to all PWS. USEPA can directly enforce compliance of these standards, or delegate authority for enforcement of the federal SDWA to any state that has an authorizing state statute at least as stringent as the federal SDWA, and a state regulatory program for PWS that meets various enforcement, planning, and record keeping requirements.

Delegation of the enforcement of the federal SDWA to a state is known as "primacy." As part of the delegation of primacy to a state, USEPA provides oversight and partial grant funding of the state program as well as annual capitalization grants under the DWSRF. The oversight by USEPA requires an annual work plan, an annual DWSRF Intended Use Plan, and specific reporting requirements including an annual PWS compliance report.

2.1.3. Local Agencies

AB 2158, (Chapter 1182, Statutes of 1990) allows the State Water Board to delegate the authority for regulating small water systems (PWS with less than 200 service connections) to a local county health officer. In addition, there are a number of other organizations that indirectly impact PWS including planning departments, building departments, Local Agency Formation Commissions (LAFCO), and Boards of Supervisors. The respective roles, responsibilities, and areas of concern for each of these units of government are described below.

2.1.3.1. Local Primacy Agency Counties

Currently, 30 local primacy agency counties (identified in Table 2.2) have been delegated authority to regulate PWS with less than 200 service connections. Although the delegation agreement is with the local county health officer, the regulatory program is typically operated by the LEHJs.

2.1.3.2. Local Agency Formation Commissions

LAFCOs basic authority is to approve, deny, or modify boundary changes requested by public agencies or individuals. LAFCOs provide input to PWS during the formations of new communities, special districts, and "spheres of influence" for all public agencies. In 2011, LAFCOs were provided authority (AB 54, Chapter 512, Statutes of 2011) to approve the annexation of a mutual water company that operates as a public water system into the jurisdiction of a city, a public utility or a special district, with the consent of the respective public agency or public utility and mutual water company. LAFCOs have authority to conduct municipal service reviews to ascertain whether the entity is providing municipal services in a satisfactory manner.

2.1.3.3. County Planning Departments

County planning departments may impact PWS through the development of county-wide plans, which set the framework for specific county ordinances.

2.1.3.4. Local Building Departments

Local building departments have a responsibility to enforce building standards and so ensure compliance with implementation of the state's lead ban regulations including the use of low-lead solders and prevention of the use of lead plumbing materials.

2.2. STATE DRINKING WATER REGULATORY PROGRAM

2.2.1. Division of Drinking Water

DDW's enforcement capability and responsibilities have grown over the last 20 years. Along with the ability to issue citations and compliance orders to water utilities in noncompliance with state laws and regulations, expanded fining authority under H&S Code Section 116650 has further strengthened its ability to ensure regulatory compliance.

At the national level, emphasis continues to be placed on compliance and enforcement activities, with a greater degree of reporting on these activities. New state and federal regulations to control chemical and radiologic contaminants and microbial agents have added to the technical complexity of the program, as well as making compliance among smaller water systems challenging due to TMF capacity issues.

At the same time, new state and federal sources of funding for water system improvements have helped to achieve greater rates of compliance. Drinking water quality and reliability have become even more important particularly as competition for the state's limited supply of high quality water becomes more intense. The following sections describe the regulatory and technical programs within DDW.

2.2.1.1. Regulatory Program

Included under the regulatory portion of the DDW program are: (1) issuance of permits for PWS and their sources and treatment, 2) inspection of water systems, (3) tracking of monitoring requirements of water systems to determine compliance, and (4) enforcement actions. DDW field activities also include training, technical assistance, plan review, and problem or disaster response. Pursuant to H&S Code Sections 116565 – 116580, DDW has the authority to recover the cost of carrying out these regulatory program activities. As noted above, DDW's responsibilities do not include either private domestic wells or water systems that are not PWS; instead, these are under the purview of local agencies.

2.2.1.2. Permits

All PWS must have a permit to operate issued by the State Water Board. These permits and their accompanying engineering reports describe how a water system is to be operated, including monitoring requirements. Almost all permits include special provisions established specifically for the individual water system, setting forth operating requirements that, if not met, could result in a formal enforcement action. Permits do not have expiration dates, but whenever a water system adds a new water source, adds or changes treatment, has a change in ownership, or makes changes that are not in compliance with DDW drinking water regulations, then an amendment to the water permit is required. Table 2.1 indicates the total number and types of PWS under the State Water Board permit in California.

Table 2.1
Number of California Public Water Systems
Under Permit by Type as of January 9, 2014

Public Water System by Type	Number of Systems
Community Water System	3,015
Nontransient, Noncommunity Water System	1,489
Noncommunity Water System	3,138
TOTAL	7,642

PWS are separated into three categories: community water systems (CWS), nontransient noncommunity water systems (NTNCWS), and transient noncommunity water systems (TNCWS). CWS serve communities with full-time residents. Noncommunity water systems, NTNCWS, and TNCWS serve populations in nonresidential settings. NTNCWS serve the same people for an extended length of time (e.g., schools, factories, and prisons), while TNCWS serve different people for a minimum of time over the year (e.g., restaurants and campgrounds). (See Appendix 2 for specific definitions)

2.2.1.3. Inspections

Inspections and sanitary surveys of a public water system are critical to assurance of a safe and adequate water supply. Although water quality sampling provides documentation of the actual quality of water being served, sampling alone does not prevent problems from occurring. Inspections and sanitary surveys are needed to detect potential problems and eliminate them before the problem results in a water quality failure. H&S Code Section 116735(b) requires that PWS be inspected according to the following schedule: 1) annually for systems with a surface water source with treatment; 2) biannually for systems with groundwater subject to treatment; and 3) every three years for systems with groundwater not subject to treatment.

2.2.1.4. Compliance Tracking

DDW electronically tracks the water quality monitoring performed by water systems to ensure they are doing what is required of them, and to determine if they are in compliance with all drinking water standards. USEPA requires the State Water Board submit an annual compliance report containing information on noncompliance with drinking water standards by PWS.

2.2.1.5. Enforcement

DDW has several mechanisms available to obtain compliance with drinking water standards, including (1) specifying corrective action provisions in the water permit, (2)

issuance of citations and compliance orders, and (3) initiation of a court action. Monetary penalties can also be imposed through citations. Pursuant to H&S Code Section 116650(e), fines of up to $1,000 per day can be assessed for a violation of a regulation, permit, standard, or previously issued citation or compliance order. In addition, H&S Code Section 116725(b) authorizes the court to impose a fine up to $25,000 per day for violating a citation schedule of compliance or order for a primary drinking water standard. Specific requirements can be added to permits using amendments and, under extreme conditions, a permit may be suspended or revoked (rarely done for water systems serving residential customers).

The enforcement action of last resort is to take a legal action through the court system. Such actions are normally reserved for the most recalcitrant and non-cooperative water systems. In such cases the court may impose additional fines or DDW may ask the court to appoint a receiver to take over operation of a public water system. These actions can consume significant resources of the agencies involved, and once initiated must be followed through to a decision. A total of 15 cases, all involving receiverships, were referred to the Attorney General in the past decade.

2.2.1.6. Technical Programs

There are a number of other activities carried out by DDW not directly associated with the regulatory overview of water systems. Among these activities are: (1) the development and processing of regulations related to drinking water, (2) development of drinking water standards, (3) review of potential projects for groundwater recharge, (4) provision of information to other state agencies regarding activities that might impact drinking water sources, and (6) a registry of residential point-of-entry (POE) and point-of-use (POU) water treatment devices. While these activities are not considered direct regulatory functions many of them have a direct bearing on the effectiveness of the state drinking water regulatory program.

In addition, DFA has responsibility for: (1) the review and processing of applications from water systems for funding under state Propositions and the DWSRF, (2) review of systems for possible Emergency Grant funding, and (3) certification of drinking water treatment and distribution operators. DDW provides support to DFA program, which certifies water treatment plant operators and water distribution operators, including the testing of operators and renewal of their certificates. The Office of Operator Certification presently certifies approximately 33,000 operators.

DDW has adopted new or more stringent drinking water standards for 16 inorganic and 33 organic contaminants, two groups of disinfection byproducts (DBPs), two individual DPBs, and two treatment technique requirements. These and the other regulated contaminants are presented in Appendix 2. Monitoring requirements were also established in 2001 for nine unregulated organic and inorganic chemical contaminants, which allowed collection of information on their presence in drinking water supplies. These chemicals are presented in Appendix 3. In 2011, emergency regulations were adopted for the use of POE and POU treatment devices. The use of these devices is limited to PWS serving less than 200 service connections. State law further limits the

use of POE devices to only three years or less if centralized treatment is installed before that time. In addition, requirements were updated that address standards covering the design and operation of PWS such as minimum operating water pressure and water source capacity, water pipe materials, and well construction. Regulations that were recently adopted are included in Appendix 4.

DDW also provides a registry of water treatment devices that are allowed for use by individuals to treat water in their homes.

DDW provides support to DFA for the implementation of the federal infrastructure funding programs, DWSRF; and the American Recovery and Reinvestment Act of 2009 (ARRA) and the state Propositions 50 and 84, two grant programs that provide funding for water system infrastructure; and for the funding of water systems to address emergency situations under the Proposition 84 Emergency Clean Water Grant Fund. Water systems are provided with emergency funds to address such problems as serious water quality contamination and water outages. DFA also provides drought funding for PWS, as recently provided by the Legislature.

2.2.2. Local Environmental Health Jurisdictions

The State Water Board may, pursuant to state law, delegate to the local county health officer the responsibility for enforcement of state laws and regulations for all small PWS (PWS with less than 200 service connections) in their jurisdiction. These counties are known as Local Primacy Agency (LPA) counties. The actual delegation activities are carried out by the LEHJs. Table 2.2 provides information on the number of PWS within each of the 58 counties as well as denoting the counties with delegated authority. As of July 2014, the DDW had delegation agreements with 30 LPA counties.

The regulatory responsibility of LEHJs is the same as the DDW's including the issuance of permits, inspection, surveillance, and enforcement activities. Pursuant to H&S Sections 116565(b), 116570, 116577, 116580 and 116595, the LEHJs are authorized to collect fees as well as recover actual costs for implementing the regulatory program.

Under the provisions of State Law, the State may delegate primary responsibility for the administration and enforcement of the California Safe Drinking Water Act to a local health officer authorized by the board of supervisors to assume such duties. This delegation to Local Primacy Agencies is only for small water systems serving fewer than 200 service connections and is subject to specific requirements that are contained in a Primacy Delegation Agreement with the Local Primacy Agency (LPA). Of the 58 California counties, 30 are LPAs. In the last several years, some LPAs have chosen to no longer operate as LPAs. In these cases, the DDW assumed regulatory jurisdiction for these water systems.

LPAs must meet the requirements of their delegation agreement. Under this delegation, the DDW reviews the performance of each LPA annually and makes recommendations for program improvements. The LPA has a 'reasonable amount of time' to make program

improvements required by the DDW. Should an LPA fail to make needed improvements to their program, the DDW has the authority to revoke the LPA's delegation agreement. There are several challenges facing LPAs that are seeking to continue the delegation of primacy including:

1. The increasing number and complexity of drinking water standards and regulations;
2. The technical expertise required to operate water treatment facilities;
3. The amount of time and resources required to carry out enforcement actions;
4. Complex compliance issues, such as regional nitrate and arsenic problems that disproportionately impact small water systems.

In 2014, the DDW issued updated delegation agreements to the 30 LPAs reflecting current primacy delegation requirements. The goal of these updated delegation agreements is to ensure that all program objectives are clearly stated so that LPAs understand all required program elements. Beginning in 2014, the LPA programs are being evaluated based on the new delegation agreements. The DDW will be reporting to the Board and the public on the effectiveness of the LPA programs annually in the Water Board's Performance Report. Tracking the LPA's programs more closely will allow the DDW to prioritize technical assistance and training for LPAs or to take other appropriate actions if necessary.

Table 2.2
2014 Inventory of Water Systems in California

COUNTY	CWS	NCWS	NTNCWS	TOTAL
Alameda	14	5	6	25
Alpine+	5	37	3	45
Amador+	23	45	6	74
Butte+	51	30	30	111
Calaveras+	17	28	5	50
Colusa	10	16	5	31
Contra Costa+	46	49	14	109
Del Norte	17	15	5	37
El Dorado+	22	119	11	152
Fresno	22	119	11	152

COUNTY	CWS	NCWS	NTNCWS	TOTAL
Glenn	15	13	9	37
Humboldt	46	37	10	93
Imperial+	29	26	25	80
Inyo+	48	57	12	117
Kern	188	90	74	352
Kings+	18	12	16	46
Lake	52	38	3	93
Lassen	17	10	9	36
Los Angeles+	228	84	31	343
Madera+	64	102	43	209
Marin	15	27	8	50
Mariposa	14	50	11	75
Mendocino	43	54	22	119
Merced	21	28	45	94
Modoc	5	8	4	17
Mono+	16	80	3	99
Monterey+	160	74	93	327
Napa+	33	83	57	173
Nevada+	20	50	16	86
Orange	43	3	4	50
Placer+	61	55	16	132
Plumas+	31	82	4	117

COUNTY	CWS	NCWS	NTNCWS	TOTAL
Riverside+	105	90	22	217
Sacramento+	67	77	35	179
San Benito	32	15	20	67
San Bernardino+	153	152	38	343
San Diego+	79	114	19	212
San Francisco	7	3		10
San Joaquin+	96	118	103	317
San Luis Obispo+	72	32	53	157
San Mateo	40	11	3	54
Santa Barbara+	59	59	20	138
Santa Clara	67	29	27	123
Santa Cruz+	57	29	21	107
Shasta+	61	91	31	183
Sierra	8	24	0	32
Siskiyou	33	36	11	80
Solano	26	25	15	66
Sonoma	133	191	101	425
Stanislaus+	69	80	60	209
Sutter	11	16	20	47
Tehama+	52	37	37	126
Trinity	18	27	5	50
Tulare	99	175	82	356

COUNTY	CWS	NCWS	NTNCWS	TOTAL
Tuolumne	59	67	10	136
Ventura	70	10	19	99
Yolo+	17	49	27	93
Yuba+	32	33	17	82
TOTAL	3,015	3,138	1,489	7,642

CWS: Community Water System
NCWS: Noncommunity Water System
NTNCWS: Nontransient, Noncommunity Water System
+: Indicates county with delegation agreement (LPAs)

2.3. FUNDING ASSOCIATED WITH STATE DRINKING WATER REGULATORY PROGRAMS

The funding for state drinking water regulatory program activities is derived from several sources including the state General Fund, cost recovery and fees from PWS for regulatory program activities (Safe Drinking Water Account) operator certification program fees, Environmental Laboratory Improvement Fund, Propositions 50 and 84, and Federal Funds. For the 2013-14 fiscal year, the budget for drinking water regulatory program activities was $47.6 million. The largest sources of funding were Federal Funds at $18.3 million (38 percent) and the Safe Drinking Water Account at $14 million (29 percent), while the General Fund provided $3.9 million (8 percent) of total program support.

The reliance on Federal Funds has become problematic given the efforts at the federal level to reduce the federal expenditures. The Public Water System Supervision Grant Program provided to states to implement federal SDWA requirements has not increased in more than a decade and was recently reduced by $0.3 million (from $6 million to $5.7 million).

In addition, the federal SDWA allows states to “set aside” funds from the DWSRF, capped at 31 percent of the capitalization grant allocation, for the activities associated with state implementation, operations, and regulatory oversight. The amount of funding received by each state depends on the infrastructure needs of the PWS in each state as determined by a needs survey conducted by USEPA every four years. USEPA determines each state’s DWSRF allocation based on the amount of PWS infrastructure needs that each state reports. The needs survey depends upon the participation of PWS. The participation by California PWS has varied significantly in past surveys. For example, PWS participation was poor for the 2003 survey and very good for the 1999

and 2007 surveys. As a result, California's allotment from the 1999 survey was $79.8 million (10.2 percent), $68.1 million (8.2 percent) from the 2003 survey, and $75 million (9.4 percent) from the 2007 survey. The 2011 survey indicated that California's PWS infrastructure needs were about 12 percent of the nation's total. However, the DWSRF allocation has remained at 9.4 percent, which for the federal fiscal year 2014 was $83.2 million. Any reduction in the state's DWSRF allocation by the federal government would reduce the amount of the DWSRF that can be used for program activities.

The Safe Drinking Water Account derives the majority of its funding from fee-for-service cost recovery for activities associated with the oversight of PWS serving 1,000 or more service connections. A lesser amount comes from smaller PWS and noncommunity water systems. For community water systems serving less than 1,000 service connections, a graduated flat fee is applied based on the number of service connections. For nontransient noncommunity water systems (NTNCWS), the fee is based on the number of people the public water system serves, while transient noncommunity water systems (TNCWS) pay a flat fee per system. There are also fees that cover the costs of writing permits and enforcement actions. The problem with this funding structure is that the greatest need for oversight is among those smaller PWS serving less than 1,000 service connections, but the fees to cover this activity are insufficient. As a result, it has been a struggle to maintain a program that provides sufficient oversight of small PWS. In recent years, more LPAs have returned the small PWS regulatory oversight program because their funding is inadequate to effectively administer the program.

Finally, Propositions 50 and 84 program support funds are nearly exhausted. Administrative funds from these two funding sources represent 14 percent of the program budget. Unless the voters approve the 2014 Water Bond, which has a significant allocation for drinking water quality infrastructure improvements and new administrative support funding, the loss of Propositions 50 and 84 program support funding will have a significant adverse impact on the drinking water regulatory program activities (as well as financial assistance to PWS).

2.4. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

There are a multitude of state and local agencies involved in the regulation of PWS and water supplies. Coordination among agencies continues to improve, and the regulation of PWS has become more consistent. This improvement has principally been the result of more defined regulatory authority. In addition, close cooperation and coordination among agencies has resulted in improvements in areas such as source water quality protection, water supply reliability, and financial responsibility requirements.

Further collaboration with state agencies is needed to address differences between the regulatory requirements of the respective agencies that affect the provision of drinking water that meets quality standards. In addition, more collaboration is needed with local

agencies to prevent the proliferation of new housing developments that do not provide adequate sources of drinking water that meet quality standards as well as to address areas that are not served, or are inadequately served, by a PWS.

The funding for the implementation of the state drinking water regulatory program is tenuous. Federal Funds either have been reduced or can fluctuate by millions of dollars. Safe Drinking Water Account fees on PWS are structured such that larger PWS receive the majority of oversight activities even though the greatest oversight need is associated with small PWS, particularly those that are disadvantaged. More LPA counties are returning the small PWS regulatory program, which further exacerbates the problem. The General Fund provides only a small amount of program support in relation to the other funding sources. The loss of Propositions 50 and 84 funding for program support as those bond programs wind down will adversely impact program activities.

Recommendations

2-1 The State Water Board will develop closer relationships with DHCD to resolve the conflicts between these agencies' requirements particularly as it relates to mobile home parks. The State Water Board will schedule a meeting with DHCD management by the second quarter of 2015 to develop a coordinated strategy to address water quality and water quantity in mobile home parks.

2-2 The State Water Board will identify the most efficient mechanism of working more closely with LAFCOs to help address technical, managerial, and financial issues with small agencies under their purview that operate a PWS.

2-3 As resources allow, the State Water Board will coordinate with local county and city planning departments, LAFCOs, and LEHJs to identify: 1) areas currently developed without safe drinking water to determine where Community Services Districts could be created or where other actions could be taken, 2) areas where upgrades to housing are needed, and 3) areas where new development or issuance of new building permits should be postponed until safe water is demonstrated.

2-4 As resources allow, the State Water Board will coordinate with local county and city planning departments, LAFCOs, and LEHJs to identify those unincorporated areas within the county where a county-wide County Service Area (CSA) could be created to address drinking water needs particularly associated with water systems smaller than regulatory size. If communities/neighborhoods within the CSA wished to seek funding and/or consolidation, the LAFCO can then establish a specific zone of benefit for that area within which drinking water would be provided by a PWS. The CSA would then be eligible to apply for funding on behalf of the area. Alternatively, the PUC's role in defining the service areas of water utilities under its jurisdiction (including authorization of non-adjacent service area expansions and acquisitions of other water systems) may be part of the solution to this issue.

2-5 The State Water Board will welcome the participation of investor-owned water systems, both large and small, in the efforts described in Recommendations 2-2 through 2-4, both as sources and recipients of technical, managerial, and financial assistance. Given the PUC's authority over service area expansions and system acquisitions by investor-owned water utilities, PUC participation in such efforts would also be beneficial.

2-6 The State Water Board will continue to encourage new and existing board members of public water systems to complete a course on their duties to all public water systems and the members of the boards or other directing bodies that oversee their operation.

2-7 The State Water Board recommends enactment of legislation to implement a funding strategy that will ensure that the program is adequately and consistently funded. That strategy should address the need for funding of activities that provide greater oversight of and technical assistance to small PWS particularly those that serve disadvantaged communities.

2-8 Funding should be provided for infrastructure improvements to PWS particularly small PWS serving disadvantaged communities that are not meeting safe drinking water quality requirements. Sufficient funding for administration should be included.

2-9 The State Water Board will report on the effectiveness of the LPA programs annually in the Water Board's Performance Report and will use this information to track progress and prioritize activities related to LPAs.

REFERENCES

AB 2158 (Chapter 1182, Statutes of 1990), Sacramento, 1990.

California Department of Health Services and California Public Utilities Commission Memorandum of Understanding on Maintaining Safe and Reliable Water Supplies for Regulated Water, San Francisco, November 1996.

California Public Utilities Commission, "Rules of Practice and Procedure," San Francisco.

California Public Utilities Commission, "Regulation of Public Utilities and Transportation Companies in the State of California, A Handbook," San Francisco, March 1984.

AB 54 (Chapter 512, Statutes of 2011), Sacramento, 2011.

AB 1540 (Chapter 298, Statutes of 2009), Sacramento, 2009.

CHAPTER 3. QUALITY OF CALIFORNIA'S DRINKING WATER

Annual compliance reports to USEPA indicate that over 98 percent of the population served by PWS receives drinking water that meets federal and state drinking water standards. As discussed in Chapter 4, those that do not generally serve smaller communities particularly those communities that are disadvantaged. Also as mentioned previously, this Plan does not take into account the state's residents who are not served by a PWS. The State Water Board will look for future opportunities to partner with local agencies as they address the drinking water needs of residents who are not served by PWS. In support of the Human Right to Water, the State Water Board is pursuing initiatives within its jurisdiction, namely to pursue solutions to ensure that California's small PWS customers receive affordable, safe, and reliable drinking water.

3.1. SOURCES OF DRINKING WATER

3.1.1. Surface and Groundwater Sources

The state's water supplies are from surface water sources such as rivers, streams, and lakes and from groundwater sources, which are present throughout the state in a number of groundwater basins. The amount of drinking water derived from surface water sources versus groundwater sources can vary annually depending on rainfall and snow pack conditions. In general, surface water sources provide a larger portion of the drinking water supply than groundwater sources. For example, the United States Geological Survey estimated that, in 2005 in California, over 80 percent of the drinking water provided by PWS was from surface water sources (http://pubs.usgs.gov/circ/1344/). However, in drought years the use of groundwater sources can increase significantly and may even become the state's predominant source of drinking water.

The distribution of water supplies from areas with water to areas needing water is handled by large state and federal water projects. These are primarily involved in the transfer of water from the northern part of the state to the south and within Southern California, such as water from the Colorado River.

There are a number of conditions that have altered and will continue to affect the adequacy of the state's drinking water sources. These include increasing requirements for water due to population growth; uncertainty in water supplies as a result of drought conditions and climate change; demands for water by agriculture, industry, and environmental purposes; contaminating activities that threatens surface water and groundwater quality (therefore affecting available quantity); and reductions in access and use of the Colorado River as a source.

There are many existing water systems that depend on a single source of supply, which renders them highly vulnerable to system outages, contamination plumes, drought depletion, and other challenges. Accordingly, the Waterworks Standards currently

require new public water systems to have access to multiple sources. However, current law does not require existing public water systems to have access to multiple sources. This resulted in numerous instances where water systems faced dire emergency situations when their single source of water supply failed or was curtailed. Especially in light of the persisting severe drought, these situations will become more common.

3.1.2. Alternative or Supplemental Sources of Drinking Water

In addition to the usual surface and groundwater sources of drinking water, there are alternative or supplemental sources of water, which may be used to augment drinking water supplies. These include recycled water and desalination, which may be used to treat seawater or for brackish groundwater.

3.1.2.1. Recycled Water

There has been considerable development in the use of recycled water to supplement drinking water supplies. Recycled water is obtained from municipal wastewater (sewage) treatment plants and is highly treated prior to its reuse. It is likely that recycled water will become a more significant source of drinking water.

Recycled water may be used as an indirect source of drinking water (called indirect potable reuse), wherein recycled water is used to augment groundwater or surface water sources, by being introduced into those sources after additional treatment and prior to consumption by drinking water customers.

Most of the indirect potable recycled water activity to date has been in Orange County and in Los Angeles County, where recycled water has been highly treated and reintroduced to groundwater by direct injection or by the use of recharge basins, from which the recycled water drains into underground aquifers. New projects are planned in the Inland Empire (San Bernardino/Riverside area) and in Monterey County. Indirect potable water recycling projects operate under permits issued by the Regional Water Boards, which consult with DDW to establish conditions necessary to protect drinking water supplies. In addition, the State Water Board now has authority to issue indirect potable recycled water permits.

To assist in the development of recycled water projects for groundwater replenishment that are protective of public health, regulations for such projects were adopted and became effective on June 18, 2014. More information about those regulations is available at the following website:
http://www.cdph.ca.gov/HealthInfo/environhealth/water/Pages/Waterrecycling.aspx

Surface water augmentation, a similar use of highly treated recycled water to supplement surface water supplies, has been extensively studied in San Diego County. Under Senate Bill 918, the State Water Board has a legislative mandate to develop regulations for Surface Water Augmentation by December 31, 2016 provided that the Expert Panel

formed pursuant to SB 918 finds that such regulations would be protective of public health for this use.

Recycled water is also being considered as a direct source of drinking water, which would be introduced directly into a public water system's distribution system for customer use (direct potable reuse). Under SB 918 and SB 322 (Chapter 637, Statutes of 2013), The State Water Board is required to investigate and report on the feasibility of developing uniform water recycling criteria for direct potable reuse by December 31, 2016.

Use of alternative water supplies for drinking water requires considerable treatment to provide adequate public health protection. Care must be taken to ensure the required high level of water treatment does not fail, so customers do not receive unsafe drinking water. The purpose of current and potential future State Water Board's water recycling regulations is to ensure that project design, construction, and operation are protective of public health.

3.1.2.2. Desalination

Other sources of supplemental water supplies involve the desalination of water that is otherwise not fit for consumption. Ocean water desalination is currently under construction in Carlsbad and is scheduled to be completed by November 2015. The treated water will be piped to the San Diego County Water Authority for distribution.

Brackish groundwater may also be desalinated, and may be considered suitable for human consumption after treatment.

3.2. THREATS TO THE SAFETY OF DRINKING WATER SUPPLIES

3.2.1. Contamination Threats

Threats to a safe drinking water supply include:

- microbiological organisms, such as viruses, bacteria, *Giardia*, and *Cryptosporidium*
- inorganic chemical contaminants, many of which may be naturally occurring
- radiological contaminants, from natural radioactivity or from human activities that may release radionuclides into the environment, and
- organic chemical contaminants, many of which are of industrial, agricultural, or household origin.

3.2.1.1. Microbiological Contaminants

Microbiological contaminants, historically of public health concern and the basis for water treatment and disinfection for the prevention of infectious disease, are generally

considered to be a greater concern for surface water sources than for groundwater sources. Nevertheless, groundwater contamination by microbiological contaminants may be a concern when water wells are improperly sealed, or when there is release of sewage or septage directly into groundwater. Groundwater also may be at risk of microbiological contamination when it is under the influence of surface water (for example, when shallow groundwater is near a stream).

3.2.1.2. Chemical and Radiological Contaminants

Water systems may use water from sources having detectable levels of chemical contaminants provided they meet health protective drinking water standards, called maximum contaminant levels (MCLs). If the chemicals are present in concentrations greater than the MCLs, the water systems must take measures to treat the source, blend it with a clean source, or remove the source from use.

In 2002, information was presented on the findings of chemical contaminants in drinking water, as part of Environmental Protection Indicators in California (OEHHA, Cal/EPA, April 2002, http://oehha.ca.gov/multimedia/epic/Epicreport.html.). From thousands of data points collected from 1984 through 2000, the major contaminants were identified in drinking water supplies.

At the time of that report, regulated inorganics that were most often detected (excluding fluoride and aluminum, which are often added to drinking water supplies for public health benefits) were nitrate, arsenic, lead, and total chromium. The reported lead findings are generally considered to have been associated with lead solder, brass fixtures, or lead service lines and not source water. Inorganics that most frequently exceeded their MCLs were nitrate, cadmium, and arsenic. For inorganics, most detections above MCLs were in Los Angeles, San Bernardino, Kern, Riverside, and Santa Clara Counties.

Among the industrial organic contaminants (excluding disinfection byproducts of water treatment), were tetrachloroethylene (or PCE), TCE, 1,1,1-trichloroethane, 1,1-dichloroethylene, cis-1,2-dichloroethylene, carbon tetrachloride, and 1,2-dichloroethane. Those most often detected above their MCLs were TCE, PCE, 1,2-dichloroethane, carbon tetrachloride, and 1,1-dichloroethylene. For industrial organics, most detections above MCLs were in Los Angeles, San Bernardino, Kern, Riverside, Fresno, and San Joaquin Counties.

Among the pesticides that were most often detected were DBCP, EDB, and 1,2-dichloropropane; these pesticides were also the most likely to exceed their MCLs. For pesticides, most detections above MCLs occurred in Fresno, Kern, Stanislaus, San Bernardino, and Tulare Counties.

Radioactivity analyses included gross alpha activity, which may be used to trigger further analyses for uranium and radium-226 and radium-228, which are the result of natural soil radioactivity. Relatively few detections of tritium and strontium-90 (radionuclides of human origin) were reported. Detections above their MCLs were found for gross alpha

activity and uranium. For radioactivity, most detections above MCLs occurred in Kern, San Bernardino, Riverside, Stanislaus, and Los Angeles Counties.

A 2013 report to the Legislature pursuant to AB 2222 (Chapter 670, Statutes of 2008) utilized public water system analytical data to provide information on communities whose primary source of drinking water is contaminated groundwater. For data from 2002 to 2010, the most prevalent regulated drinking water contaminants were arsenic, nitrates, gross alpha particle activity, perchlorate, PCE, TCE, uranium, DBCP, fluoride, and carbon tetrachloride. Community water systems relying on contaminated groundwater were most numerous in Los Angeles, Kern, San Bernardino, Tulare, Riverside, Fresno, and Madera Counties. For more information, see the report at: http://www.waterboards.ca.gov/gama/ab2222/docs/ab2222.pdf.

3.2.2. Current Threats to Drinking Water Sources

3.2.2.1. Microbial Contaminants

Public health protection from microbiological contaminants of drinking water and the avoidance of infectious disease continues to be a major reason for regulating PWS. Because of this, drinking water rules dictate requirements for drinking water source selection and assessment, and proper treatment, filtration, and disinfection, and for overall operation of the treatment and distribution systems.

Generally the requirements for microbiological treatment are focused on surface water. Significant surface water sources such as the Colorado River and the State Water Project are used predominantly by larger water systems to provide service to their primarily urban customers. Inadequately treated wastewater from treatment plants or stormwater from municipalities that discharge into rivers and streams may result in elevated levels of pathogens (e.g., viruses, bacteria, *Giardia*, *Cryptosporidium*) and pose unacceptable health risks to those who use the surface water for supply of drinking water; the Water Boards issue permits to require treatment preventing such discharges. While DDW is tasked within the State Water Board to oversee the regulation of the treatment of water used for drinking water, DDW is not involved in the regulation of wastewater treatment. DDW, however, does provide consultation to the Regional Water Boards, which regulate such discharges.

Microbiological contaminants may also reach groundwater through untreated or partially treated sewage leaking from septic systems (septage) or from wastes from confined animals' feeding operations. Wildlife and facilities that enhance wildlife habitat can also be a source of pathogens. These kinds of contamination sources are generally rural in nature, and would be more likely to pose risks of contamination to private well owners and small PWS, especially in rural areas, than they would to larger urban PWS.

Groundwater under the influence of surface water may be susceptible to surface waterborne pathogens. There are State Water Board and USEPA regulatory

requirements to treat groundwater under the influence of surface water as a surface water supply and to filter and disinfect the water accordingly. To prevent drinking water source contamination from inadequately-treated recycled water, the State Water Board has regulations and guidance that ensure the recycled water projects safely augment these sources, and DDW makes recommendations to the Regional Water Boards, which include these recommendations in their permits of wastewater dischargers/water recyclers.

3.2.2.2. Chemical and Radiological Contaminants

Natural elements such as arsenic, lead and copper, and chromium (to address the more toxic hexavalent form of the element), continue to be the focus of regulatory activity, and a new inorganic contaminant, perchlorate, has been regulated since 2007. All regulated contaminants are presented in Appendix 2. The State Water Board's advisory notification levels for other contaminants that have been found to be present in drinking water are presented in Appendix 5. More information about notification levels is available at: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/NotificationLevels.shtml

Arsenic, nitrates, and the recently regulated perchlorate are currently the regulated inorganic contaminants most often detected at levels greater than their primary MCLs. Manganese, which is regulated by a secondary standard that addresses the acceptability of drinking water relative to aesthetics, is also a common contaminant. A new MCL for hexavalent chromium, was established, effective July 2014. Because of its widespread natural occurrence, hexavalent chromium is expected to join those that are detected most often. However, the extent of any MCL violations of hexavalent chromium will only be known after the required monitoring period has been completed. In addition, chlorite and bromate are inorganic disinfection byproducts that may result from water disinfection.

Among radiological contaminants, uranium and radium are common naturally occurring radionuclides. Gross alpha activity and gross beta activity are used as screening measurements; exceeding standards for these constituents can prompt additional monitoring for the causes of the excess radioactivity.

The most commonly detected organic contaminants are TCE and PCE, and the banned nematocide DBCP, as well as disinfection byproducts such as the trihalomethanes and haloacetic acids. Other contaminants of more recent concern are methyl tertiary butyl ether (MTBE), 1,2,3-trichloropropane (1,2,3-TCP), 1,4-dioxane, and N-nitrosodimethylamine (NDMA).

There are approximately 90 contaminants that are currently regulated for drinking water by the State Water Board and another 30 with notification levels. Technical support documents associated with each contaminant's PHG have been established by OEHHA (www.oehha.ca.gov/water/phgs/allphgs.html).

Additional information is available from the State Water Board's Groundwater Ambient Monitoring and Assessment (GAMA) program, which has published fact sheets on many of these chemicals that include statewide maps showing the locations of contaminated wells, based on the its water quality database. Those fact sheets and maps are available at: http://www.waterboards.ca.gov/water_issues/programs/gama/coc.shtml.

3.2.2.2.1. Inorganic Contaminants

Specific contaminants of concern are discussed below.

- Arsenic - Due to concerns about the potential for cancer-related health risks and non-cancer effects associated with exposures to this natural element (which also has some industrial uses), the federal MCL was reduced from 50 ppb to 10 ppb in 2006 and the state MCL to 10 ppb in 2008. Because arsenic is present in groundwater supplies throughout the state, reducing the MCL greatly increased the number of water systems that have exceeded the state and federal MCL. From 2002 to 2005, 2,200 active and standby drinking water sources were reported to have arsenic present at concentrations greater than 2 µg/L, the detection limit for purposes of reporting (DLR).

- Nitrate/Nitrite – Nitrates historically have been considered significant contaminants of drinking water – they can be present as a result of human activities, for example in rural areas from septage and from fertilizer application in agriculture or from wastes in concentrated animal feeding operations such as dairies or feedlots. Focus has been on controlling the release of nitrates to the environment from such human activities. The MCL for nitrate is 45 ppm as nitrate; the MCL for nitrate and nitrite combined is 10 ppm as nitrogen; and the MCL for nitrite as nitrogen is 1 ppm. Results from January 2001-05 show over 900 sources reporting forms of nitrate that exceeded their MCLs. More information is available at: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Nitrate.shtml A recent report from researchers at the University of California at Davis (pursuant to SB X2 1, Statutes of 2008) presented extensive information on nitrates in the Tulare Lake Basin and Salinas Valley. This report is available at: http://groundwaternitrate.ucdavis.edu. The State Water Board's Report to the Legislature, "Recommendations Addressing Nitrate in Groundwater" is available at: http://www.waterboards.ca.gov/water_issues/programs/nitrate_project/docs/nitrate_rpt.pdf

- Lead and copper - Lead exposures can result in neurological, reproductive, and developmental effects. The source of most lead and copper in water supplies tends to be the pipes, fixtures, and associated hardware from which the lead can leach. In 1991, USEPA adopted the Lead and Copper Rule (LCR). The LCR changed the approach to regulating lead and copper in drinking water to regulatory action levels, for which compliance is measured at the water taps of

customers and determined by statistical measures. Because the most likely sources of lead and copper exposure are associated with water distribution systems, this approach is reasonable for the protection of public health. In addition, there have been other changes in the production of plumbing fixtures to reduce the presence of lead and to minimize its leaching into water (for example, from changes in the Building Code and from enforcement actions resulting from the Safe Drinking Water and Toxic Enforcement Act of 1986, Proposition 65).

- Manganese - Manganese is a naturally occurring element, and is regulated via a secondary MCL. Secondary MCLs address taste, odor, and appearance, and unlike federal secondary standards, are enforceable in California. Manganese--and its natural but non-toxic co-contaminant iron--can cause aesthetic problems with regard to taste and color. Manganese is not considered to pose a health risk at low levels, and is an essential nutrient. However, at very high levels, it has the potential to cause neurological effects. To address health concerns that may be associated with high levels of manganese exposure, in 2003 a notification level of 500 ppb was established, ten times the secondary MCL. Water systems that serve water above the notification level are required to notify their county boards of supervisors or city councils that their customers are receiving this water. Approximately 3,600 drinking water sources have reported detections of manganese above the DLR of 200 ppb. Results from January 2006 through June 15, 2011, show that 384 sources reported a peak concentration above 500 ppb. More information is available at: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Manganese.shtml

- Hexavalent Chromium – This form of chromium is the more toxic, carcinogenic form (trivalent chromium is a required nutrient). Total chromium has been regulated in drinking water supplies since the 1970s to protect against adverse health effects associated with the hexavalent form. Hexavalent chromium has been known to be carcinogenic in people when inhaled, but its potential for carcinogenicity when ingested was not supported scientifically until 2007 when the National Toxicology Program reported the results of long-term laboratory animal studies that showed ingested hexavalent chromium can result in cancer.

  Hexavalent chromium has been found in drinking water supplies, both as a naturally occurring contaminant and as an industrial contaminant. To address this contamination, a primary drinking water standard of 0.01 mg/l (10 ppb) was adopted that is specific for hexavalent chromium. From 2000-12, approximately 2,400 sources reported hexavalent chromium at peak concentrations of greater than 1.0 ppb, with two-thirds of the peak detections between 1 and 5 ppb. This monitoring showed the presence of hexavalent chromium was more widespread than previously thought, reflecting its natural distribution in water supplies. Since small PWS serving less than 150 connections were not required to perform this monitoring prior to MCL establishment, the number of sources expected to contain detections of hexavalent chromium can be expected to increase. The highest

levels of contamination have resulted from industrial uses of hexavalent chromium. The hexavalent chromium MCL became effective on July 1 , 2014; more information is available at the following website: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Chromium6.shtml

- Perchlorate – In 1997, perchlorate, used as a propellant in solid rocket fuel, and in fireworks and munitions, was found to have contaminated groundwater supplies near several aerospace facilities. At high enough levels, perchlorate can interfere with the thyroid gland's ability to take up iodine and to make thyroid hormones, which are required for normal growth and development and for normal metabolism. Inadequate thyroid hormones are a particular concern for developing fetuses and infants. Perchlorate is an example of a contaminant that has been present in groundwater for some time, but at levels that were undetectable at very low concentrations due to limitations of laboratory analytical methods. With laboratory analytical improvements, it was able to be detected at much lower concentrations, and its presence was found to be more widespread than previously thought. Perchlorate was also found to be present in the Colorado River, a major source of drinking water in Southern California, resulting from industrial operations in Nevada. To address this contamination, monitoring was first required for perchlorate, and then in 2007 a perchlorate MCL was adopted. From 2006-11, nearly 300 active and standby sources were reported to have detected perchlorate, primarily in the counties of Los Angeles, Riverside, and San Bernardino. More information is available at the following website: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Perchlorate.shtml

3.2.2.2.2. Radiological Contaminants

- Uranium – A naturally occurring radionuclide that exists in soil, uranium can be found in groundwater. Like other radioactive materials and radiation in general, high enough exposures can result in an elevated lifetime cancer risk. In 2006, regulations were updated for uranium, radium-226 and -228, gross alpha and gross beta particle activity, strontium-90, and tritium. Uranium and the radium isotopes are the predominant radionuclides in drinking water, and reflect the natural radioactivity that occurs in soil. Uranium is most commonly detected in groundwater in the foothill areas of the state where the geology is associated with granitic formations. More than 3,800 active and standby sources have been found to have detectable levels of uranium.

- Radon – A tasteless, odorless radioactive gaseous element, radon is a decay product of naturally occurring radioactive materials in the earth; it is considered to pose a cancer risk by inhalation. Radon was at one time considered by the USEPA for possible regulation as a drinking water contaminant, even though its primary means of exposure is indoor air from radon gas that percolates from the earth as it decays from primordial radionuclides. Although plans to regulate

indoor air quality related to radon by limiting its presence in drinking water were dropped, programs to limit exposure to indoor air radon have been developed. More information can be found at: http://www.cdph.ca.gov/HealthInfo/environhealth/Pages/Radon.aspx.

3.2.2.2.3. Organic Contaminants

- DBCP – Though the agricultural use of the nematocide DBCP has not been allowed since the late 1970s, groundwater continues to be contaminated and water continues to need to be treated to remove this widespread contaminant. The concern about DBCP initially was sterilization of male workers, both in its manufacture and in its agricultural use, and it was subsequently found to pose a cancer risk. DBCP was detected at a level greater than the MCL in 123 sources, mainly in the Central Valley. More information about this and consideration of revising MCLs in response to PHGs is available at: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/MCLsandPHGs.shtml

- EDB – Ethylene dibromide is no longer in use as a pesticide. From 2009-12, EDB was detected at a concentration greater than its MCL in seven sources.

- TCE – An industrial solvent, TCE is a contaminant that can pose a cancer risk. It was detected at levels above its MCL in 150 sources from 2009-12. TCE contamination is widely distributed throughout the state, often present in groundwater associated with hazardous waste sites. Where cleanup has not been completed, it can spread laterally and vertically in contaminated groundwater basins. This is likely to continue because the cleanup of the groundwater contamination is very expensive, time-consuming, and technically challenging.

- PCE – An industrial solvent, PCE was detected above its MCL in 136 sources from 2009-12. PCE, like TCE, is often present in groundwater associated with hazardous waste sites, and is considered carcinogenic. Because of its historic use in dry cleaners, there has been urban contamination of groundwater supplies by this contaminant.

- MTBE – In the 1990s, MTBE was found to have contaminated groundwater and certain surface water sources that allow gasoline-powered watercraft. MTBE was used as a gasoline oxygenate. Leaks from underground gasoline storage tanks caused dozens of drinking water supplies to become contaminated; its use as a gasoline additive was eventually prohibited. From 2000-09, 69 sources reported detectable levels of MTBE. Of those, 24 had peak detections greater than the primary MCL, with the greatest number in the counties of San Diego (5) and Monterey (4). To address MTBE contamination from leaking underground gasoline storage tanks, the Drinking Water Treatment and Research Fund was established (H&S Code Section 116367, SB 2198, Chapter 997, Statutes of 1998)

to help affected water systems. This fund was accessible to affected water systems through 2006. More information is available at the following website: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/MTBE.shtml

- 1,4-Dioxane – 1,4-Dioxane has been used as a solvent and as a stabilizer for solvents, in particular 1,1,1-trichloroethane (TCA), and in a number of industrial and commercial applications. In 1998, a drinking water notification level was established for 1,4-dioxane of 3 micrograms per liter (µg/L), and in 2010 revised it downwards to take into account revisions by USEPA of the cancer risk estimate, based on laboratory animal studies. As of 2011, 1,4-dioxane was detected at levels greater than 1 ppb in 79 sources, mostly in the counties of Los Angeles (52 sources) and Orange (24). More information is available at the following website: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/14-Dioxane.shtml

- 1,2,3-Trichloropropane (1,2,3-TCP): In 1999, a 0.005-microgram per liter (µg/L) drinking water notification level was established for 1,2,3-TCP, based on cancer risks derived from laboratory animals studies. 1,2,3-TCP has had various industrial uses and historic pesticide uses, with the primary possible contaminating activity appearing to be hazardous waste sites. The notification level for 1,2,3-TCP was established to address its presence at the Burbank Operable Unit — a Southern California Superfund hazardous waste site — and concerns that it might find its way into drinking water supplies. 1,2,3-TCP was also found in several drinking water wells at that time, primarily in the San Joaquin Valley. Subsequently, water systems were required to monitor for 1,2,3-TCP (as an unregulated contaminant for which monitoring is required) and through 2011, 1,2,3-TCP was reported to have been detected in over 300 sources, with the greatest numbers of sources in the counties of Kern (108 sources), Los Angeles, (46), Fresno (45), Tulare (32), Merced (25), Riverside (19), and San Bernardino (19). The State Water Board plans to propose an MCL for 1,2,3-TCP in 2015**.** More information is available at the following website: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/123TCP.shtml

- NDMA**:** In 1998, N-Nitrosodimethylamine (NDMA) was found to be present in several drinking water wells that was the result of industrial contamination. These findings prompted a notification level for NDMA to be established. In 2000, it was found to be a contaminant present in monitoring wells associated with a groundwater recharge project in Orange County. In addition, NDMA was found to be produced in water treatment; therefore, it can be considered a disinfection byproduct in certain water treatment situations. However, because NDMA and other nitrosamines have been shown to produce cancer in laboratory animal testing, it is important to limit exposures to NDMA in drinking water. More information is available at the following website: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/NDMA.shtml

3.2.2.3. Constituents of Emerging Concern

Constituents of Emerging Concern (CECs) are a number of constituents that are present in wastewater and, therefore, may reach surface water or groundwater supplies of drinking water. These constituents include pharmaceuticals, personal care products, household products, and hormones among others, as well as their breakdown products. Some are considered to be endocrine disrupting constituents, in that they may mimic the action of hormones, particularly female and male sex hormones.

CECs have received a lot of attention in the past decade owing to possible health concerns related to their presence in wastewater and in drinking water supplies. As a result, the State Water Board's statewide Recycled Water Policy addresses CEC monitoring requirements. The State Water Board also convened a Blue Ribbon Expert Panel to develop a list of CECs that permit holders are required to address in their monitoring program; in 2010 the panel released its report, "Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water - Recommendations of a Scientific Advisory Panel." More information about these CECs and the Panel report are available from SWRCB's website: http://www.waterboards.ca.gov/water_issues/programs/water_recycling_policy/recycledwater_cec.shtml.

The CECs considered to be important to monitor were determined based on consideration of their presence in recycled water, the concentrations found therein, and the potential for adverse health effects in people should that water be ingested as drinking water. The panel recommended these constituents be subjects of monitoring in groundwater recharge projects: as indicator compounds (reflecting the adequacy of wastewater treatment), NDMA, 17-beta-estradiol, caffeine, and triclosan; and as performance indicator compounds for surface spreading and direct injection projects, N,N-diethyl-meta-toluamide (DEET), gemfibrozil, iopromide, and sucralose. In 2013, the State Water Board amended its Recycled Water Policy to reflect the panel's recommendations.

The replenishment or recharge of groundwater basins with recycled water continues to involve more basins and will increase, in terms of percent of the contribution of wastewater, in existing projects. Contamination of a groundwater basin by chemical contaminants (NDMA, 1,4-dioxane) in wastewater has already occurred (in the late 1990s in an Orange County water recycling project), which prompted new attention to wastewater treatment and industrial source control. Monitoring will determine if similar incidents will occur in newly recharged basins or in existing basins using more recycled water. Improvements in the design and construction of membranes used as part of the treatment process may reduce the likelihood of such occurrences. The State Water Board's Recycled Water Policy requires groundwater monitoring for CECs.

Even though the Water Boards have addressed CECs for groundwater recharge, CECs from wastewater are also present in surface water sources into which wastewater is discharged. As the state's population grows, the volume of treated wastewater from

municipal sewage treatment plants can be expected to increase. Since no increase is anticipated in the volume of natural water supply from rainfall, the percentage of treated wastewater in the receiving water bodies (discharge-receiving water bodies) will likely increase. A point may be reached when the percentage of wastewater is high enough that the approval of the recipient stream as a source of drinking water will be questioned, especially if CECs are detected at higher concentrations. DDW, the Regional Water Boards and DWQ will continue to coordinate to ensure that no losses of drinking water supplies occurs as a result.

Use of recycled water for irrigation will continue to increase in the future as it has been for the past four decades and is addressed in the State Water Board's Recycled Water Policy.

3.2.2.4. Wastewater

Many wastewater treatment plants discharge treated wastewater into surface water bodies, such as rivers. Many other wastewater treatment plants discharge treated wastewater into groundwater. There may be health concerns about the use of water supplies that receive such discharges for drinking water unless the wastewater treatment is adequate to protect public health. The Regional Water Boards limit such discharges for the protection of public health and the environment.

As the state's population grows, there are commensurate increases in the volume of waste discharges from industries and municipal sewage. These discharges, except along the coast, are into rivers and streams (surface waters) or groundwater used as drinking water supplies. In the past, those discharges have been just minor contributors to the drinking water supply (generally less than five percent in most supplies); however, the increase in the population is increasing the percentage of sewage in drinking water supplies.

When water supplies are not affected by wastewater or other human activities, the chance for contamination is diminished. The water supply from Hetch-Hetchy that San Francisco uses is an example of a relatively pristine surface water supply that is not required to be filtered. However, such pristine sources are relatively rare. A Fact Sheet on the Water Board's 2010 map of impaired surface water bodies, required by the federal Clean Water Act, is available at:
http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010/ir2010_factsheet.pdf

3.2.2.5. Water Security

Recent attention has been directed toward addressing threats from the intentional release of materials into drinking water supplies, for criminal or anti-government (terrorist) purposes. Chapter 9 (Security and Emergency Preparedness) addresses the intentional release of chemicals and other agents into public water supplies.

3.2.2.6. Other Threats to Surface Water Supplies

Algae and algal toxins: Some surface water sources are affected by algae and algal toxins, which affect the quality of drinking water supplies and can also pose health risks. The public health concern about algal toxins is generally related to recreational exposures (swimming), although some cyanotoxin exposures have caused fish kills and deaths of pets and livestock. In coastal environments marine algal toxins can affect the suitability of shellfish for harvest and consumption. For drinking water supplies, the likelihood of exposure to algal toxins is low, since most PWS strive to minimize algal growth in order to meet drinking water standards that address taste and odor, and to avoid problems of consumers finding their water unacceptable for use.

Recent concerns about cyanobacteria (blue-green algae) blooms have resulted in renewed focus on these organisms and their toxins. Poor circulation and mixing, high temperatures, and nutrients from runoff can contribute to algal growth. USEPA has recently developed advisory levels for certain cyanotoxins, which can result in neurotoxicity and other adverse health effects at high enough levels, and California's OEHHA also evaluated health concerns about such toxins in response to a request from the State Water Board. More information is available at the following website: http://www.cdph.ca.gov/HealthInfo/environhealth/water/Pages/Bluegreenalgae.aspx

USEPA also added three cyanotoxins (anatoxin-a, microcystin-LR, and cylindrospermopsin) to its Candidate Contaminants List 3 (CCL3) in 2011. Their presence on CCL3 indicates a need for additional information on occurrence in drinking water supplies and their potential to cause adverse health effects. More information on CCL3 is here: http://water.epa.gov/scitech/drinkingwater/dws/ccl/ccl3.cfm.

Invasive Fish Eradication Projects: In 2007, the Department of Fish and Wildlife Northern Pike Eradication Program for Lake Davis used rotenone to kill the invasive species. Concerns about the effect of the poison on the use of Lake Davis as a drinking water supply resulted in considerable local concern among the community, and required extensive monitoring of the pesticide and its degradation products in water and sediment samples until levels were below detectability.

Accidental Releases: Surface water sources can also be subject to accidents involving chemical releases. The 1991 railroad accident at the Cantara Loop on the Sacramento River resulted in the release of thousands of gallons of the fumigant pesticide metam sodium from a tank car into the Sacramento River and the contamination of the river and Shasta Lake. This spill not only threatened drinking water supplies, but resulted in concerns about the public health and ecological effects of chemical exposures.

Industrial Releases: Groundwater contamination by industrial and agricultural activities is well known. In addition to examples discussed above, surface water contamination of the Colorado River by perchlorate resulted from groundwater contamination at a perchlorate manufacturing facility in Nevada, and subsequently via the Las Vegas Wash to the Colorado River. This contamination was significant to California because the

Colorado River provides drinking water to many Southern Californians, and because it is used to recharge groundwater supplies.

3.2.2.7. Other Threats to Groundwater Supplies

Natural Geologic Formations: The geology of the state contributes to a number of contaminants in drinking water supplies. Chemicals such as arsenic, chromium (particularly hexavalent chromium), cadmium, and radionuclides like uranium are examples of regulated chemicals that have natural origins. Unregulated contaminants of natural origin, for which the State Water Board has established notification levels, include boron and vanadium.

Industrial and Agricultural Activities: Groundwater contamination has occurred historically in industrial and agricultural areas throughout the state and has resulted in widespread groundwater contamination, as has been described previously.

Groundwater Recharge Projects: Groundwater recharge projects that use recycled water, either via surface application (spreading) of the recycled water or via subsurface application (injection), have the potential of introducing contaminants into aquifers used for drinking water.

Hydraulic Fracturing: Various oil and natural gas well stimulation techniques including hydraulic fracturing are used in California to increase oil and natural gas production from "tight" (low permeability) geological formations such as diatomite or shale.

Concerns have arisen both in the state and nationally about the potential for groundwater contamination from hydraulic fracturing and other well stimulation activities. These concerns relate to the quantities of water and chemicals that are pumped into oil and gas production wells to fracture rock and release oil and natural gas from tight geologic formations, and whether drinking water supplies may be contaminated as a result. Though oil and gas production zones are typically located far below drinking water aquifers, the potential for drinking water contamination can occur if the wells used to inject fracking chemicals are improperly constructed, if the wells develop leaks, or if the fractures created through well stimulation allow chemicals under pressure to disperse into drinking water sources. In August 2014, the California Council on Science and Technology released its independent review of well stimulation in California, available at: http://www.ccst.us/projects/fracking_public/BLM.php. The report's topics include potential effects on potable water supplies although noting that more data on water quality is needed.

Pursuant to SB 4 (Chapter 313, Statutes of 2013), the California Department of Conservation, Division of Oil, Gas, and Geothermal Resources, in coordination with the Water Boards, has adopted interim well stimulation regulations effective January 1, 2014. These regulations and additional background and details on well stimulation can be found at: http://www.conservation.ca.gov/dog/Pages/Index.aspx.

In September 2014, Governor Edmund G. Brown Jr. signed a three-bill package known as the Sustainable Groundwater Management Act. The legislation allows local agencies to adapt groundwater sustainability plans to their regional economic and environmental needs. The Act creates a framework for sustainable, local groundwater management for the first time in California history. The primary responsibility assigned to the State Water Board is to protect groundwater resources if a local agency cannot or will not manage its groundwater sustainably. If local efforts fail to adequately manage groundwater, the State Water Board has the authority to step-in and collect groundwater data, designate the basin as probationary, develop groundwater management plans, and collect fees for these activities.

3.2.2.8. Addressing Threats to Drinking Water Supplies

3.2.2.8.1. Source Water Assessment and Protection Programs

The State Water Board has a Drinking Water Source Assessment and Protection (DWSAP) program. The 1996 reauthorization of the federal SDWA included a requirement for states to assess all groundwater and surface water sources. A source water assessment is an inventory of possible contaminating activities that may threaten the quality of the source. If possible contaminating activities present a threat to the source, water systems are encouraged to protect their water sources from contamination through the establishment and implementation of a source water protection program. The results of the source water assessment must be included in the water system's annual Consumer Confidence Report. Any new drinking water sources must include an assessment as part of DDW's permit process. More information is available at http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/DWSAP.shtml

The transfer of the Drinking Water Program provides the State Water Board an opportunity to better integrate surface water and groundwater protection efforts to protect drinking water supplies. The Regional Water Boards already have placed greater emphasis on drinking water source water protection through salt and nutrient management planning and regulation and enforcement of nitrate discharges from agriculture and dairies. The State Water Board's Groundwater Ambient Monitoring and Assessment Program and the Regional Water Boards' Irrigated Lands Regulatory Programs monitor groundwater to characterize potential impacts to drinking water supplies. In addition, the State Water Board has begun to integrate data from the Drinking Water Program to improve source water protection efforts. For example, the Division of Drinking Water has used public water system well location information to identify wells that are vulnerable to contamination from wastewater injection wells used by the oil and gas exploration industry.

3.2.2.8.2. Limits on Industrial Releases into Drinking Water Supplies

Due to the widespread contamination of several groundwater basins, the State Water Board and the Regional Water Boards have been even more diligent in controlling discharges of wastes to prevent further contamination of groundwater basins. The regulation of wastewater discharges from larger facilities into surface water supplies now includes requirements for industrial source control, whereby industries must limit chemical releases into wastewater collection systems.

3.2.2.8.3. Limits on Household Chemical Releases into Drinking Water Supplies

Household hazardous substances, personal care products, and prescription pharmaceuticals are examples of materials that can be discharged into wastewater collection systems and subsequently discharged into surface water bodies. Regional Water Boards cannot feasibly require or enforce source control or household discharges. However, some progress has been made in limiting the presence of pharmaceuticals released from households into wastewater and subsequently into water used for drinking. A number of communities have instituted public education programs or other programs to collect unused drugs and to keep them from being flushed down the toilet, which, although now discouraged via such outreach efforts as "Don't Rush to Flush", is used to dispose of such materials. Alameda County passed an ordinance in July 2012 requiring drug manufacturers and producers that sell, offer for sale, or distribute certain prescription drugs in the county to participate in a program that includes a process for the collection and disposal of unwanted products from residential prescription drug consumers.

3.3. THREATS RELATED TO DRINKING WATER SYSTEM OPERATIONS

3.3.1. Disinfection and Disinfection Byproducts

With very few exceptions, all surface waters must be filtered and disinfected to address the microorganisms present in surface waters to make it safe for drinking (water treatment processes are discussed further in Chapter 7). For surface water supplies, microorganisms and disinfection byproducts (DBPs) have been and continue to be contaminants that must be dealt with by PWS.

Disinfection is the most important barrier to the spread of infectious disease from waterborne pathogens. Historically chlorine was the disinfectant of choice for use when treating surface water sources. However, in the 1970s it was discovered that chlorine will react with natural organic matter to form DBPs that have potential long-term health effects. Surface water contains natural organic compounds from vegetation that may fall into or otherwise be present in water supplies, or from algae that may grow in sun-lit water. To prevent the formation of DBPs, water systems must take steps to reduce

organic material in surface water sources, and/or change the method or chemicals used for disinfection.

Beginning in 1989 and continuing to the present, USEPA promulgated several regulations that apply to certain PWS that use surface water. These regulations were all subsequently adopted by the state. They include the Surface Water Treatment Rule (SWTR), Interim Enhanced Surface Water Treatment Rule (IESWTR), Long Term (LT) 1 Surface Water Treatment Rule (LT1SWTR), LT 2 Surface Water Treatment Rule (LT2SWTR), and the Filter Backwash Recycling Rule. In 1995, the *Cryptosporidium* Plan, was released to address risks associated with this parasite. Subsequently, regulations for *Cryptosporidium* and *Giardia* were included in the surface water treatment rules mentioned above. Additional requirements and regulations to minimize the presence of DBPs have been put into place, including the Stage 1 Disinfection and Disinfection Byproducts Rule in 1998 and the Stage 2 Disinfection and Disinfection Byproducts Rule in 2006.

The nitrosamine NDMA is currently unregulated. It has been found to result from water chlorination and can be present in drinking water and in wastewater. In this regard, the production of NDMA can be considered a disinfection byproduct. At high enough levels, it can be of concern for drinking water and for wastewater that is destined for use in a recycled water project involving the augmentation of drinking water supplies.

3.3.2. Distribution Systems

PWS distribution systems consist of water pipes, pumps, storage facilities, and other appurtenances to meet distribution needs. The maintenance and operation of the distribution system are critical to meet the demands for water, including during natural disasters such as earthquakes, floods, fires, power outages, etc.

Adequate storage facilities and standby power helps water systems during disasters. Some water systems have made efforts to prepare for such disasters, but most water systems, especially small water systems, have not. Recently, mutual aid organizations have been formed for some small water systems that need help. An inventory of standby equipment is maintained to assist those water systems.

All water systems must properly operate and maintain their distribution facilities in order to provide customers with drinking water of good quality and at an adequate pressure under all conditions, including during emergencies or natural disasters. Most of the distribution system facilities were constructed many decades ago. In California, based on the USEPA 2011 Infrastructure Needs Assessment, the estimated cost to bring distribution systems up to date is over $26.8 billion.

Some water systems continue to have uncovered distribution reservoirs, which are susceptible to contamination of treated water from runoff and airborne contaminants, and vandalism. These sources are no longer acceptable according to the state regulations “California Waterworks Standards,” adopted in 2008. Recent USEPA requirements

require water systems to develop a plan for covering all open distribution reservoirs or taking them out of service. A list of all remaining open distribution reservoirs has been developed along with a long-term compliance strategy.

Most water systems use storage reservoirs to handle hourly, daily, and seasonal fluctuations in water demands. During periods of low water demand, especially during the winter months, water can be stored in the reservoirs for several days and, in some cases, weeks. This can cause the water to become stale. If the water system uses chloramines for disinfection, the stale water could result in the breakdown of chloramines, undergoing nitrification. This leads to bacteriological problems in water quality.

Water pipes are subject to contamination if the pipes develop leaks as a result of deterioration. Depending on the water pressure, the openings in the pipe may allow contaminants in the surrounding soil to seep in and contaminate the water inside the pipe. In addition, during repairs the water could become contaminated if proper procedures are not carefully followed. Adequate disinfection is necessary after repairs to ensure that the water in the pipe is safe for drinking.

It is essential to maintain a disinfectant residual in the distribution system to control microbial growth inside distribution system piping and reservoirs. As normal disinfection does not sterilize the water, there will still be some microbiological organisms present in the water supply that can be controlled by the disinfectant residual. In addition, a disinfectant residual will prevent contamination that may occur if microbiological organisms are introduced into the distribution system via leaks, vents, or other openings.

Connections can be made that expose the distribution system to contaminants or pollutants that may cause the water supply to be unsafe for drinking. “Cross connection” occurs when a connection is made between the drinking water and another source of water that is not safe. An example of a cross connection is when a container of a chemical is connected to the drinking water through a pipe or a hose. If the drinking water system loses pressure or a vacuum occurs, the chemical can be sucked into the drinking water system. Another example is when the homeowner leaves a garden hose flowing and submerged in a pond or pool of water. If the drinking water system experiences a loss of pressure or a vacuum is created, the water in the pond or pool can be sucked into the drinking water system. To prevent such events, California requires every water system to have a cross connection control program, including an ordinance or rules of service.

Water system owners and operators must be diligent in inspecting and monitoring their facilities on a frequent basis. At any time, the facilities may be targets of vandals or terrorists. Several acts of vandalism and/or terrorism have occurred in California. Several water systems inspect their facilities more than once a day. Some systems have installed cameras and intrusion alarm systems.

3.3.3. Operation and Maintenance

Many of the problems that occur in water systems result from operator errors. These are caused by poor or no training, inadequate staffing, lack of proper guidance from supervisors, or few or no practice sessions.

To address these issues, in 2001 USEPA required states to establish certification programs for operators of water treatment and water distribution facilities. While California has long had a water treatment certification program, it did not previously certify or require certified distribution operators. The State Water Board now has a comprehensive program, funded by application and renewal fees, to certify treatment and distribution operators. Over the past decade the number of operators has grown significantly from about 23,000 to 33,000 active certified operators.

Small water systems have greater difficulty in obtaining and keeping certified operators than do larger systems. The larger water systems can pay higher salaries than small water systems, and many small water systems are located in isolated rural areas where the availability of certified operators is limited. In the past, USEPA provided one-time federal funds through the Expense Reimbursement Grant Fund (ERG) to pay operators from small water systems for classes and certification, however these funds have been exhausted. Methods were investigated to continue this program with set-aside funds from the DWSRF, but that approach was hampered by the state's contracting and fiscal requirements. There is a surplus from the revenue that is derived from operator application and renewal fees. This surplus, which is contained in the OpCert Surplus Money Investment Fund (SMIF), could also be used to support operator education and training.

The availability of classes also depends on location. In rural areas, especially in Northern California, there generally is a lack of classes an operator can attend in person. Consequently, many small water systems will continue to be challenged to cover such training and certification costs.

3.4. REGULATORY COMPLIANCE ISSUES

Regulations have been adopted resulting in increased monitoring requirements, more MCLs, new DBP and SWTR rules, source water protection programs, and new MCLs are forthcoming (1,2,3 TCP). Compliance with the regulations has been good among large water systems. However, some small water systems, particularly community PWS serving less than 200 service connections and smaller nontransient, noncommunity water systems, have had considerably more difficulty complying with the regulations. Chapter 4 provides a detailed discussion of the water quality issues affecting these small systems.
Additionally, the State Water Board recognizes that a number of small water systems with less than 15 service connections may serve more than 25 individuals daily, and should therefore be regulated as a PWS.

Overall Water Quality/Improvements in Compliance: The State Water Board water quality data demonstrate that more than 98 percent of the population served by community water systems receives water meeting all primary drinking water standards. There are fewer small water systems failing bacteriological standards; however, more small water systems have difficulty meeting chemical standards. Also as mentioned previously, this Plan does not take into account the state's residents who are not served by a PWS. The State Water Board will look for future opportunities to partner with local agencies as they strive to address the drinking water needs of residents who are not served by PWS. The State Water Board is committed to pursuing solutions to ensure that California's small PWS customers receive affordable, safe, and reliable drinking water.

Distribution Systems: The distribution systems of almost all water systems are in need of replacement, as many of the facilities have exceeded their useful life. Unless replaced, operators will face the daunting challenge of trying to keep the distribution systems operating to provide safe drinking water at adequate pressure.

Funding to Address Water Quality: The DWSRF can be used to construct facilities that address existing water quality problems. While California has received significant DWSRF funding from USEPA, it is insufficient to fund all the needed permanent facility improvements to ensure that all water systems remain or become compliant with drinking water standards. In addition, the DWSRF is predominantly a loan program, and many small water systems cannot afford loan repayments in addition to necessary operation and maintenance costs. California voters recognized this need and passed two bond measures: Proposition 50, The Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002, Water Code Section 79500, et seq., and Proposition 84, The Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Act of 2006, Public Resources Code Section 75001, et seq. Proposition 50 and Proposition 84 funds for drinking water improvements are no longer available to new applicants – the pending applications exceed the remaining funding (which will all be committed to projects by June 2015).

Additional financial support for infrastructure improvements for water systems is needed. Besides the problem of limited revenue base to sustain loan repayments, funding infrastructure improvements for small systems, particularly those in disadvantaged communities, is particularly difficult, owing to federal requirements that systems that receive DWSRF funding have an appropriate level of TMF expertise. There are no current funding mechanisms to provide for ongoing operations and maintenance after treatment systems are constructed. Based on state agencies' experience in certain financial assistance programs, there is a significant potential for fraud, waste, and abuse if the State were to provide funding for operations and maintenance and other ongoing, non-capital costs. Strong program oversight should ensure that potential fraud, waste and abuse of government funding is avoided.

Small vs Large Water Systems: Small water systems have the greatest difficulty in providing safe drinking water because they are least able to address the threats to public health associated with water quality.

Larger water systems are better equipped to deal with water quality issues because they have more customers to fund the necessary improvements, have economy of scale, more technical expertise, better management skills and knowledge, are able to solve operational problems internally, and have dedicated financial and business-related staff. They generally have more sophisticated treatment and distribution system operators who are able to react to incidents and changes in treatment conditions that may occur during operations.

On the other hand, small systems, especially those in disadvantaged communities, have only a small number of customers, which provides them with limited fiscal assets and no economy of scale. They often lack technical expertise, the ability to address many of the issues pertinent to operating a water system, as well as qualified management and financial and business personnel. In many instances, especially for very small water systems, the system operator may be just a part-time position. The State Water Board is committed to pursuing solutions to ensure that California's small PWS customers receive affordable, safe, and reliable drinking water.

3.5. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Over 98 percent of the population served by PWS receives drinking water that meets federal and state drinking water standards. The chemical, radiological, and microbiological contaminants are effectively being removed through treatment. However, as mentioned earlier, this Plan does not take into account the state's residents who are not served by a PWS. The State Water Board will look for future opportunities to partner with local agencies as they strive to address the drinking water needs of residents who are not served by PWS. However, the State Water Board is committed to pursuing solutions to ensure that California's small PWS customers receive affordable, safe, and reliable drinking water.

In the past two decades, many new contaminants have been identified and the majority of which have been effectively regulated or are in the process of being regulated. In addition, MCLs for some regulated contaminants and disinfection byproducts have been made more stringent. CECs are the next group of contaminants that may require consideration for regulatory action although, because of their low concentrations in drinking water sources, it is unclear whether or not they pose a health risk. Water quality monitoring for the myriad of regulated contaminants has become costly, which has resulted in an economic burden on many small water systems.

California still depends on a combination of surface water and groundwater to meet its drinking water needs. Pollution threats such as wastewater discharges and agricultural

practices can impact the quality of these sources. Fortunately, strong regulatory efforts along with greater emphasis on drinking water source protection activities have lessened the impact from these threats. However, with California's population increasing and as climate change affects water resource reliability, new sources of drinking water will be needed. Sources derived from high-quality recycled water and desalination will likely become more prevalent.

The operation and maintenance of water systems has a significant impact on the quality of drinking water delivered to the public. Larger water systems have the financial capacity to provide for a well-trained and technically competent workforce of water system operators. However, small water systems, particularly those that have treatment facilities have a difficult time acquiring and retaining water system operators with the expertise to operate such facilities. In addition covering the cost of training operators is a challenge to small water systems.

Recommendations

3-1 The State Water Board will encourage large water systems, subject to compliance with such PUC requirements as may apply, to assist neighboring water systems in sampling and analysis, particularly when the small systems are out of compliance and when sampling of the small systems' source(s), including surface and groundwater, might provide information that would be of value to the larger system (e.g., presence of contaminants, movement of contaminants). Similar arrangements for water systems that utilize the same surface water source already exist.

3-2 The State Water Board will explore possible funding sources to facilitate operator education opportunities particularly for small water system operators.

3-3 The State Water Board will require, as appropriate, vulnerable water systems to 1) submit studies regarding the reliability of their existing sources of drinking water, and 2) take necessary actions to improve system reliability in accordance with the studies, as well as avoid or mitigate the impact of the loss of supply on the public health and safety, including the loss of supply due to prolonged or severe drought conditions. The cost of a reliability analysis is eligible for funding through DWSRF planning studies.

REFERENCES

Joan F. Kenny, Nancy L. Barber, Susan S. Hutson, Kristin S. Linsey, John K. Lovelace, and Molly A. Maupin, "Estimated Use of Water in the United States in 2005," Circular 1344, U.S. Geological Survey, 2009

CHAPTER 4. WATER QUALITY ISSUES AFFECTING PWS SERVING FEWER THAN 10,000 SERVICE CONNECTIONS

The quality (accuracy and completeness) of water quality data has significantly improved over the last two decades. The most important improvements are the reporting of water quality data electronically by PWS and the increased water quality data reported by smaller PWS serving less than 200 service connections. Until recently limited data were available about organic chemical contaminants and virtually no information about inorganic chemical contaminants affecting PWS serving less than 200 service connections. Now all PWS are required to report their water quality monitoring data (except for microbiological data) electronically through the analytical laboratories with whom they contract.

PWS are separated into three categories: community water systems (CWS), nontransient noncommunity water systems (NTNCWS), and transient noncommunity water systems (TNCWS). CWS serve communities with full-time residents and are categorized based on the number of service connections: 15 to 199 (small), 200 to 999 (intermediate), 1,000 to 9,999 (medium) and 10,000 or more (large). Noncommunity water systems, NTNCWS and TNCWS, serve populations in nonresidential settings. NTNCWS serve the same people for an extended length of time (e.g., schools, factories, and prisons), while TNCWS serve different people for a minimum of time over the year (e.g., restaurants and campgrounds).

NTNCWS are subject to the same primary drinking water standards as CWS, because the exposure to contaminants in drinking water served by these systems is similar to residential settings. TNCWS are generally only subject to microbiological and nitrate standards because exposure to contaminants in drinking water is for limited duration. A few TNCWS use surface water and are required to meet additional treatment requirements. Although TNCWS are subject to fewer requirements, the safety of drinking water from these systems is still important as the last waterborne disease outbreak in California was associated with a TNCWS.

Because NTNCWS and TNCWS do not have multiple service connections, they are addressed according to the following ranges based on population served: less than 660 people (small); 660 to 3,300 people (intermediate); and greater than 3,300 (medium). Defining small NTNCWS and TNCWS as serving less than 660 people is intended to make them equivalent to small CWS in terms of the number of people served. The conversion factor of 3.3 people per service connection is used as defined in H&S Code Section 64412. The same approach is used to categorize intermediate and medium NTNCWS and TNCWS. Table 4.1 provides a breakdown of the number of PWS within each category. The statutory definition of each type of PWS is contained in Appendix 2

Table 4.1
Number of Public Water Systems
By Type and Size as of January 9, 2014

PUBLIC WATER SYSTEMS BY TYPE AND SIZE	NUMBER OF SYSTEMS
CWS, LARGE (10,000+SC/WHOLESALER)	221
CWS, MEDIUM (1,000-9,999 SC)	461
CWS, INTERMEDIATE (200-999 SC)	416
CWS, SMALL (<200 SC)	1,917
NTNCWS	1,489
TNCWS	3,138
Total	7,642

SC = Service Connections
CWS = Community water system
NTNCWS = Nontransient noncommunity water system
TNCWS = Transient noncommunity water system

This Plan describes water quality issues affecting these systems based on the Annual Compliance Reports (ACRs) that are submitted to USEPA on PWS violations of primary drinking water standards from the latest two reporting years 2011 and 2012. The Plan also addresses unregulated contaminants for which there are potential health concerns and for which monitoring data exist for these systems. In general, the ACRs indicate that CWS serving less than 10,000 services connections and the NTNCWS and TNCWS are affected by both ongoing issues and challenges resulting from more stringent drinking water standards and the discovery of new contaminants that pose potential adverse health effects. However, these PWS have made significant strides in addressing many water quality issues and challenges. The following provides a description of the water quality issues presently affecting CWS serving less than 10,000 service connections and NTNCWS and TNCWS based on water sources and types of contaminants including microbial, chemical (organic and inorganic), and radiological.

4.1. SURFACE WATERS

4.1.1. Microbiological

Over the last two decades, a greater emphasis has been placed on improving treatment of surface waters to provide greater assurance that bacterial, parasitic, and viral

pathogens are effectively removed and to address new microbiological threats, specifically *Cryptosporidium*. USEPA has adopted several regulations that apply to certain PWS that use surface water. These regulations were all subsequently adopted by the state. They include the Surface Water Treatment Rule (SWTR), Interim Enhanced Surface Water Treatment Rule (IESWTR), Long Term (LT) 1 Surface Water Treatment Rule (LT1SWTR), LT 2 Surface Water Treatment Rule (LT2SWTR), and the Filter Backwash Recycling Rule. The LT1SWTR is directed at PWS serving less than 10,000 people, while the LT2SWTR affects all PWS that use surface water. The effect of these Rules has been to significantly reduce the risk of waterborne infectious disease transmission as evidenced by the lack of waterborne infectious disease outbreaks associated with PWS that use surface water sources in California.

Tables 4.2 and 4.3 show the number of CWS, NTNCWS, and TNCWS that were in violation of these Rules in 2011 and 2012. To summarize, in 2011, a total 48 PWS were in violation of the SWTR and the IESWTR (all of which were PWS that served less than 10,000 service connections), and in 2012, a total of 44 PWS were in violation of the SWTR and the IESWTR (all but one of which were PWS that served less than 10,000 service connections).

Table 4.2
Number of PWS in Violation of SWTR and IESWTR
by County and Water System Type and Size in 2011

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
Fresno	CWS - Small (15 -199 SC)	8
	NTNCWS - Small (<660 persons/day)	2
Humboldt	CWS - Small (15 -199 SC)	2
	NTNCWS - Small (<660 persons/day)	1
	TNCWS - Small (<660 persons/day)	2
Kern	NTNCWS -Small (<660 persons/day)	1
Mendocino	TNCWS - Small (<660 persons/day)	1
Monterey	CWS - Small (15 -199 SC)	5
	TNCWS - Small (<660 persons/day)	2
Nevada	CWS - Small (15 -199 SC)	1
Orange	CWS - Medium (1,000 - 9,999 SC)	1
Placer	TNCWS - Small (<660 persons/day)	1
Riverside	CWS - Small (15 -199 SC)	1
San Benito	NTNCWS - Small (<660persons/day)	1
	TNCWS - Small (<660 persons/day)	1
San Mateo	TNCWS - Small (<660 persons/day)	1
Shasta	CWS - Small (15 -199 SC)	1

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
Sierra	TNCWS - Small (<660 persons/day)	1
Sonoma	CWS - Small (15 -199 SC)	1
Trinity	CWS - Small (15 -199 SC)	1
	TNCWS - Small (<660 persons/day)	2
Tulare	CWS - Small (15 -199 SC)	3
	CWS - Intermediate (200 - 999 SC)	1
	TNCWS- Small (<660 persons/day)	6
TOTAL		48

Table 4.3
Number of PWS in Violation of SWTR and IESWTR
by County and Water System Type and Size in 2012

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
Amador	CWS - Medium (1,000 - 9,999 SC)	1
Fresno	CWS - Small (15 - 199 SC)	8
	NTNCWS - Small (<660 persons/day)	1
	TNCWS - Small (<660 persons/day)	2
Humboldt	NTNCWS - Small (<660 persons/day)	1
Imperial	CWS - Medium (1,000 - 9,999 SC)	2
Los Angeles	CWS - Small (15 - 199 SC)	1
	CWS - Large (>10,000 SC)	1
Monterey	CWS - Small (15 - 199 SC)	6
	TNCWS - Small (<660 persons/day)	2
Placer	TNCWS - Small (<660 persons/day)	1
Riverside	CWS - Small (15 - 199 SC)	1
San Benito	NTNCWS - Small (<660 persons/day)	1
	TNCWS - Small (<660 persons/day)	1
Santa Cruz	CWS - Small (15 - 199 SC)	4
Shasta	CWS - Small (15 - 199 SC)	1
	TNCWS - Small (<660 persons/day)	2
Siskiyou	TNCWS - Small (<660 persons/day)	1
Sonoma	CWS - Small (15 - 199 SC)	1
Tulare	CWS - Small (15 - 199 SC)	1
	TNCWS - Small (<660 persons/day)	3
Ventura	CWS - Small (15 - 199 SC)	1
TOTAL		44

4.1.2. Disinfection Byproducts

All CWS and NTNCWS are required to meet standards for disinfection byproducts (DBPs) to reduce the potential for long-term health effects. There are MCLs for total trihalomethanes (TTHMs) (bromodichloromethane, bromoform, chloroform, and dibromochloromethane), chlorite, bromate, and five haloacetic acids (HAA5s) (monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid). There are also requirements for disinfectant residuals including chlorine, chloramine, and chlorine dioxide.

The last regulation addressing DBPs, the Stage 2 Rule, affects CWS and NTNCWS serving less than 10,000 people. Under that Rule those PWS were required to begin compliance monitoring in October 2013. Therefore, compliance data for that Rule are not available at this time.

Tables 4.4, 4.5, 4.6, and 4.7 show the number of CWS and NTNCWS that were in violation of the MCLs for DBPs in 2011 and 2012. To summarize, in 2011, there were 43 violations of the MCL for THMs and 19 violations of the MCL for HAA5s (all of which occurred among PWS serving less than 10,000 service connections), and in 2012, there were 43 violations of the MCL for THMs and 13 violations of the MCL for HAA5s (all but one of which occurred among PWS serving less 10,000 service connections).

Table 4.4
Number of PWS in Violation of MCL for THMs
by County and Water System Type and Size in 2011

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
Amador	CWS - Intermediate (200 - 999 SC)	1
Fresno	CWS - Small (15 - 199 SC)	16
	NTNCWS - Small (<660 persons/day)	6
Humboldt	CWS - Small (15 - 199 SC)	1
Imperial	CWS - Intermediate (200 - 999 SC)	2
	NTNCWS - Small (<660 persons/day)	1
Kern	NTNCWS - Intermediate (660 - 3,300 persons/day)	1
Kings	CWS - Medium (1000 -9,900 SC)	2
Los Angeles	CWS - Medium (1000 - 9,900 SC)	1

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
Madera	CWS - Small (15 - 199 SC)	1
Marin	CWS - Small (15 - 199 SC)	1
	CWS - Intermediate (200 – 999 SC)	1
Mariposa	CWS - Intermediate (200 - 999 SC)	1
Monterey	NTNCWS - Small (<660 persons/day)	1
Napa	CWS - Intermediate (200 - 999 SC)	1
San Mateo	CWS - Small (15 - 199 SC)	1
Santa Cruz	CWS - Intermediate (200 - 999 SC)	1
Sonoma	CWS - Small (15 - 199 SC)	1
Tulare	CWS - Small (15 - 199 SC)	3
TOTAL		43

Table 4.5
Number of PWS in Violation of MCL for HAA5s
by County and Water System Type and Size in 2011

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
Fresno	CWS - Small (15 - 199 SC)	1
	CWS - Intermediate (200 - 999 SC)	1
Humboldt	CWS - Small (15 - 199 SC)	1
	CWS - Intermediate (200 - 999 SC)	1
Kern	NTNCWS - Intermediate (600 - 3,300 persons/day)	1
Lake	CWS - Small (15 - 199 SC)	1
Madera	CWS - Small (15 - 199 SC)	1
Marin	CWS - Small (15 - 199 SC)	1
	CWS - Intermediate (200 - 999 SC)	1
	NTNCWS - Small (<660 persons/day)	1
Mariposa	CWS - Intermediate (200 - 999 SC)	1
Monterey	NTNCWS -Small (<660 persons/day)	1
Napa	CWS - Intermediate (200 - 999 SC)	1

San Mateo	CWS - Small (15 - 199 SC)	1
Sonoma	CWS - Small (15 - 199 SC)	1
	NTNCWS - Small (<660 persons/day)	1
Tulare	CWS - Small (15 - 199 SC)	3
TOTAL		19

Table 4.6
Number of PWS in Violation of MCL for THMs
by County and Water System Type and Size in 2012

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
Fresno	CWS - Small (15 - 199 SC)	16
	CWS - Medium (1,000 - 9,999 SC)	1
	NTNCWS - Small (<660 persons/day)	5
Imperial	CWS - Medium (1,000 - 9,999 SC)	1
	NTNCWS - Small (<660 persons/day)	1
	NTNCWS - Intermediate (660 - 3,300 persons/day)	1
Kern	CWS - Medium (1,000 - 9,999 SC)	3
	CWS - Intermediate (200 - 999 SC)	1
	NTNCWS - Small (<660 persons/day)	2
Kings	CWS - Large (>10,000 SC)	1
Lake	CWS - Intermediate (200 - 999 SC)	1
Madera	CWS - Small (15 - 199 SC)	1
Mariposa	CWS - Intermediate (200 - 999 SC)	1
Mendocino	NTNCWS-Small (<660 persons/day)	1
Merced	NTNCWS-Small (<660 persons/day)	1
Napa	CWS - Intermediate (200 - 999 SC)	1
San Diego	CWS - Small (15 - 199 SC)	1
San Mateo	CWS - Small (15 - 199 SC)	1
Tulare	CWS - Small (15 - 199 SC)	1
	CWS - Intermediate (200 - 999 SC)	2
TOTAL		43

Table 4.7
Number of PWS in Violation of MCL for HAA5s
by County and Water System Type and Size in 2012

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
Alpine	CWS - Medium (1,000 - 9,999 SC)	1
El Dorado	CWS - Small (15 - 199 SC)	1
Fresno	CWS - Small (15 - 199 SC)	1
Humboldt	CWS - Intermediate (200 - 999 SC)	1
Lake	CWS - Small (15 - 199 SC)	1
Madera	CWS - Small (15 - 199 SC)	1
Mariposa	CWS - Intermediate (200 - 999 SC)	1
Monterey	CWS - Small (15 - 199 SC)	1
Napa	NTNCWS-Small (<660 persons/day)	1
San Luis Obispo	CWS - Small (15 - 199 SC)	1
San Mateo	CWS - Small (15 - 199 SC)	1
Tulare	CWS - Small (15 - 199 SC)	1
	CWS - Intermediate (200 - 999 SC)	1
TOTAL		13

4.1.3. Chemicals

Surface waters in California continue to be free from organic and inorganic chemicals that exceed MCLs. The principal chemicals that affect surface waters are naturally occurring organic chemicals and, in some situations, bromide that are precursor materials in the formation of DBPs.

The Colorado River contamination by perchlorate from a Nevada facility, however (discussed in Chapter 3), shows that chemical contaminants may be problematic for surface water supplies of drinking water in some situations. Recent monitoring suggests that emerging chemical contaminants such as pharmaceuticals and personal health care products are being detected at low levels in surface waters that receive wastewater discharges. The public health significance of these chemicals at these low levels is unclear.

4.2. GROUNDWATER

4.2.1. Organic Chemicals

Agricultural chemical pesticides such as DBCP and volatile organic chemicals such as the chlorinated solvents TCE and PCE have been the most common organic chemicals found to exceed MCLs. In the past two decades tremendous strides have been made to

mitigate these problems. The 2011 and 2012 ACRs indicate the only organic chemical MCL violations involved DBCP, with the total number amounting to less than five.

Of the unregulated organic chemicals only one, 1,2,3-TCP, a byproduct of an agricultural pesticide and industrial solvent, is a potentially significant problem for PWS serving less than 10,000 service connections. Although the monitoring data are limited for these systems, the overall data indicate that 1,2,3-TCP is present in groundwater in several counties in the Central Valley including Kern, Fresno, Tulare, Merced, San Joaquin, and Stanislaus. This contamination is most likely due to agricultural pesticide use. The data also indicate the presence of the chemical in Riverside and San Bernardino Counties, which may either be from agricultural pesticide use or from the use and disposal of certain industrial solvents. The chemical has also been found in parts of Los Angeles County, which has generally been attributed to industrial sources. A summary of recent monitoring data as well as individual results can be found at the following website: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/123TCP.shtml

4.2.2. Radionuclides

New regulations adopted for radionuclides over the last two decades include an MCL for uranium, which was initially promulgated in California and subsequently by USEPA.

Tables 4.8 and 4.9 summarize the uranium MCL violations for 2011 and 2012. In summary, in 2011, there were 22 PWS that were in violation of the uranium MCL, and in 2012, there were 27 PWS in violation of the uranium MCL. There were no water systems serving more than 10,000 service connections that exceeded a radionuclide MCL in 2011 and 2012. As the results indicate, there was an increase in violations in 2012 with the majority of violations occurring among the small CWS. The preponderance of these water systems were located in the foothills of the Central Valley where the geology (granitic formations) is consistent with the presence of radionuclides in groundwater.

Table 4.8
Number of PWS in Violation of MCL for Uranium
by County and Water System Type and Size in 2011

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
Fresno	CWS - Small (15 -199 SC)	2
	NTNCWS - Small (<660 persons/day)	5
Inyo	CWS - Small (15 -199 SC)	1
	NTNCWS - Small (<660 persons/day)	1
Kern	CWS - Medium (1,000 - 9,999 SC)	1
Madera	CWS - Small (15 -199 SC)	4
	CWS - Intermediate (200 - 999 SC)	1
	NTNCWS - Small (<660 persons/day)	1

	NTNCWS - Intermediate (660 - 3,300 person/day)	1
Plumas	CWS - Small (15 -199 SC)	1
Riverside	CWS - Small (15 -199 SC)	1
San Bernardino	CWS – Intermediate (200 - 999 SC)	1
San Diego	CWS – Intermediate (200 - 999 SC)	1
Tulare	CWS - Intermediate (200 - 999 SC)	1
TOTAL		22

Table 4.9
Number of PWS in Violation of MCL for Uranium
by County and Water System Type and Size in 2012

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
Inyo	CWS - Small (15 - 199 SC)	2
	NTNCWS - Small (<660 persons/day)	1
Kern	NTNCWS - Small (<660 persons/day)	1
Kings	CWS - Small (15 - 199 SC)	1
Madera	CWS - Small (15 - 199 SC)	8
	CWS - Medium (1,000 - 9,999 SC)	1
	NTNCWS-Intermediate (660 - 3,300 persons/day)	2
Plumas	CWS - Intermediate (200 - 999 SC)	1
Riverside	CWS - Small (15 - 199 SC)	1
	NTNCWS - Small (<660 persons/day)	1
San Bernardino	CWS - Small (15 - 199 SC)	2
	CWS - Intermediate (200 - 999 SC)	3
San Diego	CWS - Intermediate (200 - 999 SC)	1
Tulare	CWS - Intermediate (200 - 999 SC)	1
	NTNCWS - Small (<660 persons/day)	1
TOTAL		27

4.2.3. Inorganic Chemicals

The most significant inorganic water quality issue affecting groundwater has been arsenic and the revision of the MCL for arsenic. In 1993, the MCL for arsenic was 50 micrograms per liter (µg/L). In 2001, USEPA lowered the MCL for arsenic to 10 µg/L and the state subsequently adopted the same MCL. As a result, arsenic has become the most significant groundwater quality issue affecting PWS serving less than 10,000 service connections. Table 4.10 and 4.11 summarize the MCL violations for both years including the counties in which the water systems were located.

Table 4.10
Number of PWS in Violation of MCL for Arsenic
By County and Type and Size in 2011

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
Colusa	CWS - Small (15 -199 SC)	2
Contra Costa	CWS - Small (15 -199 SC)	2
Fresno	CWS - Small (15 -199 SC)	4
	CWS - Intermediate (200 - 999 SC)	4
	NTNC -Small (<660 persons/day)	3
Imperial	NTNC - Small (<660 persons/day)	1
Inyo	CWS - Small (15 -199 SC)	3
	NTNC -Small (<660 persons/day)	1
Kern	CWS - Small (15 -199 SC)	23
	CWS - Intermediate (200 - 999 SC)	4
	CWS - Medium (1,000 - 9,999 SC)	8
	CWS - Large (>10,000 SC)	1
	NTNC -Small (<660 persons/day)	6
	NTNC - Intermediate (660 - 3,300 person/day)	2
Kings	CWS - Small (15 -199 SC)	4
	CWS - Intermediate (200 - 999 SC)	2
	CWS - Medium (1,000 - 9,999 SC)	1
	NTNC -Small (<660 persons/day)	3
Los Angeles	CWS - Intermediate (200 - 999 SC)	1
Madera	CWS - Small (15 -199 SC)	11
	CWS - Intermediate (200 - 999 SC)	1
	CWS - Medium (1,000 - 9,999 SC)	1
	NTNCWS - Small (<660 persons/day)	3
Mariposa	NTNCWS - Small (<660 persons/day)	1
Mono	CWS - Intermediate (200 - 999 SC)	1
Monterey	CWS - Small (15 -199 SC)	8
	NTNCWS -Small (<660 persons/day)	7
Nevada	CWS - Small (15 -199 SC)	1
Placer	CWS - Small (15 -199 SC)	1
Plumas	CWS - Intermediate (200 - 999 SC)	2
Riverside	CWS - Small (15 -199 SC)	3
	NTNCWS - Small (<660 persons/day)	2
Sacramento	CWS - Small (15 -199 SC)	5
	CWS - Medium (1,000 - 9,999 SC)	1
	NTNCWS - Small (<660 persons/day)	2
San Benito	NTNCWS - Small (<660 persons/day)	1

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
San Bernardino	CWS - Small (15 -199 SC)	2
	CWS - Intermediate (200 - 999 SC)	1
	CWS - Medium (1,000 - 9,999 SC)	3
	NTNCWS - Small (<660 persons/day)	1
San Joaquin	CWS - Small (15 -199 SC)	3
	CWS - Medium (1,000 - 9,999 SC)	1
	CWS - Large (>10,000 SC)	1
	NTNCWS - Small (<660 persons/day)	3
	NTNCWS - Intermediate (660 - 3,300 person/day)	1
Santa Barbara	CWS - Intermediate (200 - 999 SC)	1
Sierra	CWS - Small (15 -199 SC)	1
Sonoma	CWS - Small (15 -199 SC)	6
	NTNCWS - Small (<660 persons/day)	4
Stanislaus	CWS - Small (15 -199 SC)	8
	CWS- Medium (1,000 - 9,999 SC)	2
	CWS - Large (>10,000 SC)	1
	NTNCWS - Small (<660 persons/day)	8
Sutter	CWS - Small (15 -199 SC)	2
	NTNCWS - Small (<660 persons/day)	7
Tehama	CWS - Small (15 -199 SC)	1
	CWS - Intermediate (200 - 999 SC)	2
Trinity	CWS - Small (15 -199 SC)	1
Tulare	CWS - Small (15 -199 SC)	1
	CWS - Intermediate (200 - 999 SC)	3
	NTNCWS -Small (<660 persons/day)	1
TOTAL		191

Table 4.11
Number of PWS in Violation of MCL for Arsenic
by County and Type and Size in 2012

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
Colusa	Intermediate (200 - 999 SC)	1
Fresno	Intermediate (200 - 999 SC)	3
	Medium (1,000 - 9,999 SC)	1
	NTNCWS - Small (<660 persons/day)	3
	Small (15 - 199 SC)	4

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
Inyo	Small (15 - 199 SC)	2
Kern	Intermediate (200 - 999 SC)	4
	Large (>10,000 SC)	2
	Medium (1,000 - 9,999 SC)	8
	NTNCWS - Intermediate (660 - 3,300 persons/day)	2
	NTNCWS - Small (<660 persons/day)	3
	Small (15 - 199 SC)	19
Kings	Intermediate (200 - 999 SC)	1
	Large (>10,000 SC)	1
	Medium (1,000 - 9,999 SC)	1
	NTNCWS-Small (<660 persons/day)	5
	Small (15 - 199 SC)	3
Los Angeles	Intermediate (200 - 999 SC)	1
Madera	Medium (1,000 - 9,999 SC)	1
	NTNCWS - Small (<660 persons/day)	3
	Small (15 - 199 SC)	13
Mariposa	NTNCWS - Small (<660 persons/day)	1
Mono	Intermediate (200 - 999 SC)	1
Monterey	NTNCWS - Small (<660 persons/day)	11
	Small (15 - 199 SC)	13
Nevada	Intermediate (200 - 999 SC)	1
Placer	Small (15 - 199 SC)	1
Plumas	Intermediate (200 - 999 SC)	1
	Medium (1,000 - 9,999 SC)	1
Riverside	Medium (1,000 - 9,999 SC)	1
Riverside	NTNCWS - Small (<660 persons/day)	2
	Small (15 - 199 SC)	2
Sacramento	NTNCWS - Small (<660 persons/day)	2
	Small (15 - 199 SC)	7
San Benito	NTNCWS - Small (<660 persons/day)	1
San Bernardino	Intermediate (200 - 999 SC)	4
	Medium (1,000 - 9,999 SC)	1
	NTNCWS-Intermediate (660 - 3,300 persons/day)	3
	NTNCWS - Small (<660 persons/day)	1
	Small (15 - 199 SC)	1
San Joaquin	Large (>10,000 SC)	1
	NTNCWS-Intermediate (660 - 3,300 persons/day)	1

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
	NTNCWS -Small (<660 persons/day)	5
	Small (15 - 199 SC)	3
Santa Barbara	Intermediate (200 - 999 SC)	1
Sierra	Small (15 - 199 SC)	1
Sonoma	Small (15 - 199 SC)	1
Sonoma	NTNCWS - Small (<660 persons/day)	4
	Small (15 - 199 SC)	4
Stanislaus	Medium (1,000 - 9,999 SC)	1
	NTNCWS - Small (<660 persons/day)	7
	Small (15 - 199 SC)	9
Sutter	NTNCWS - Small (<660 persons/day)	5
	Small (15 - 199 SC)	3
Tehama	Intermediate (200 - 999 SC)	1
Trinity	Small (15 - 199 SC)	1
Tulare	Intermediate (200 - 999 SC)	2
	Medium (1,000 - 9,999 SC)	1
	NTNCWS - Small (<660 persons/day)	2
	Small (15 - 199 SC)	2
TOTAL		191

The second most significant groundwater quality issue affecting PWS serving less than 10,000 service connections is nitrates. Nitrates have historically been a major groundwater contaminant. The use of nitrogen fertilizers and large dairy operations and cattle feeding facilities and to a lesser extent individual sewage disposal practices have been the principal sources of the contamination. Tables 4.12 and 4.13 summarize the MCL violations for both years including the counties in which the water systems were located. In summary, the data indicate that nitrate violations are predominately in the Central Valley (mainly in Tulare, Kern, and Fresno Counties) and in the Salinas Valley in Monterey County, and that the preponderance of water systems affected are small community PWS serving less than 200 service connections as well as a significant number of NTNCWS and TNCWS. These findings are consistent with findings contained in the February 2013 Report to the Legislature by the State Water Board, "Recommendations Addressing Nitrate in Groundwater," available at: http://www.swrcb.ca.gov/water_issues/programs/nitrate_project/index.shtml.

Table 4.12
Number of PWS in Violation of MCL for Nitrate by County and Type and Size in 2011

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
Contra Costa	TNCWS - Small (<660 persons/day)	2
Fresno	CWS - Small (15 -199 SC)	2
	NTNCWS -Small (<660 persons/day)	6
	NTNCWS - Intermediate (660 - 3,300 person/day)	1
	TNCWS - Small (<660 persons/day)	3
Kern	CWS - Small (15 -199 SC)	10
	NTNCWS - Small (<660 persons/day)	2
	TNCWS - Small (<660 persons/day)	9
Madera	CWS - Small (15 -199 SC)	1
	NTNCWS -Small (<660 persons/day)	1
	TNCWS - Small (<660 persons/day)	3
Merced	NTNCWS -Small (<660 persons/day)	1
Monterey	CWS - Small (15 -199 SC)	10
	NTNCWS -Small (<660 persons/day)	7
	TNCWS - Small (<660 persons/day)	2
Placer	TNCWS - Small (<660 persons/day)	1
Riverside	CWS - Small (15 -199 SC)	2
	Medium (1,000 - 9,999 SC)	1
	TNCWS - Small (<660 persons/day)	1
Sacramento	NTNCWS - Small (<660 persons/day)	1
San Benito	CWS - Small (15 -199 SC)	3
	TNCWS - Small (<660 persons/day)	1
San Diego	CWS - Small (15 -199 SC)	1
	Intermediate (200 - 999 SC)	1
San Joaquin	CWS - Small (15 -199 SC)	1
	TNCWS - Small (<660 persons/day)	1
Santa Barbara	TNCWS - Small (<660 persons/day)	1
Santa Clara	CWS - Small (15 -199 SC)	1
Sonoma	CWS - Small (15 -199 SC)	1
Stanislaus	CWS - Small (15 -199 SC)	1
	NTNCWS - Small (<660 persons/day)	2
	TNCWS - Small (<660 persons/day)	1
Tulare	CWS - Small (15-199 SC)	12
	Intermediate (200 - 999 SC)	1
	NTNCWS - Small (<660 persons/day)	5
	TNCWS - Small (<660 persons/day)	14
TOTAL		114

Table 4.13
Number of PWS in Violation of MCL for Nitrate
by County and Type and Size in 2012

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
Colusa	NTNCWS - Small (<660 persons/day)	1
Fresno	NTNCWS – Intermediate (660 - 3,300 persons/day)	1
	NTNCWS - Small (<660 persons/day)	3
	CWS - Small (15 - 199 SC)	1
	TNCWS - Small (<660 persons/day)	5
Kern	Intermediate (200 - 999 SC)	1
	NTNCWS - Small (<660 persons/day)	5
	CWS - Small (15 - 199 SC)	6
	TNCWS - Small (<660 persons/day)	7
Madera	CWS - Small (15 - 199 SC)	1
	TNCWS - Small (<660 persons/day)	3
Monterey	NTNCWS-Small (<660 persons/day)	5
	CWS - Small (15 - 199 SC)	8
	TNCWS - Small (<660 persons/day)	2
Placer	TNCWS - Small (<660 persons/day)	2
Riverside	CWS - Small (15 - 199 SC)	2
	TNCWS - Small (<660 persons/day)	1
San Bernardino	NTNCWS - Small (<660 persons/day)	3
	TNCWS - Small (<660 persons/day)	2
San Diego	Intermediate (200 - 999 SC)	1
	NTNCWS - Small (<660 persons/day)	1
	TNCWS - Small (<660 persons/day)	1
San Joaquin	NTNCWS - Small (<660 persons/day)	1
	CWS - Small (15- 199 SC)	3
	TNCWS - Small (<660 persons/day)	3
Santa Barbara	NTNCWS - Small (<660 persons/day)	1
	TNCWS - Small (<660 persons/day)	1
Santa Cruz	CWS - Small (15 - 199 SC)	1
Sonoma	CWS - Small (1 - 199 SC)	1
Stanislaus	Large (>10,000 SC)	1
Stanislaus	NTNCWS - Small (<660 persons/day)	3
	CWS - Small (15 - 199 SC)	2
	TNCWS - Small (<660 persons/day)	3
Sutter	NTNCWS –S mall (<660 persons/day)	1
Tulare	Intermediate (200 - 999 SC)	1

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
	Medium (1,000 - 9,999 SC)	1
	NTNCWS - Small (<660 persons/day)	14
	CWS - Small (15 - 199 SC)	10
	TNCWS - Small (<660 persons/day)	16
TOTAL		125

Other inorganic contaminants affecting groundwater for which there were MCL violations include naturally occurring fluoride, perchlorate, and cadmium. CWS and NTNCWS are required to comply with the MCLs for these chemicals. However, MCL violations for these contaminants were very small, less than ten in total, and all were associated with CWS and NTNCWS serving less than 10,000 service connections.

Although not reflected in the compliance data because the chemical was only recently regulated, hexavalent chromium, which is naturally occurring in groundwater, as well as a groundwater contaminant from industrial disposal practices, poses a potentially significant problem for PWS serving less than 10,000 service connections. An MCL for hexavalent chromium, became effective on July 1, 2014. (More information on the MCL can be found at: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Chromium6.shtml)

Although monitoring data are limited for certain smaller PWS (serving less than 150 service connections), they do indicate that hexavalent chromium is present in groundwater in Yolo and Sacramento Counties in the north, several Central Valley counties including Fresno, San Joaquin, Stanislaus, Kern, and Merced, and southern counties including Los Angeles, San Bernardino, and Riverside. Results of monitoring can be found at: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Chromium6sampling.shtml

4.3. COMPLIANCE WITH MICROBIAL STANDARDS

Microbial contaminants continue to be the primary concern for PWS and health officials because of the potential for waterborne illness. Routine monitoring programs required of PWS mandate the collection of water samples from the distribution system for bacteriological examination on a schedule based on the size of the PWS. Coliform bacteria are used as the indicator to determine if drinking water is free of contamination from human wastes. The coliform group is accepted as the indicator organism since they are the most prevalent bacteria in the environment. Analytical methods used to determine the presence or absence of these organisms are the easiest and least expensive to use. There are two types of violations of drinking water standards associated with coliform organisms, which is also known as the Total Coliform Rule

(TCR): an acute violation, which indicates a PWS has detected fecal coliform or *E. coli* bacteria in the drinking water being delivered to customers; and a nonacute violation indicates a PWS detected total coliform bacteria in a specific number of samples of drinking water being delivered to customers within a specific timeframe (i.e., a month). An acute violation will result in immediate action including a notice to consumers to boil the water before drinking or use of an alternate supply. Nonacute violations generally result from the introduction of non-fecal coliform organisms and are reflective of microbial activity in the distribution system and the need for better operation and maintenance of the water system's infrastructure. Fortunately, the nonacute violations can generally be addressed quickly, although some may require infrastructure improvements that can be costly. This is particularly true of TNCWS such as restaurants, which may have to close until the problem is resolved.

Tables 4.14 and 4.15 summarize the MCL violations for both years by water system type and by the counties in which they are located. Although the majority of violations were not acute violations and did not represent a public health risk, TCR violations are reflective of the problems with aging infrastructure and poor maintenance and operation of the water system. It is also important to note that most of the violations occurred in the smallest of water systems whether they were CWS, NTNCWS, or TNCWS.

Table 4.14
PWS Serving Less Than 10, 000 Service Connections
with TCR Violations in 2011

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
Amador	CWS - Small (15 -199 SC)	1
	TNCWS - Small (<660 persons/day)	4
Butte	CWS - Small (15 -199 SC)	3
	NTNCWS -Small (<660 persons/day)	1
	TNCWS - Small (<660 persons/day)	4
	TNCWS - Intermediate (660-3299 persons/day)	1
Calaveras	CWS - Small (15 -199 SC)	1
	NTNCWS -Small (<660 persons/day)	2
	TNCWS - Small (<660 persons/day)	1
Contra Costa	CWS - Small (15 -199 SC)	2
	NTNCWS - Small (<660 persons/day)	1
	TNCWS - Small (<660 persons/day)	3
Fresno	CWS - Small (15 -199 SC)	6
	Intermediate (200 - 999 SC)	2
	Medium (1,000 - 9,999 SC)	1
	NTNCWS - Small (<660 persons/day)	8
	TNCWS - Small (<660 persons/day)	18

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
Humboldt	Medium (1,000 - 9,999 SC)	1
	TNCWS - Intermediate (660-3299 persons/day)	1
Imperial	NTNCWS - Small (<660 persons/day)	1
Inyo	CWS - Small (15 -199 SC)	1
Kern	CWS - Small (15 -199 SC)	2
	Intermediate (200 - 999 SC)	2
	Medium (1,000 - 9,999 SC)	2
	TNCWS - Small (<660 persons/day)	1
Kings	CWS - Small (15 -199 SC)	1
	NTNCWS -Small (<660 persons/day)	5
Lake	TNCWS - Small (<660 persons/day)	1
Lassen	Intermediate (200 - 999 SC)	1
	NTNCWS -Small (<660 persons/day)	2
	TNCWS - Small (<660 persons/day)	1
Los Angeles	Medium (1,000 - 9,999 SC)	2
Madera	CWS - Small (15 -199 SC)	9
	Intermediate (200 - 999 SC)	1
	Medium (1,000 - 9,999 SC)	1
	NTNCWS - Small (<660 persons/day)	5
	TNCWS - Small (<660 persons/day)	4
Mariposa	CWS - Small (15 -199 SC)	2
	TNCWS - Small (<660 persons/day)	2
Mendocino	CWS - Small (15 -199 SC)	1
	NTNCWS - Small (<660 persons/day)	1
	TNCWS - Small (<660 persons/day)	1
Merced	Intermediate (200 - 999 SC)	1
Monterey	CWS - Small (15 -199 SC)	14
	Intermediate (200 - 999 SC)	1
	NTNCWS -Small (<660 persons/day)	8
	TNCWS - Small (<660 persons/day)	5
	TNCWS – Intermediate (660-3299 persons/day)	1
Napa	CWS - Small (15 -199 SC)	1
	NTNCWS - Small (<660 persons/day)	1
	TNCWS - Small (<660 persons/day)	1
Nevada	CWS - Small (15 -199 SC)	4
	NTNCWS -Small (<660 persons/day)	4
	TNCWS - Small (<660 persons/day)	4
Placer	CWS - Small (15 -199 SC)	4

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
	NTNCWS - Small (<660 persons/day)	5
	TNCWS - Small (<660 persons/day)	2
	TNCWS – Intermediate (660-3299 persons/day)	1
Plumas	CWS - Small (15 -199 SC)	2
	Intermediate (200 - 999 SC)	1
	TNCWS - Small (<660 persons/day)	6
Riverside	Medium (1,000 - 9,999 SC)	2
Sacramento	NTNCWS -Small (<660 persons/day)	2
	TNCWS - Small (<660 persons/day)	1
San Benito	NTNCWS - Small (<660 persons/day)	3
San Bernardino	Intermediate (200 - 999 SC)	2
	TNCWS - Intermediate (660-3299 persons/day)	1
San Diego	CWS - Small (15 -199 SC)	4
	NTNCWS - Intermediate (660 - 3,300 person/day)	1
	TNCWS - Small (<660 persons/day)	7
San Joaquin	CWS - Small (15 -199 SC)	8
	NTNCWS -Small (<660 persons/day)	16
	NTNCWS - Intermediate (660 - 3,300 person/day)	1
	TNCWS - Small (<660 persons/day)	16
	TNCWS - Intermediate (660-3299 persons/day)	1
San Mateo	NTNCWS - Small (<660 persons/day)	1
	TNCWS - Small (<660 persons/day)	2
Santa Barbara	CWS - Small (15 -199 SC)	1
	Intermediate (200 - 999 SC)	1
	TNCWS - Small (<660 persons/day)	1
Santa Clara	CWS - Small (15 -199 SC)	1
Santa Cruz	CWS - Small (15 -199 SC)	4
	NTNCWS -Small (<660 persons/day)	3
	NTNCWS - Intermediate (660 - 3,300 person/day)	1
	TNCWS - Small (<660 persons/day)	2
Shasta	CWS - Small (15 -199 SC)	1
	NTNCWS - Intermediate (660 - 3,300 person/day)	1
	TNCWS - Small (<660 persons/day)	8
	TNCWS - Medium (>3,300 persons/day)	1
Sierra	TNCWS - Small (<660 persons/day)	1
	TNCWS – Intermediate (660-3299 persons/day)	1
Siskiyou	CWS - Small (1 -199 SC)	3
	NTNCWS - Small (<660 persons/day)	2

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
Sonoma	CWS - Small (15 -199 SC)	3
	TNCWS - Small (<660 persons/day)	5
Stanislaus	CWS - Small (15 -199 SC)	3
	Intermediate (200 - 999 SC)	1
	Medium (1,000 - 9,999 SC)	1
	NTNCWS - Small (<660 persons/day)	8
	TNCWS - Small (<660 persons/day)	11
Sutter	CWS - Small (15 -199 SC)	2
	Intermediate (200 - 999 SC)	1
	NTNCWS -Small (<660 persons/day)	2
	TNCWS - Small (<660 persons/day)	3
Tehama	CWS - Small (15 -199 SC)	2
	NTNCWS - Small (<660 persons/day)	3
	TNCWS - Small (<660 persons/day)	1
Tulare	CWS - Small (15 -199 SC)	12
	Intermediate (200 - 999 SC)	4
	Medium (1,000 - 9,999 SC)	2
	NTNCWS - Small (<660 persons/day)	17
	TNCWS - Small (<660 persons/day)	26
	TNCWS -Medium (>3,300 persons/day)	2
Tuolumne	NTNCWS -Small (<660 persons/day)	1
	TNCWS - Small (<660 persons/day)	2
Ventura	CWS - Small (15 -199 SC)	1
Total		389

Table 4.15
PWS Serving Less Than 10, 000 Service Connections
with TCR Violations in 2012

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
Alpine	TNCWS - Small (<660 persons/day)	1
Amador	CWS - Small (15 - 199 SC)	1
	TNCWS - Small (<660 persons/day)	2
Butte	CWS - Small (15 - 199 SC)	1
	NTNCWS - Small (<660 persons/day)	1
	TNCWS - Small (<660 persons/day)	1
Calaveras	NTNCWS –S mall (<660 persons/day)	1

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
	TNCWS - Small (<660 persons/day)	3
Contra Costa	CWS - Small (15 - 199 SC)	1
	TNCWS - Small (<660 persons/day)	1
El Dorado	NTNCWS - Intermediate (660 - 3,300 persons/day)	1
	TNCWS - Small (<660 persons/day)	5
Fresno	CWS - Small (15 - 199 SC)	8
	CWS - Intermediate (200 - 999 SC)	1
	CWS - Medium (1,000 - 9,999 SC)	1
	NTNCWS - Small (<660 persons/day)	8
	TNCWS - Small (<660 persons/day)	11
Glenn	CWS - Small (15 - 199 SC)	1
Imperial	CWS - Intermediate (200 - 999 SC)	1
Inyo	TNCWS - Small (<660 persons/day)	2
Kern	CWS - Small (15 - 199 SC)	6
	CWS - Medium (1,000 - 9,999 SC)	3
	TNCWS - Small (<660 persons/day)	2
Kings	NTNCWS - Small (<660 persons/day)	1
Lassen	TNCWS - Small (<660 persons/day)	1
Los Angeles	CWS - Small (15 - 199 SC)	7
	CWS - Intermediate (200 - 999 SC)	1
	CWS - Medium (1,000 - 9,999 SC)	1
	NTNCWS - Medium (>3,300 persons/day)	1
	TNCWS - Small (<660 persons/day)	4
Madera	CWS - Small (15 - 199 SC)	4
	NTNCWS - Small (<660 persons/day)	3
	NTNCWS - Intermediate (660 - 3,300 persons/day)	1
	TNCWS - Small (<660 persons/day)	9
Mariposa	CWS - Small (15 - 199 SC)	1
	NTNCWS - Small (<660 persons/day)	1
	TNCWS – Small (<660 persons/day)	1
Mendocino	CWS - Small (15 - 199 SC)	1
	TNCWS - Small (<660 persons/day)	2
Merced	CWS - Intermediate (200 - 999 SC)	1
	NTNCWS - Small (<660 persons/day)	6
	TNCWS - Small (<660 persons/day)	1
Monterey	CWS - Small (15 - 199 SC)	9
	NTNCWS - Small (<660 persons/day)	5
	TNCWS - Intermediate (660 - 3,300 persons/day)	1

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
	TNCWS - Small (<660 persons/day)	2
Napa	CWS - Small (15 - 199 SC)	3
	CWS - Intermediate (200 - 999 SC)	1
	NTNCWS - Small (<660 persons/day)	1
Nevada	CWS - Small (15 - 199 SC)	3
	NTNCWS - Small (<660 persons/day)	1
	TNCWS - Small (<660 persons/day)	8
Placer	CWS - Small (15 - 199 SC)	6
	CWS - Intermediate (200 - 999 SC)	1
	CWS - Medium (1,000 - 9,999 SC)	1
	NTNCWS - Small (<660 persons/day)	1
	TNCWS - Small (<660 persons/day)	2
Plumas	CWS - Intermediate (200 - 999 SC)	2
	TNCWS - Small (<660 persons/day)	1
	CWS - Small (15 - 199 SC)	3
	CWS - Intermediate (200 - 999 SC)	1
	TNCWS - Small (<660 persons/day)	6
Riverside	CWS - Small (15 - 199 SC)	1
	NTNCWS - Small (<660 persons/day)	1
	TNCWS - Small (<660 persons/day)	1
Sacramento	CWS - Small (15 - 199 SC)	2
	NTNCWS - Small (<660 persons/day)	1
	TNCWS - Small (<660 persons/day)	1
San Bernardino	CWS - Small (15 - 199 SC)	2
	CWS - Intermediate (200 - 999 SC)	3
	TNCWS - Intermediate (660 - 3,300 persons/day)	2
	TNCWS - Small (<660 persons/day)	2
San Diego	CWS - Small (15 - 199 SC)	3
	NTNCWS - Small (<660 persons/day)	2
	TNCWS - Small (<660 persons/day)	11
San Joaquin	CWS - Small (15 - 199 SC)	7
	NTNCWS - Small (<660 persons/day)	10
	NTNCWS – Intermediate (660 - 3,300 persons/day)	1
	TNCWS - Small (<660 persons/day)	8
San Luis Obispo	CWS - Medium (1,000 - 9,999 SC)	1
San Mateo	NTNCWS - Small (<660 persons/day)	1
Santa Barbara	CWS - Medium (1,000 - 9,999 SC)	1
	TNCWS - Small (<660 persons/day)	2

COUNTY	PWS TYPE/SIZE	# OF PWS IN VIOLATION
Santa Clara	CWS - Small (15 - 199 SC)	1
	TNCWS - Intermediate (660 - 3,300 persons/day)	1
Santa Cruz	CWS - Small (15 - 199 SC)	2
	NTNCWS - Small (<660 persons/day)	1
Shasta	CWS - Small (15 - 199 SC)	2
	NTNCWS - Small (<660 persons/day)	1
	TNCWS - Small (<660 persons/day)	6
Sierra	TNCWS - Small (<660 persons/day)	1
Siskiyou	CWS - Small (15 - 199 SC)	1
	CWS - Intermediate (200 - 999 SC)	1
	NTNCWS - Small (<660 persons/day)	1
	TNCWS - Small (<660 persons/day)	2
Sonoma	CWS - Small (15 - 199 SC)	2
	TNCWS - Small (<660 persons/day)	3
Stanislaus	CWS - Small (15 - 199 SC)	2
	CWS - Medium (1,000 - 9,999 SC)	1
	NTNCWS - Small (<660 persons/day)	3
	TNCWS - Medium (>3,300 persons/day	1
	TNCWS - Small (<660 persons/day)	5
Tehama	CWS - Small (15 - 199 SC)	1
	CWS - Medium (1,000 - 9,999 SC)	1
Tulare	CWS - Small (15 - 199 SC)	10
	CWS - Intermediate (200 - 999 SC)	4
	NTNCWS - Small (<660 persons/day)	14
Tulare	NTNCWS - Intermediate (660 - 3,300 persons/day)	1
	TNCWS - Medium (>3,300 persons/day	1
	TNCWS - Small (<660 persons/day)	23
Tuolumne	CWS - Small (15 - 199 SC)	1
	TNCWS - Small (<660 persons/day)	1
Ventura	CWS - Small (15 - 199 SC)	1
Yolo	NTNCWS - Small (<660 persons/day)	4
	TNCWS - Small (<660 persons/day)	6
Yuba	CWS - Small (15 - 199 SC)	2
	TNCWS - Small (<660 persons/day)	2
TOTAL		340

4.4. LEAD AND COPPER

In 1991, USEPA promulgated the Lead and Copper Rule (LCR), which was the most extensive regulation involving water quality associated with materials used in the water distribution system. Monitoring and compliance requirements did not take effect until several years after the LCR was adopted. The LCR applied to CWS and NTNCWS and established Action Levels for lead of 15 µg/L and for copper of 1.3 mg/L. If an Action Level is exceeded pursuant to certain monitoring criteria for either or both chemicals, remediation methods must be implemented. In addition, water systems are required to install corrosion control treatment if the water sources have the potential to become corrosive.

The 2011 ACR indicates that no CWS or NTNCWS were in violation of the lead or copper Action Levels. Four systems were in violation of the corrosion control treatment requirement including: one small CWS, one intermediate CWS, one medium CWS, and one intermediate NTNCWS. The 2012 ACR indicates that, as in 2011, no CWS or NTNCWS were in violation of the lead or copper Action Levels. Four systems were in violation of the corrosion control treatment requirement including: one small CWS, two intermediate CWS, and one medium CWS.

4.5. ESTIMATED COST OF REQUIRING PWS SERVING LESS THAN 10,000 SERVICE CONNECTIONS TO MEET PRIMARY DRINKING WATER STANDARDS AND PUBLIC HEALTH GOALS

4.5.1. Estimated Cost to Meet Primary Drinking Water Standards

The costs of requiring PWS serving less than 10,000 service connections to meet primary drinking water standards cannot be accurately estimated given the variables involved in such an estimate. While large PWS generally have reasonable estimates for treatment costs, often because they have operated or tested treatment systems, in many cases, the treatment processes used by large PWS are not always suitable for use by small PWS. An example is the difficulty of small PWS to meet the primary standard for arsenic. Although the best available treatment technology was identified and costs were estimated based on that technology, actual experience has shown that the technology is too costly and technical to operate and maintain by many smaller PWS, especially those with a limited rate base and level of engineering and operational expertise. Many small PWS, rather than install treatment, have looked to consolidate with one or more neighboring PWS to receive drinking water meeting standards at less cost. To address the many barriers to consolidation, the State Water Board provides DWSRF incentives to larger systems and is committed to further pursuing solutions to address the barriers.

4.5.2. Estimated Cost to Meet Public Health Goals

Estimating the cost of requiring PWS serving less than 10,000 services connections to meet PHGs would be difficult. Since there is no requirement to meet PHGs, large PWS

(those serving more than 10,000 service connections) do not have experience with such costs. Large PWS are only required to prepare a report that estimates the cost to meet PHGs and to hold a public hearing to take comment on the report. In addition, the cost to PWS serving less than 10,000 service connections to meet PHGs would far out-weigh the potential population risk reduction. Thus, the focus should be on compliance with drinking water standards.

For example, the PHG for arsenic is 0.004 µg/L, while the lowest level that arsenic can be reliably measured in water is 2 µg/L. When adopting the MCL for arsenic of 10 µg/L, the annual cost to different size PWS was estimated to meet the proposed MCL and the lowest measureable level. For PWS serving less than 10,000 service connections, the estimated cost to meet an MCL of 10 µg/L was approximately $77 million, while the estimated cost to meet an MCL of 2 µg/L was approximately $417 million. Such a cost burden would be unmanageable particularly among the smaller PWS that, as indicated in this chapter, are having extreme difficulty complying with the existing arsenic MCL.

4.6. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The majority of water quality issues have been largely addressed over the past two decades with the exception of arsenic and nitrates, which continue to remain the principal contaminants that affect PWS that serve less than 10,000 service connections. Some new and revised MCLs for contaminants such as uranium and DBPs and treatment technique rules such as the SWTR and the ESWTR have also had a significant impact on these PWS, particularly the smallest ones. In addition, the new MCL for hexavalent chromium, effective July 1, 2014, is likely to have an effect on small water systems equivalent to that of arsenic.

The compliance information from both the 2011 and 2012 ACRs clearly indicate the overwhelming majority of water quality issues affect PWS that serve less than 10,000 service connections, including both CWS and NTNCWS. Most significant is the fact that in 2011 and 2012, for CWS, more than 99 percent and 98 percent of the systems, respectively, that were not in compliance with chemical and radionuclide primary drinking water standards served less than 10,000 service connections. More important, small CWS serving between 15 and 199 service connections represented the group with the largest percentage of non-complying systems. This pattern held for all additional regulated contaminants or treatment technique requirements for which there were violations. Most troubling are the violations of the requirements for the treatment of surface waters, which increases the risk of waterborne infectious disease transmission. The same pattern of system size violations was also true for NTNCWS and TNCWS. A summary of the percent distribution of violations for 2011 and 2012 within the different sized PWS is shown in Tables 4.16 and 4.17.

Table 4.16
Percent Distribution of MCL Violations
Based on PWS Size and Type for 2011

PWS TYPE	PWS SIZE			
Contaminant/Treatment Technique Total Violations	Percent of Total Violations			
CWS	Small	Intermediate	Medium	Large
Arsenic 133 Violations	69%	16%	13%	2%
Nitrate 48 Violations	94%	4%	2%	
Uranium 14 Violations	64%	29%	7%	
DBPs 48 Violations	69%	25%	6%	
SWTR 25 Violations	92%	4%	4%	
NTNCWS	Small	Intermediate	Medium	
Arsenic 58 Violations	95%	5%		
Nitrate 27 Violations	96%	4%		
Uranium 8 Violation	88%	12%		
DBPs 14 Violations	86%	14%		
SWTR 5 Violations	100%			
TNCWS	Small	Intermediate	Medium	
Nitrate 39 Violations	100%			
SWTR 18 Violations	100%			

Table 4.17
Percent Distribution of MCL Violations
Based on PWS Size and Type for 2012

PWS TYPE	PWS SIZE			
Contaminant/Treatment Technique Total Violations	Percent of Total Violations			
CWS	Small	Intermediate	Medium	Large
Arsenic 131 Violations	68%	16%	13%	3%
Nitrate 40 Violations	87.5%	7.5%	2.5%	2.5%
Uranium 21 Violations	67%	28%	5%	
DBPs 44 Violations	64%	20%	12%	2%
SWTR 27 Violations	85%	11%		4%
NTNCWS	Small	Intermediate	Medium	
Arsenic 61 Violations	90%	10%		
Nitrate 38 Violations	100%			
Uranium 6 Violation	67%	33%		
DBPs 14 Violations	86%	14%		
SWTR 5 Violations	100%			
TNCWS	Small	Intermediate	Medium	
Nitrate 46 Violations	100%			
SWTR 12 Violations	100%			

These findings highlight the ongoing problems faced by water systems that either serve small communities or are small facilities that serve the same non-resident populations during much or all of the year such as rural schools, small farming operations, and churches. The findings are consistent with those contained in the January 2013 legislative report, "Communities that Rely on a Contaminated Groundwater Source for Drinking Water," (http://www.waterboards.ca.gov/water_issues/programs/gama/ab2222/index.shtml). That report found that between 2002 and 2010, a total of 265 community water systems that rely on contaminated groundwater had at least one MCL violation. The report found that the largest number of MCL violations involved three contaminants: arsenic, nitrate,

and uranium; and that the violations were overwhelmingly associated with small community water systems of which about 81 percent served less than 1,000 service connections.

In recognition of the compliance problems facing small water systems, a Small Water System Program Plan was developed that focuses on three areas: funding, technical assistance, and enforcement/compliance. The target group was 183 community water systems with between 15 and 999 service connections that are in violation of a primary constituent MCL. As shown by data in Table 4.17, 183 is a targeted subset of the total number of community water systems in this size range with MCL violations. This plan was initiated at the beginning of 2012 with the goal to bring 63 of these smaller CWS into compliance by the end of 2014. The plan and the implementation status can be found at: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Smallwatersystems.shtml.

Solutions to the compliance problems and operation of small water systems are multifaceted and can involve: 1) technical support to identify the most optimal solution to achieve compliance, 2) financial support for infrastructure improvements such as new treatment facilities or constructing a new well, and 3) developing a revenue stream that can address the ongoing operational costs of the water system that includes maintenance of the system as well as operation of treatment facilities that will ensure compliance is maintained. For many small water systems, it is too financially and technically challenging to continue operating as a stand-alone system and, where feasible, consolidating with other communities or a larger system is the best solution. At the same time, the creation of new small water systems should be discouraged.

Recommendations

4-1 As resources allow, the State Water Board will expand the goal of the Small Water System Plan to address the number of small water systems that have compliance problems, continue to track and report progress of these systems, and utilize the plan to prioritize technical assistance and financial assistance.

4-2 The State Water Board will continue to promote consolidation of small water systems wherever feasible and appropriate. Consolidation is not limited to full or physical consolidation of drinking water treatment and delivery systems, and may include technical, managerial, financial or physical arrangements between water systems.

4-3 The most critical recommendation in the State Water Board's 2013 Report to the Legislature, "Recommendations Addressing Nitrate in Groundwater" was that a new funding source be established to help ensure that all Californians, including those in disadvantaged communities, have access to safe drinking water, consistent with AB 685. A stable, long-term funding source should be provided for safe drinking water for small disadvantaged communities. Funding sources could

include a point-of-sale fee on agricultural commodities, a fee on nitrogen fertilizing materials, a water use tax, or another funding source. The term was simply used for convenience and consistency. As noted in the Governor's Budget, the Administration, including the State Water Board, will work in concert with local governments, communities and dischargers on strategies to bring all systems into compliance, including governance, technical assistance, capital improvements, and ongoing operations and maintenance costs.

4-4 Where the State Water Board has identified responsible parties that have contaminated local groundwater used as a drinking water source and has caused violation of an MCL, the State Water Board will require those parties to cover the cost of mitigation including capital and treatment operation and maintenance costs. The Division of Drinking Water will coordinate with Regional Boards and the Office of Enforcement when issues are identified.

4-5 The State Water Board recommends enactment of legislation to identify a funding source to cover the costs of operating and maintaining treatment facilities in small, disadvantaged communities. Funds should be provided in a manner that safeguards public funds from potential fraud, waste, and abuse. Funding of operation costs should be time limited with the goal towards financial sustainability within a given period of time.

REFERENCES

"Communities that Rely on a Contaminated Groundwater Source for Drinking Water: Report to the Legislature," State Water Resources Control Board, January 2013

"Recommendations Addressing Nitrate in Groundwater: Report to the Legislature," State Water Resources Control Board, February 2013

CHAPTER 5. DRINKING WATER-RELATED INFORMATION SYSTEMS

5.1. INTRODUCTION

Timely and accurate information and data are critical in protecting public health. It is even more so with all the technological improvements made to data and information systems. The growth of the internet with the raise of social media and instant messaging has made access and availability to events, data, and information almost real time.

The terms “data” and “information” have their own meanings, but have been used interchangeably. Data are the actual results or raw facts. Information is interpreted data or what is derived from the data. This difference can be critical when data is readily available without the knowledge of how to use the data and what information it conveys. Data management systems must be able to make all data available to the regulators who then interpret the data. Data management systems are the data and information systems combined.

5.2. STATE PROGRAM IN DRINKING WATER

DDW uses several data management systems to manage, track, and report data and information relevant to operations of all the various programs in the Drinking Water Program. Each system is described as it currently operates in comparison to where it was when the original 1993 Plan was published.

5.2.1. PICME

The Permits, Inspections, Compliance, Monitoring, and Enforcement (PICME) database was created to be the main information system for DDW field offices to track public water system compliance. When this system was developed and deployed over 20 years ago, it was one of the better data management systems based on the technology available to the state at the time.

Although PICME has served the Drinking Water Program for over 20 years, advances in technology and software have made this system obsolete. Further, PICME is not able to track and report compliance with the newer rules being implemented by USEPA. DDW also lacks sufficient computing resources to update and maintain PICME for all new regulations.

Because of the issues with maintaining the PICME database, DDW decided to transition to a PWS data management system that has been developed by USEPA known as the Safe Drinking Water Information System (SDWIS). USEPA handles the maintenance and updates of SDWIS. In addition, moving to SDWIS will ease the process of electronically submitting drinking water data to USEPA . However, given the complexity of the existing PICME database, transitioning from PICME to SDWIS is a significant ongoing challenge.

5.2.2. SDWIS

USEPA has determined that data management plays a critical role in protecting public health and has invested resources into improving their data management system as well as providing a data management system for its state partners to use to report and access data. Consequently, SDWIS was developed to provide state drinking water regulatory programs with a uniform and consistent means to track and report PWS compliance to USEPA. USEPA is responsible for maintaining the SDWIS including all updates to track compliance with new rules under the Safe Drinking Water Act, and the costs are shared by USEPA and states. SDWIS has two components, SDWIS/FED and SDWIS/STATE.

SDWIS/FED: SDWIS/FED is the federal version of SDWIS. It is designed to store the information USEPA needs to monitor approximately 156,000 public water systems. All state drinking water program partners provide their information to SDWIS/FED.

SDWIS/STATE: SDWIS/STATE is the state version of SDWIS. It is a management system designed to help states consistently and uniformly monitor and track public water systems regulatory compliance. The State Water Board is currently transitioning from PICME to SDWIS/STATE. The transition is being completed in three phases.

The first phase brings SDWIS/STATE into production for entering and maintaining basic water system information, site visits, and actions. This included migrating PWS data from PICME to SDWIS/STATE and training staff for ongoing entry and maintenance of inventory, site visits, and actions. This phase has been completed for DDW's districts offices. The State Water Board is still working to include local primacy agencies in this data system.

The second phase of implementation also brings SDWIS/STATE into production for entering and maintaining water quality data. In order to complete this phase, all existing water quality data from Water Quality Management will need to be migrated to SDWIS and new processes will need to be developed for labs to submit new data that can be directly imported into to SDWIS. Given the volume of existing water quality data, this transfer activity will require a significant investment of time.

The third phase of implementation will include bringing SDWIS/STATE into production for monitoring and noncompliance determinations. This includes migrating water quality monitoring schedules and training staff to use SDWIS/STATE for compliance tracking.

5.2.3. Water Quality Management

Water Quality Management (WQM) has been in operation since 1988 and is the repository of drinking water quality monitoring results, locations of drinking water sources, and operating status of each source. In 2001, Title 22, CCR, Sections 64449 and 64819 established requirements and the format for reporting laboratory results of public water systems' water quality analyses. All certified drinking water analytical

laboratories, including those that are subcontractors of other laboratories, are required to submit water quality data directly to the State Water Board in digital, electronic form. A data entry and transfer program, Write-On, was developed for laboratories to submit water quality data into WQM. The amount of water quality data that has been submitted is one of the largest and most comprehensive water quality databases in the state.

With the transition to SDWIS, Write-On will need to be revised to accommodate the new file formats and schema needed for migrating water quality data to SDWIS. Further, the data intake process will need to be improved to meet other USEPA electronic reporting requirements.

5.2.4. Water Quality Inquiry

Water Quality Inquiry (WQI) is the information management system that allows the state Drinking Water Program staff to access and make reports from the data in WQM. WQI interfaces with both PICME and WQM.

5.2.5. Loans and Grants Tracking System

The Loans and Grants Tracking System (LGTS) is the data system developed to track projects for the DWSRF funding program, but it is also used by DFA to track Proposition 84 projects. The data system is also used by the State Water Board for the Clean Water SRF program. LGTS serves as both a project management as well as an accounting database tool in tracking, record keeping, and reporting information pertinent to the DWSRF program.

LGTS has program and project management components, including information for each water system applicant such as service connections, population served, and contacts. The system also tracks information from pre-applications such as date of submittal, project description, public health problem, compliance issue, and estimated project cost. The information from the pre-applications has been used in LGTS to generate the annual Project Priority List, the DWSRF funding invitations, and the annual Fundable Lists. LGTS tracks application milestones, project eligibility reviews, authorizations, funding agreements, and amendments, as well as project status milestones.

LGTS also tracks information related to the financial elements of the DWSRF program, including accounts receivables and accounts payables (i.e., loan repayment funds, federal capitalization grants, and set-aside receipts/expenditures, as well as information regarding special funds, general ledgers, loan terms and amortizations, and reimbursement claims. LGTS also includes records for project and set-aside encumbrances and expenditures. An essential component is the information necessary for reporting to the USEPA National Infrastructure Management System (NIMS) as well as the USEPA Project Benefits Reporting System.

5.3. Local Primacy Agencies

With the implementation of AB 2158 in 1992, there was a significant change to the regulatory oversight of small PWS that serve less than 200 service connections allowing for Local Primacy Agencies (LPAs) to provide this oversight in those counties that wished to do so. As of July 2014, the number of LPAs regulating small water systems is 30, down from 58 in 1992 (See Table 2.2 in Chapter 2).

The original LEHJs used a variety of data management systems to track and report data for small water systems. Upon implementation of AB 2158, each contracting LPA had to meet specific reporting requirements for data. Each LPA either established its own data management system or switched to EnvisionConnect, a privately developed data management system to meet the requirements. As of 2013, eight LPAs use their own data management system and the remaining use Decade Software EnvisionConnect.

The reporting of drinking water program data from LPAs to DDW and subsequently to USEPA has been problematic. There are multiple problems that hinder the transmission of good data, such as changing regulations by USEPA and the state, different data systems (WQM and PICME, in addition to local and federal systems) where changes made to one must be made in the others, and no real-time error correction.

Issues with LPA data access and data quality also factored into the DDW decision to switch to SDWIS/STATE. The initial schedule was for all LPAs to switch to SDWIS/STATE by the end of 2013; however, the process has been slow and complicated and it may take until the end of 2014 to be successfully completed. Data reporting requirements have been sent to all LPAs in addition to requirements for eventual direct reporting and access to SDWIS/STATE. In Fiscal Year 2013-2014, the state provided one-time grant funding to the LPAs to assist them in complying with their primacy delegation agreements. The funding can be used for data reporting, training, staffing, equipment, and other drinking water related items.

5.4. IMPROVEMENT – CURRENT DIRECTIONS

PICME

The transition from PICME to SDWIS/STATE is a complex and time-consuming task. The data currently in PICME must be transferred to SDWIS/STATE and the data must be validated to make sure no errors are introduced into SDWIS/STATE.

During this transition all staff must be adequately trained on the new system. The training also includes LPA staff who will be using SDWIS/STATE for the first time. There are also some LPAs that will continue to use Envision as their data management system for other environmental health programs.

WQM and WQI

In 2014, both WQM and WQI will be phased out. All laboratories will be reporting based on the Electronic Data Interchange (EDI) nationwide standards or still using Write-On for data entry. All data will be sent directly into SDWIS/FED. It is intended that by 2015, DDW will be compliant USEPA's electronic reporting requirements. Access to the water quality data will be through SDWIS/STATE.

Geographical Information Systems

Geographical Information Systems (GIS) are networks of computer hardware, software, and services designed to work with data that has a particular interest: geographic location**.** This location information may be any kind of spatial reference such as a street address, a set of latitude-longitude coordinates, or the center point of a zip code boundary. GIS lets users visualize, question, analyze, interpret, and understand data to reveal relationships, patterns, and trends.

Much of the data and information DDW generates and utilizes has a geographic or spatial component: public water system locations, public water source locations, distribution system water quality data, disease case distribution, spatial relationship between environmental hazards, and health outcomes. GIS technology helps the State Water Board and CDPH to collaborate, manage and integrate public health data, do statistical analysis, visualization and reporting, document data and information, and collaborate with other disciplines.

DDW utilizes GIS in the Water System Geographic Reporting Tool; the Drinking Water Source Assessment and Protection (DWSAP) Program; and Drinking Water Watch. DDW is partnering with the University of California at Davis, Information Center for the Environment (ICE) on the development, use, and maintenance of these tools. ICE is the source for much of the GIS data that is generated by DDW and its regulated community of public water systems. Information regarding ICE can be found at: http://ice.ucdavis.edu/.

DDW uses the TurboSWAP software program to assist in the preparation of source water assessment reports for DWSAP. With TurboSWAP, the user inputs assessment data and the program performs calculations and produces finished reports. The key feature of TurboSWAP is the ability to submit assessments electronically to DDW. This allows DDW to track progress on assessments, to obtain copies of assessments without the exchange of paper, and to compile the assessment results into a database. TurboSWAP also minimizes inconsistencies and inaccuracies by requiring the user to select sources from a built in pick list, and by creating forms with a consistent format. Information on TurboSWAP, which is supported by ICE, can be found at: http://www.cdph.ca.gov/certlic/drinkingwater/Pages/DWSAP-Turboswap.aspx

Water Systems Geographic Reporting Tool

Up-to-date boundaries of the service areas of all PWS in California is useful to various organizations such as emergency management agencies, public health agencies, and the general public. Boundary maps assist in answering questions such as: "What water system serves a certain area?" or "Which water systems may be impacted by a fire or other emergency event?" The technology and software developments in GIS and internet based programs, such as Google Maps and MapQuest, have made mapping systems more readily available to everyone.

DDW's Water Systems Geographic Reporting Tool allows personnel from water systems, DDW field staff, LPAs, other state agencies, and other authorized individuals to input and edit public water system service area boundaries throughout California. The tool also allows authorized users to: create and edit service area boundaries; track boundaries as they change over time; collaborate with other users to improve accuracy of boundaries; and export digital files of the customer service areas.

The geographic tool was initiated by the California Environmental Health Tracking Program (CEHTP) within CDPH's Environmental Health Investigations Branch (EHIB). EHIB developed, deployed, and maintains the tool and hosts the website. DDW and ICE have partnered with CEHTP in developing this tool, offering key information and support. DDW has provided information about the PWS in the state, which was essential to the tool's development; facilitates relationship-building with water systems and other key stakeholders; and provides guidance and support in the tool's implementation. Information about this tool can be found at: http://cehtp.org/project.jsp?project_key=EHSS01.

This tool was created with the following goals:

- Produce a high resolution digital map of drinking water system customer service areas for the entire state of California.
- Assist water systems in digitizing their customer service area boundaries and identifying their neighboring systems.
- Create a GIS layer that can be used for:
  - Emergency preparedness
  - Public health prevention and response
- Research to better understand the relationship between drinking water, health, and the environment.

Drinking Water Source Assessment and Protection (DWSAP) Program

The 1996 federal Safe Drinking Water Act amendments required each state to develop and implement a Source Water Assessment Program. H&S Code Section 11672.60 requires DDW to develop and implement a program to protect sources of drinking water, including both a source water assessment program and a wellhead protection program. The DWSAP Program provides information to communities that wish to develop local programs to protect their sources of drinking water. The California DWSAP Program

addresses both groundwater and surface water sources. The groundwater portion of the DWSAP Program serves as the state's wellhead protection program. The existing requirements for watershed sanitary surveys were integrated into the components of the DWSAP Program.

As of 2013, DWSAP assessments have been completed for over 17,000 public water supply sources in the state. The lists of water systems that have completed the DWSAP assessments and their summaries are listed at:
http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/DWSAP.shtml
Some assessment summaries may not be available for some sources because:

- the assessment has not been completed. Contact the local DDW district office or the water system to find out when the assessment is scheduled to be completed.
- the source is not active. It may be out of service, or new and not yet in service.
- the assessment was not submitted electronically. The State Water Board website only provides access to assessment summaries submitted electronically.

DWSAP assessments are required for permitting for all new proposed drinking water sources. All assessments must be done with the TurboSWAP program, unless other arrangements are authorized by the local DDW field office. Alternate arrangements can be made for small water systems, but the data is still input into TurboSWAP by DDW field staff or the LPA.

GeoTracker

The State Water Board uses drinking water source locations and water quality data in their programs to manage sites where groundwater has been contaminated and requires cleanup. GeoTracker is SWRCB's data management system for managing sites that impact groundwater and those that require groundwater cleanup such as Underground Storage Tanks (USTs) or the Department of Defense Site Cleanup Program. GeoTracker is also used for permitted facilities such as operating USTs and land disposal sites. GAMA-Geotracker is the repository for the State Water Board's groundwater data and also includes DDW data and well completion reports.

GeoTracker has both public and secure portals to retrieve records and view integrated data sets from multiple the State Water Board programs; including PICME, WQI, and DWSAP and from other agencies. The program uses Google maps with a GIS interface that allows users to view data in relationship to streets/roads, satellite imagery, and terrain map views as well as other sites that affect groundwater quality and wells and other beneficial uses that may be affected.

Groundwater Ambient Monitoring and Assessment (GAMA) Program

The State Water Board is implementing GAMA, a statewide, comprehensive assessment of groundwater quality designed to help better understand and identify risks to groundwater resources. Drinking water source data is also made available to this

program. More information about GAMA can be found at the State Water Board's website: www.waterboards.ca.gov/gama/.

Surface Water Ambient Monitoring Program (SWAMP)

The State Water Board has implemented SWAMP to provide resource managers, decision makers, and the public with information to evaluate the condition of surface waters throughout California. SWAMP uses monitoring programs and assists other entities statewide in the generation of comparable data that can be brought together to allow for integrated assessments to provide answers to current management questions.

The SWAMP program created a Quality Assurance program, developed a standardized data storage system, created Standard Operating Procedures for sampling, developed peer reviewed monitoring plans for each project, and created a water quality indicator list from which to work.

SWAMP is managed by a roundtable of monitoring coordinators from the State Water Board and nine Regional Water Boards. More information about SWAMP can be found at: www.waterboards.ca.gov/water_issues/programs/swamp/.

Additionally, the "My Water Quality" web portal: (http://www.mywaterquality.ca.gov/index.shtml) is hosted by the SWAMP program, supported by a wide variety of public and private organizations, and presents California water quality monitoring data and assessment information that may be viewed across space and time. Initial web portal development concentrates on specific theme areas, with web portals to be released one at a time. The theme areas are: Is our water safe to drink? Is it safe to swim in our waters? Is it safe to eat fish and shellfish from our waters? Are our aquatic ecosystems healthy? What stressors and processes affect our water quality?

Drinking Water Watch

Drinking Water Watch (DWW) is a collection of web pages that allows the public to access certain PWS data stored in the SDWIS database including basic water system information (population served, number of service connections, etc.), contact information limited to the administrative contact, site visits (sanitary surveys), violations, enforcement actions, and in the future, water quality data and monitoring schedules. Users search for a water system by system number or system name and are presented with a list of matches. Clicking on the desired water system name will take the user to that water system's specific page where water system information is either displayed on the page or made available via links. This public version is available at: http://drinc.ca.gov/DWW/index.jsp.

Public Access

In addition to the public DWW, there are other means by which the public can obtain information that is collected and maintained on water quality. Information about chemical contaminants in drinking water supplies can be found at: http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Chemicalcontaminants.shtml: The water quality database files are available for download. Also posted on the website is information about water quality monitoring schedules, information about specific contaminants, DWSAP summaries, and water system boundaries. It should be noted that the actual water source location is secured information. Security vulnerabilities exist at many public water sources. The State Water Board has determined that source locations are exempt from the Public Records Act and, thus, can only be released to a government agency that needs this information and first signs a confidentially agreement stating that the source location information will only be used for a specific purpose.

Online Permitting

The State Water Board is evaluating the feasibility of developing an online permitting system for all its regulated facilities.

California Health Alert Network

The California Health Alert Network (CAHAN) is California's web-based information and communications system available on a 24/7/365 basis for distribution of health alerts, dissemination of prevention guidelines, coordination of disease investigation efforts, preparedness planning, and other initiatives that strengthen state and local preparedness. CAHAN participants, including DDW, have the ability to receive alerts and notifications via alphanumeric pager, e-mail, fax, and phone (cellular and landline).

DDW has looked at ways to expand CAHAN to all PWS. The use of CAHAN to notify all PWS of an event would be an effective way to quickly reach all PWS during an emergency. Several regional collaborations have been enrolled into CAHAN, but interest has waned. Also, many smaller systems are technologically unable to use the system. However, as more business is done online, such as electronic data reporting, the use of CAHAN by all water systems may be looked at again to determine if CAHAN can be used for emergency notifications.

COLLABORATION WITH OTHER WATER QUALITY DATA SYSTEMS

CDPH Environmental Health Investigations Branch (EHIB): EHIB is under the CDPH, Division of Environmental and Occupational Disease Control (DEODC) and undertakes and conducts health exposure investigations and surveillance. EHIB has been investigating possible adverse health outcomes due to exposure to drinking water contaminants. As noted earlier, CEHTP obtained a federal grant to develop the Water Systems Geographic Reporting Tool, which includes information on the geographic

areas that are supplied water by specific water systems. EHIB now uses water quality data from WQM, WQI, and the geographic data from their tool to carry out their investigations and surveillance.

United States Geologic Survey (USGS)

USGS is the technical lead for the Priority Basin Project (PBP), one of four GAMA components. The USGS is sampling groundwater at many locations across California in order to characterize its constituents and identify trends in groundwater quality. The USGS also utilizes drinking water source data from the State Water Board.

Governor's Office of Emergency Services (OES)

OES has used water system size and location with regard to fires, floods, or other disasters impacting an area. The water system boundaries now being completed will also be a useful tool to be used by OES planners.

California Water and Wastewater Agency Response Network (CAL WARN)

CAL WARN is a mutual aid/mutual assistance organization for water and wastewater systems in California. CAL WARN has supported the Water Systems Geographic Reporting Tool. CAL WARN has encouraged all it members to participate in the program to map boundaries and has recognized its value in emergency response.

Department of Pesticide Regulation (DPR)

DPR uses the source water locations and drinking water quality source data within its own programs to monitor pesticide contamination of surface water and groundwater.

Sharing of Information

As noted earlier, much of the drinking water quality data is available to the public. In addition to the Consumer Confidence Reports that PWS are required to provide to their customers on an annual basis, many PWS post their annual consumer water quality data on their own websites. DDW also provides for public downloading of drinking water quality data from the State Water Board website. Many PWS will provide copies of their source water assessments to their consumers. California regulations also require that public water systems provide notices to their customers, including Consumer Confidence Reports, in English, Spanish, and the language spoken by any non-English-speaking group exceeding 1,000 residents or 10% of the population served by the water system (22 CCR § 64465 and 64481).

California Water Quality Monitoring Council

In November 2007, a Memorandum of Understanding (MOU) was signed by the Secretaries of the California Environmental Protection Agency (Cal/EPA) and the

California Natural Resources Agency to establish the California Water Quality Monitoring Council (Monitoring Council). The MOU was mandated by SB 1070 (Chapter 750, Statutes of 2006,) and requires the boards, departments, and offices within the Cal/EPA and the California Natural Resources Agency to integrate and coordinate their water quality and related ecosystem monitoring, assessment, and reporting. The Monitoring Council seeks to provide multiple perspectives on water quality information and to highlight existing data gaps and inconsistencies in data collection and interpretation, thereby identifying areas for needed improvement in order to better address the public's questions. DDW is a major partner in this effort.

The MOU requires that the Monitoring Council develop specific recommendations to improve the coordination and cost-effectiveness of water quality and ecosystem monitoring and assessment, enhance the integration of monitoring data across departments and agencies, and increase public accessibility to monitoring data and assessment information. The Monitoring Council published its initial recommendations in December 2008, and its recommendations for, "A Comprehensive Monitoring Program Strategy for California," in December 2010.

5.5. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

As noted in the 1993 Plan, "A strong regulatory program requires an effective and efficient information management program to collect, organize, and make accessible the information necessary to carry out that program." DDW has implemented many new technologies and programs in its effort to keep up with the quantity of data that is generated. The switchover to SDWIS/STATE for DDW and for the LPAs will assist DDW to be in a better position to manage the information.

SDWIS/STATE is only the beginning of a better information system. The needs and technology will grow much faster than the funding for and capability of DDW to meet those needs. There are still many improvements to be made while incorporating new regulations and new reporting requirements. Therefore, it is important to remember that information system funding and resources are needed to implement any new regulation or requirement.

In addition, there is now a significant effort among state agencies to share water quality data. The public benefits when they have access to knowledge about the quality of their water. This effort has been supported by legislative mandates, but is also the result of greater collaboration among state agencies that have a role in ensuring that the quality of the state's water resources is maintained. State agencies that collect water quality data are also making these data available to the public in ways that are easy to obtain and understand. The State Water Board has responded to public interest about drinking water quality by developing public portals that not only allow the public to access drinking water quality data, but to obtain information about the water systems that serve them.

Recommendations

5-1 As part of funding identified in recommendation 2-7, funding should include the resources necessary to maintain and expand the information management systems to implement the drinking water program efficiently and effectively and make such information available to the public.

5-2. The State Water Board will explore the best method for notifying PWS during emergencies, in alignment with their respective emergency response plans.

CHAPTER 6. METHODS AND INSTRUMENTS FOR SCREENING AND DETECTING CHEMICALS AND MICROBIAL AGENTS

6.1. INTRODUCTION

Analytical methods used to monitor for contaminants in drinking water have become more sophisticated and the scope and type of contaminants has broadened. In this chapter, methods that are used to monitor for these contaminants including chemical, radionuclide, and microbiological agents will be discussed.

There are generally two types of monitoring that are undertaken by PWS to screen and detect chemical, radionuclides, and microbiological agents in drinking water: compliance monitoring and occurrence monitoring. Compliance monitoring is used to determine compliance with federal and state drinking water standards. Methods for testing for these chemicals, microbes, and radionuclides are specified in the federal and state regulations.

Occurrence monitoring is used to determine the extent to which unregulated contaminants are present in drinking water sources. Historically, California has had a vigorous program to monitor for contaminants, particularly chemicals that are currently not regulated at the federal or state level. These unregulated contaminants may be first detected as part of routine compliance monitoring for a closely related contaminant or a chemical that may be in wide use and has the potential to enter and contaminate drinking water sources. It is important to know whether certain forms of a chemical are present because of the significance of the health risk.

Prior to the implementation of occurrence monitoring, the analytical method(s) must be standardized. CDPH's Drinking Water and Radiation Laboratory and the State Water Board's ELAP Program work closely with testing laboratories to develop and standardize the appropriate drinking water analytical methods to assure reliability, ruggedness, and quality of the data produced. A more detailed discussion of occurrence monitoring is provided below.

It is important that the methods used for compliance monitoring ensure that a contaminant can be detected and reliably reported at a level at or below the applicable drinking water standard (MCL). The reporting level for regulated contaminants, that is, the level at which there is confidence that the chemical is present at the levels being reported for compliance purposes, is called the Detection Level for Purposes of Reporting (DLR). The DLR is established in regulations with the MCL. Methods used for occurrence monitoring must be sensitive enough to define the broad presence of a contaminant in drinking water sources as well as taking into account that the contaminant may pose a health risk at low levels and may be regulated in the future.

All testing by PWS must be carried out at a laboratory certified by the USEPA or the State. If an analysis is not done by a certified laboratory using approved methods for a

particular contaminant, the PWS is deemed noncompliant with regard to its required testing.

6.2. BACKGROUND ON EXISTING METHODS AND INSTRUMENTATION

The following provides an overview of the contaminants for which PWS must monitor along with a discussion of the complexity of the methods used. The most current and reliable source of information on specific methods can be found at USEPA's drinking water website: http://water.epa.gov/scitech/drinkingwater/labcert/methods_index.cfm. The USEPA website also provides information on methods used to evaluate the occurrence of unregulated contaminants in drinking water sources that are of public health interest.

6.2.1. Chemical Analyses

The following tables list those chemical contaminants that are required to be monitored, their regulatory standards and detection limits, and a discussion of the analytical procedures used to monitor for them in drinking water sources.

6.2.1.1. Inorganic Chemicals

There are 17 inorganic chemicals that are regulated. They are listed in Table 6.1 along with the respective regulatory limit (MCL) and the lowest level that they can be reliably detected (DLR).

The testing procedures used to monitor for the regulated inorganics listed in Table 6.1 vary depending on the chemical. The procedures require sophisticated instrumentation such as inductively coupled plasma/mass spectrometry (ICP/MS) and, in the case of asbestos, electron microscopy. Although the analysis of inorganic chemicals is generally conducted in the laboratory, detectors have also been developed to continuously measure the level of certain inorganic chemicals in water.

Table 6.1
Inorganic Chemicals
Maximum Contaminant Levels
Detection Limits for Purposes of Reporting

Chemical	Maximum Contaminant Level (mg/L)	Detection Limit for Purposes of Reporting (DLR) (mg/L)
Aluminum	1.	0.05
Antimony	0.006	0.006
Arsenic	0.010	0.002
Asbestos	7 MFL*	0.2 MFL>10um*
Barium	1.	0.1
Beryllium	0.004	0.001
Cadmium	0.005	0.001
Chromium	0.05	0.01
Cyanide	0.15	0.1
Fluoride	2.0	0.1
Mercury	0.002	0.001
Nickel	0.1	0.01
Nitrate (as NO3)	45.	2.
Nitrate+Nitrite (sum as nitrogen)	10.	
Nitrite (as nitrogen)	1.	0.4
Perchlorate	0.006	0.004
Selenium	0.05	0.005
Thallium	0.002	0.001

*MFL=million fibers per liter; MCL for fibers exceeding 10um in length.

6.2.1.2. Organic Chemicals

Organic chemicals are divided into two groups: Volatile organic chemicals (VOCs) and non-volatile synthetic organic chemicals (SOCs). There are 49 organic chemicals that are regulated. They are listed in Table 6.2 along with the respective MCL and DLR.

Table 6.2
Organic Chemicals
Maximum Contaminant Level
Detection Limit for Purposes of Reporting

Chemical	Maximum Contaminant Level (mg/L)	Detection Limit for Purposes of Reporting (DLR), (mg/L)
(a) Volatile Organic Chemicals (VOCs)		
Benzene	0.001	0.0005
Carbon Tetrachloride	0.0005	0.0005
1,2-Dichlorobenzene	0.6	0.0005
1,4-Dichlorobenzene	0.005	0.0005
1,1-Dichloroethane	0.005	0.0005
1,2-Dichloroethane	0.0005	0.0005
1,1-Dichloroethylene	0.006	0.0005
cis-1,2-Dichloroethylene	0.006	0.0005
trans-1,2-Dichloroethylene	0.01	0.0005
Dichloromethane	0.005	0.0005
1,2-Dichloropropane	0.005	0.0005
1,3-Dichloropropene	0.0005	0.0005
Ethylbenzene	0.3	0.0005
Methyl-*tert*-butyl ether	0.013	0.003
Monochlorobenzene.	0.07	0.0005

Chemical	Maximum Contaminant Level (mg/L)	Detection Limit for Purposes of Reporting (DLR), (mg/L)
Styrene.	0.1	0.0005
1,1,2,2-Tetrachloroethane	0.001	0.0005
Tetrachloroethylene	0.005	0.0005
Toluene	0.15	0.0005
1,2,4-Trichlorobenzene	0.005	0.0005
1,1,1-Trichloroethane	0.200	0.0005
1,1,2-Trichloroethane	0.005	0.0005
Trichloroethylene	0.005	0.0005
Trichlorofluoromethane	0.15	0.005
1,1,2-Trichloro-1,2,2-Trifluoroethane	1.2	0.01
Vinyl Chloride	0.0005	0.0005
Xylenes	1.750*	0.0005
(b) Non-Volatile Synthetic Organic Chemicals (SOCs)		
Alachlor	0.002	0.001
Atrazine	0.001	0.0005
Bentazon	0.018	0.002
Benzo(a)pyrene	0.0002	0.0001
Carbofuran	0.018	0.005
Chlordane	0.0001	0.0001
2,4-D	0.07	0.01

Dalapon	0.2	0.01
Dibromochloropropane	0.0002	0.00001
Di(2-ethylhexyl)adipate	0.4	0.005
Di(2-ethylhexyl)phthalate	0.004	0.003
Dinoseb	0.007	0.002
Diquat	0.02	0.004
Endothall	0.1	0.045
Endrin	0.002	0.0001
Ethylene Dibromide	0.00005	0.00002
Glyphosate	0.7	0.025
Heptachlor	0.00001	0.00001
Heptachlor Epoxide	0.00001	0.00001
Hexachlorobenzene	0.001	0.0005
Hexachlorocyclopentadiene	0.05	0.001
Lindane	0.0002	0.0002
Methoxychlor	0.03	0.01
Molinate	0.02	0.002
Oxamyl	0.05	0.02
Pentachlorophenol	0.001	0.0002
Picloram	0.5	0.001
Polychlorinated Biphenyls	0.0005	0.0005
Simazine	0.004	0.001
Thiobencarb	0.07	0.001
Toxaphene	0.003	0.001

2,3,7,8-TCDD (Dioxin)	3×10^{-8}	5×10^{-9}
2,4,5-TP (Silvex)	0.05	0.001

*MCL is for either a single isomer or the sum of the isomers.

All organic chemicals require testing using standard laboratory chemical methods including: gas chromatography (GC), gas chromatography/mass spectrometry (GC/MS), liquid chromatography (LC), and immunoassay. GC methods are the least expensive while GC/MS methods generally provide the most reliable data. While the analysis of organic chemicals is generally conducted in the laboratory, GC and CG/MS based instruments are now portable to allow measurements to be made in the field. However, the costs for GC and GC/MS analysis are comparable whether in a portable situation or in a fixed lab principally because the maintenance costs are quite high for portable systems. In addition, miniaturizing of GC and GC/MS instruments have been proposed to allow for direct measurements of organic chemicals in water although general application is well into the future. LC methods are used to test for certain polar, water soluble chemicals such as Oxamyl.

Immunoassay analysis is relatively new for chemicals in the water environment. It is a biochemical technique performed in a laboratory setting where an antibody (a protein) is used to quantitatively measure a chemical such as a drug, hormone, or a pesticide. Immunoassay techniques have been approved for two herbicide chemicals, atrazine and simazine.

6.2.1.3. Disinfectant and Disinfection Byproducts

Disinfectants and disinfection byproducts (DBPs) are regulated under the various Surface Water Treatment Rules and the Disinfectant/Disinfection Byproducts Rules. They consist of a group of 14 chemicals. DBPs are listed in Table 6.3 along with the respective MCL and DLR. The disinfectants are listed in Table 6.4. The limits for these disinfectants are defined as maximum residual disinfectant levels (MRDL), which are similar to MCLs.

Table 6.3
Disinfection Byproducts
Maximum Contaminant Level
Detection Limit for Purposes of Reporting

Disinfection Byproduct	Maximum Contaminant Level (mg/L)	Detection Limit for Purposes of Reporting (mg/L)
Total trihalomethanes (TTHMs)	0.080	
Bromodichloromethane		0.0010
Bromoform		0.0010
Chloroform		0.0010
Dibromochloromethane		0.0010
Haloacetic acids (five) (HAA5)	0.060	
Monochloroacetic Acid		0.0020
Dichloroacetic Acid		0.0010
Trichloroacetic Acid		0.0010
Monobromoacetic Acid		0.0010
Dibromoacetic Acid		0.0010
Bromate	0.010	0.0050 0.0010[1]
Chlorite	1.0	0.020

Table 6.4
Maximum Residual Disinfectant Level

Disinfectant Residual	MRDL (mg/L)
Chlorine	4.0 (as Cl_2)
Chloramines	4.0 (as Cl_2)
Chlorine dioxide	0.8 (as ClO_2)

The analysis of disinfectant residuals and DBPs in water varies depending on the chemical. For example, with regard to the DBPs, the THMs are categorized as VOCs and the methods of analysis are similar to those VOCs listed in Table 6.1, In contrast, the haloacetic acids (HAA5) are considered non-volatile chemicals and, therefore, are subject to a different analysis. The same is true of bromate and chlorite. The most common approach is to analyze the disinfectants using detectors that continuously measure the residual levels in treated drinking water. The accuracy of the detectors is periodically checked against water samples analyzed in the laboratory. Field kits are also used to measure residual levels. These kits are similar to those used to measure disinfectant residuals in swimming pools.

6.2.1.4. Radionuclides

Radionuclides that are regulated in drinking water include the naturally occurring uranium, radium-226 (a decay product of uranium-238), radium-228 (a decay products of thorium-232), tritium (which can also be produced by human activities), and strontium-90, a product of nuclear fission. There are also two additional regulated constituents, gross alpha particle activity and gross beta particle activity, which measure the level of general radioactivity of water supplies and serve as screening standards to determine whether additional measurements are required. Radioactivity is expressed in terms of picocuries per liter (pCi/L), for gross alpha particle activity, radium, and uranium (Table 6.5). For gross beta activity, tritium, and strontium, the standard is based on the levels of radioactivity that will deliver a certain dose to particular tissues or organs (Table 6.6).

Table 6.5
Radionuclides
Maximum Contaminant Level
Detection Limit for Purposes of Reporting

Radionuclide	MCL	DLR
Radium-226	5 pCi/L (combined radium-226 & -228)	1 pCi/L
Radium–228		1 pCi/L
Gross Alpha particle activity (excluding radon and uranium)	15 pCi/L	3 pCi/L
Uranium	20 pCi/L	1 pCi/L

Table 6.6
Radionuclides
Maximum Contaminant Level
Detection Limit for Purposes of Reporting

Radionuclide	MCL	DLR
Beta/photon emitters	4 millirem/year annual dose equivalent to the total body or any internal organ	Gross Beta particle activity: 4 pCi/L
Strontium-90	8 pCi/L (= 4 millirem/yr dose to bone marrow)	2 pCi/L
Tritium	20,000 pCi/L (= 4 millirem/yr dose to total body)	1,000 pCi/L

The current analytical methods consist typically of a sample preparation component and a radioactivity counting components. Sample preparation is time consuming and can

only be performed in a laboratory. After the initial sample preparation, counting requires sophisticated instruments that are expensive and must be well maintained.

Gamma counters can be used effectively in the field for gamma (photon) emitters. Prolonged counting periods will allow for achieving the desired detection limits for certain radionuclides. USEPA and other emergency responders for radionuclide emergencies rely on gamma counting for initial screening.

Strontium-90 and tritium are pure beta emitters that do not lend themselves to gamma counting.

6.2.1.5. Microbial Analysis

Historically, drinking water has been analyzed for the coliform group of bacteria as an indicator of water quality. Coliform bacteria are present throughout the environment while a specific subgroup, fecal coliform bacteria, are found in the intestinal tract of warm blooded animals. Therefore, the presence of either total coliform bacteria or fecal coliform bacteria has been considered an indication that water is potentially contaminated and pathogenic microbes may also be present. New state and federal regulations have required monitoring of additional microbial agents as well as the development of new analytical methods. These microbial agents include: *Escherichia coli* (*E.coli*), Enterococci, Coliphage, Heterotrophic bacteria, and *Cryptosporidium.* Test methods such as Colilert, Colisure, Coliblue, Colite, and Enterolert have been developed for coliform organisms and Enterococci. These new methods have eased the burden on water testing for these microbes and are considered to represent one area of new innovations in testing. These methods are rapid and are comparable in costs to previously approved methods. These methods offer a tangible and immediate benefit to small water systems. Methods for testing for *Cryptosporidium* and coliphages are highly sophisticated and require the use of specialized laboratories; thus, these methods tend to be expensive and time consuming.

The use of coliform bacteria as an indicator of microbial drinking water quality has its limitations as the absence of these organisms in drinking water is not a fail-safe assurance that pathogens are also not present. Various studies have implicated the following microbes in waterborne disease outbreaks albeit, some under opportunistic conditions; *E. coli* O157:H7, *Vibrio cholerae* serotype O139, *Pseudomonas aeruginosa*, *Aeromonas* spp., *Legionella*, *Mycobacterium avium* complex, *Helicobacter pylori*, *Cryptosporidium*, *Giardia*, *Cyclospora*, *Isospora*, *Microsporidia*, Hepatitis A virus (HAV) Hepatitis E virus (HEV), Rotavirus, Calicivirus, astrovirus, and Norwalk virus. With few exceptions, such as *Cryptosporidium*, these organisms are generally not monitored in drinking water; none are monitored on a continuing basis.

As previously indicated, with few exceptions, conventional testing methods are inadequate to identify these pathogenic organisms in drinking water. And in most cases it is important to be able to determine the species of organism involved as not all organisms at the species level may cause disease. For example, it is the mutation of

some of these organisms to highly virulent forms such as *E. coli,* O157:H7 that has caused sudden explosions in pathogenicity. Therefore, testing for specific strains using sophisticated techniques is becoming an imperative. A variety of new methods including polymerase chain reaction (PCR) and other sophisticated techniques are available to identify to the species or serotype level.

However, testing for these organisms is highly specialized and must be carried out at expert laboratories. Confirmation of the presence and number of such organisms is also a time-consuming exercise and is expensive as a rule. Therefore, these methods are not available in commercial laboratories for routine testing. Although many novel techniques are being developed, confirmation of emerging pathogenic waterborne organisms remains a somewhat distant goal.

6.3. UNREGULATED CHEMICAL MONITORING

6.3.1. USEPA Unregulated Chemical Monitoring Requirements (UCMR)

As part of the federal drinking water program, USEPA periodically identifies chemicals and other contaminants that will be subject to monitoring to determine whether regulation of those contaminants may be appropriate. A select number of PWS monitor for the UCMR analytes using laboratories and methods identified by USEPA, and submit data to USEPA. California PWS that are selected for UCMR monitoring also submit their findings to the State Water Board. Testing for UCMR chemicals is done by laboratory methods, often by a limited number of laboratories. There have been several rounds of UCMR testing, as follows.

UCMR 1 included monitoring requirements for certain PWS for 25 contaminants for a specific time period from 2001 through 2003. Included in the UCMR 1 contaminants were molinate, MTBE, and perchlorate, three contaminants for which MCLs have been established. An MCL for molinate was adopted in 1989, an MCL for MTBE in 2000 (and a secondary MCL for taste and odor in 1999), and an MCL for perchlorate in 2007. USEPA has not yet established federal MCLs for any contaminants from UCMR 1.

UCMR 2 included monitoring requirements for certain PWS for 25 contaminants for a specific time period from 2008 through 2010. Included in UCMR 2 is NDMA, a nitrosamine discussed in Chapter 3, and a contaminant for which a PHG was requested and received from OEHHA. No federal MCLs have yet been established for any contaminants from UCMR 2.

UCMR 3 includes monitoring requirements for certain PWS for 30 contaminants for a specific time period from 2013 through 2015. Included in UCMR 3 are hexavalent chromium, for which an MCL was established, effective July 1, 2014, and 1,2,3-trichloropropane, for which the State Water Board intends to propose an MCL. Another contaminant, 1,4-dioxane is discussed in Chapter 3.

Prior to UCMRs 1 through 3, testing was done by states, and referred to by USEPA as UCM-States Rounds 1-2 (1988-1997). Several thousand California PWS participated in this sampling study. Many of the chemicals from this sampling activity are included in the regulated contaminants presented above.

More information about the USEPA UCMR Program is available at: http://water.epa.gov/lawsregs/rulesregs/sdwa/ucmr/.

6.3.2. Unregulated Chemical Monitoring in California

There are several specific chemicals that are presently unregulated but have been found to be present in drinking water sources in California. The most significant unregulated chemicals for which monitoring has been conducted include: NDMA and 1,2,3-TCP. Each requires testing using sophisticated analytical methods by qualified laboratories particularly given the need, based on potential public health concerns, to measure the presence of these chemicals at very low detection levels (part per trillion levels).

Methods for testing of CECs are very sophisticated and are conducted by only highly qualified laboratories. In many cases the chemicals can be myriad, which increases the cost as the suite of potential chemicals present are not detected by one or even two methods. In addition, methods development is still ongoing particularly at the federal level. A description of the research activities being undertaken on methods development by USEPA can be found at: http://www.epa.gov/ppcp/work2.html.

6.4. MONITORING IN REAL TIME, FIELD TEST KITS, AND PORTABLE TESTING

Some chemical analyses can be carried out in real time in the field. The monitoring systems can provide continuous data on concentration of the specific chemical in water supplies. The chemicals that can be monitored in this way are presently limited. Examples of those that can be monitored in real time include nitrate, fluoride, and chlorine residual. In addition, there are devices that can continuously monitor surrogate parameters such as Turbidity, an indicator of the amount of particulate material and Total Organic Carbon and Ultraviolet Absorbance, which are indicators of the concentration of certain organic material. Although these devices are generally cost-effective, they do require attendant telemetry systems to view and store the data and they must be maintained and periodically calibrated to ensure the data generated are accurate.

Several manufacturers have developed field test kits that allow for analyses of specific chemicals and groups of chemicals. The tests kits are principally designed to be used in response to emergencies including contamination events and terrorism. These analyses can provide a result within a short period of time.

As described previously, there have been developments over the past two decades in making portable sophisticated instrumentation such as GC and GC/MS systems. The portability of these devices have allowed for mobility of sophisticated laboratory analysis particularly for organic chemicals. In general, both portable GC and GC/MS instruments

serve as screening devices to detect the presence and concentration of organic chemicals with more detailed analyses being carried out in a fixed laboratory setting as necessary.

6.5. EMERGENCY DRINKING WATER TESTING

Natural disasters such as earthquakes, wild fires, levee breaks, and other flood-related events can occur at any time in California. Water systems supplying water to communities are highly susceptible to these events. Generally, the biggest threat to water systems is bacterial contamination. Typically, the affected system's ability to provide drinking water can be restored in a relatively short time period.

On the other hand, if a natural disaster or terrorism event disrupted a water supply, and if reports of sick and or dying consumers were evident, an entirely different and urgent response would be needed.

Since the agent causing harm may be a chemical, microbes, or radionuclides broad screening methods will need to be used to identify the contaminant(s). In order to coordinate the proper collection of pertinent samples, and report the findings to DDW in a timely manner, the voluntary California Mutual Aid Laboratory Network (CAMALNet) was established. The key participants are the larger water purveyors in California with testing capabilities and the CDPH Drinking Water and Radiation Laboratory. The key purposes of CAMALNet are the following:

1. Identify and develop relationships with laboratory directors.
2. Assess and document testing capabilities at each laboratory.
3. Maintain an inventory of equipment that may be put to use at short notice for non-routine testing.
4. Maintain an inventory of laboratory certification status for each laboratory by analytical method.
5. Maintain standardized sampling kits for use in an emergency. These kits are known as the Emergency Water Quality Sampling Kits (EWQSK).
6. Provide training and maintain readiness to collect samples using standardized sampling protocols.
7. In responding to an event, establish immediate contact among pertinent CAMALNet participants and agree on the most effective method to transport samples to the testing laboratory.
8. Perform periodic performance testing (PT) for unregulated and novel chemicals on PT samples supplied by the CDPH Drinking Water and Radiation Laboratory.
9. Set up protocols for the dissemination of laboratory findings to responsible parties as agreed.

In a terrorism incident, a perpetrator likely will not use a contaminant that is regulated under existing statutes. Consequently, testing for these agents may be complex and

time-consuming. The challenge for laboratories responding to these events is to develop analytical methods that will allow rapid and unambiguous identification of the agent.

6.6. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

With some exceptions, there has been limited success to date in developing less expensive methods for analyzing the majority of chemical and radionuclide contaminants that may be present in drinking water. The successes that have occurred are in testing for chemicals that have been regulated over a long period of time at higher levels. An example is nitrate that can be monitored using a relatively inexpensive device that measures the contaminant continuously and provides the result in real time.

New chemicals of emerging concern generally associated with pharmaceuticals and personal health care products do not lend themselves to being detected and measured by less sophisticated methods/instrumentation. Most of these chemicals are highly water soluble and are generally found at low levels (parts per trillion) in drinking water sources. Because the health effects, if any, of these chemicals are not known at these low levels, analytical methods should be sufficiently sensitive to detect and quantify their presence in drinking water sources.

Efforts to determine the presence of waterborne microbial pathogenic agents in drinking water sources will continue to require more sophisticated analytical methods. As a result, there will be a continued reliance on monitoring for indicator organisms including coliform bacteria and Enterococci that require less expensive and easy to use methods.

There is little indication that the development of less expensive and easy to use analytical methods that would be available to small water systems or to consumers is forthcoming. Given the nature of the vast majority of contaminants that are present in drinking water sources, research towards developing such methods is highly unlikely.

Recommendations

6-1 The State Water Board will coordinate research needs, including methods for testing for microbes using emerging technologies. Special attention should be drawn to emerging pathogens that survive in coliform free waters, as well as constituents of emerging concern.

6-2 The State Water Board will continue to stay abreast of and provide technical input on the development of field testing methods for regulated chemicals.

REFERENCES

The following provides the location within the Code of Federal Regulations where the respective analytical methods are cited as well as links to relevant websites that describe the approved methods for each chemical, radionuclide, and microbial constituent or constituent group.

Code of Federal Regulations, Title 40. Protection of Environment, Part 141-National Primary Drinking Water Regulations, Section 141.1 et seq.

Links to relevant websites:

a. Inorganic Contaminants and Other Inorganic Constituents (June 2011) (PDF) (59 pp, 780K)
http://water.epa.gov/scitech/drinkingwater/labcert/upload/methods_inorganic.pdf
b. Organic Contaminants (June 2011) (PDF) (25 pp, 522K)
http://water.epa.gov/scitech/drinkingwater/labcert/upload/methods_organic.pdf
c. Disinfection Byproduct Rules (June 2008) (PDF) (22 pp, 96K)
http://www.epa.gov/ogwdw/methods/pdfs/methods/methods_mdbprules.pdf
d. Total Coliform Rule (June 2008) (PDF) (18 pp, 101K)
http://www.epa.gov/ogwdw/methods/pdfs/methods/methods_tcr.pdf
e. Ground Water Rule (June 2008) (PDF) (10 pp, 606K)
http://www.epa.gov/ogwdw/methods/pdfs/methods/methods_gwr.pdf
f. Enhanced Surface Water Treatment Rule (June 2008) (PDF) (20 pp, 80K)
http://www.epa.gov/ogwdw/methods/pdfs/methods/methods_swtrules.pdf
g. Long Term 2 Enhanced Surface Water Treatment Rule (June 2008) (PDF) (10 pp, 62K) http://www.epa.gov/ogwdw/methods/pdfs/methods/methods_lt2.pdf
h. Unregulated Contaminant Monitoring Rule – Cycle 2
http://water.epa.gov/lawsregs/rulesregs/sdwa/ucmr/ucmr2/methods.cfm
i. Radionuclides (June 2011) (PDF) (23 pp, 125K)
http://water.epa.gov/scitech/drinkingwater/labcert/upload/methods_radionuclides.pdf
j. http://water.epa.gov/scitech/drinkingwater/labcert/analyticalmethods.cfm
k. http://www.cdph.ca.gov/certlic/drinkingwater/Pages/Chromium6.aspx
l. http://www.cdph.ca.gov/certlic/drinkingwater/Pages/UCMR.aspx
m. http://www.cdph.ca.gov/certlic/drinkingwater/Pages/Chemicalcontaminants.aspx

CHAPTER 7. TREATMENT TECHNOLOGY AND HEALTH RISK REDUCTION

7.1. TREATMENT TECHNOLOGIES

The California SDWA prescribes enforceable primary standards for five major categories of drinking water contaminants consisting of Inorganic Chemicals, Organic Chemicals, Radionuclides, Microorganisms, Disinfectants and Disinfection Byproducts. A complete listing of these regulated contaminants is presented in Appendix A with their corresponding applicable MCLs or Treatment Techniques (TTs).

Individual treatment technologies are designed to be effective in removing or reducing one or more types of contaminants including particulate, chemical, and biological contaminants. Depending on the type of contaminants present in the source water, one or a combination of treatment technologies may be applied. Relative to surface water sources, groundwater sources are more likely to contain chemical contaminants at levels of concern or above an MCL. Surface water sources must be treated to remove particulate matter while groundwater rarely requires any treatment for particulates. All surface water sources require disinfection treatment to make the water microbiologically safe for human consumption. Some groundwater sources require disinfection to ensure the microbiological quality of the water. A disinfectant residual is maintained to ensure the safety of the water as it is distributed to customer homes. Common treatment technologies currently used to meet the primary drinking water standards are discussed in this chapter.

Technologies used for reducing or removing biological contaminants are classified as disinfection or reduction treatment processes. Technologies used for particulate or turbidity removal are classified as filtration treatment processes. A variety of treatment processes are used to reduce chemical contaminants. Some of these processes will be described in the following sections.

7.2. BIOLOGICAL CONTAMINANT REDUCTION/REMOVAL TECHNOLOGIES

7.2.1. Disinfection

Disinfection is a treatment process for reducing the number of, or inactivating, pathogenic microorganisms in water. Disinfection is required by the Surface Water Treatment Rule (SWTR) for all public water systems that obtain their water from surface water or from groundwater under the direct influence of surface water. In addition, public water systems must maintain a disinfectant residual within the distribution system. Disinfection is also required by the Groundwater Rule (GWR) for some biologically contaminated water sources. Disinfection is provided by chlorination, chloramination, chlorine dioxide, ozonation, or ultraviolet (UV) light.

7.2.1.1. Chlorination

Chlorination is the most common method used for disinfection. There are a number of methods of delivery and chemical reactions utilized for chlorination. These include sodium hypochlorite solution or calcium hypochlorite tablets/pellets or chlorine gas. Most of these chemicals are made offsite at factories but sodium hypochlorite solution can also be produced onsite. The goal of all these methods is to produce a hypochlorite solution that is an effective disinfectant.

7.2.1.2. Chloramination

Chloramines are commonly used when the water supply is prone to produce high levels of disinfection byproducts (DBPs), such as trihalomethanes or haloacetic acids, when chlorination is utilized. Chlorine and ammonia are combined to produce chloramines (monochloramine or dichloramine), which do not produce as many DBPs.

7.2.1.3. Chlorine Dioxide

Chlorine dioxide is made by reacting sodium chlorite with sodium hypochlorite or with hydrochloric acid. Chlorine dioxide is a gas that reacts with the source water to be disinfected. Chlorite is a byproduct of this process and is regulated as a DBP. In California, there is minimal use of this treatment process.

7.2.1.4. Ultraviolet (UV) Light

UV light can be used to disinfect contaminated water. UV light penetrates the cell walls of a microorganism, which disrupts its genetic material causing inactivation of the microorganism. A special lamp generates the radiation that creates UV light by striking an electric arc through a lamp filled with mercury vapor. Drinking water applications generally use low pressure and medium pressure mercury vapor lamps. These lamps emit a broad spectrum of radiation. Low pressure UV lamp emits radiation with intense peaks at UV wavelengths of 253.7 nanometers (nm) and a lesser peak at 184.9 nm. Research has shown that the optimum UV wavelength range to destroy pathogens is between 250 and 270 nm. At shorter wavelengths (e.g., 185 nm), UV light is powerful enough to produce ozone, hydroxyl, and other free radicals that destroy pathogens (NDWC, 2000).

7.2.1.5. Ozonation

Ozone is a colorless, very unstable gas that is effective as an oxidizing agent and disinfectant. It is effective in killing pathogens and oxidizing taste and odor and DBP precursor compounds with a relatively short exposure time. Since the gas is unstable and has a very short life, ozone generators must be used to produce ozone gas onsite. A DBP that is formed during ozonation is bromate, which is regulated.

7.3. Particulate (Turbidity) Removal Technologies

Particulate (turbidity) removal is used as the primary treatment of surface water or from groundwater under the direct influence of surface water. The most common method of particulate removal is by means of simple filtration either by using media filtration (e.g., sand or diatomaceous earth) or by the use of bags and/or cartridge filters. Advanced filtration techniques include membrane filtration and other technologies.

7.3.1. Filtration

Filtration is a process for removing particulate matter from water by passage through porous media. There are numerous types of filtration processes. Some common filtration processes are summarized below.

7.3.2. Conventional Filtration

This process consists of the addition of coagulant chemicals, flash mixing, coagulation-flocculation, sedimentation, and filtration. The media used in the filtration process can be single media (sand) or dual media (anthracite and silica sand), or multimedia (anthracite, silica sand and other media).

7.3.3. Direct Filtration

This process is similar to conventional filtration without the sedimentation step. It is suitable only for consistently low turbidity waters.

7.3.4. Slow Sand Filtration

In this process, untreated water percolates slowly down through a layer of fine sand, then through a layer of gravel, and ultimately collects in a system of underdrains. A biological layer of “schmutzdecke” forms on the surface of the sand, trapping small particles. The schmutzdecke also helps to degrade organic material in the water. Slow sand filtration requires a large surface area to accommodate the slow percolation rate and, thus, is suitable only for settings where lower volumes of treated water are needed.

7.3.5. Diatomaceous Earth (DE)

This process, also known as pre-coat or diatomite filtration can be used to directly treat low turbidity raw water supplies or chemically coagulated, more turbid water sources. DE filters consist of a pre-coat layer of DE, approximately 1/8 inch-thick, supported by a septum or filter element (USEPA, 1998).

7.3.6. Advanced Filtration: Membrane Filtration

This is a pressure-driven separation process in which particulate matter larger than 1-micrometer is rejected by an engineered barrier, primarily through a size-exclusion mechanism and which has measureable removal efficiency for a target organism that can be verified through the application of a direct integrity test (USEPA, 2003a). Some common types of membrane filtration are microfiltration, which employs hollow-fiber membranes with a pore size range of approximately 0.1-0.2 micrometers (nominally 0.1 micrometers), ultrafiltration, which employs hollow-fiber membranes with a pore size range of approximately 0.01 – 0.05 micrometer (nominally 0.01micrometers), and nanofiltration, which employs membranes with a pore size of approximately one nanometer (USEPA, 2003a).

7.4. CHEMICAL CONTAMINANT REMOVAL

Chemical contaminants are commonly removed using ion exchange and sorption technologies. This section provides a brief overview of these technologies along with other treatment technologies that are used to remove chemical contaminants in drinking water.

7.4.1. Ion Exchange (IX)

IX involves the selective removal of charged inorganic species from water using an ion-specific resin. The surface of the ion exchange resin contains charged functional groups that hold ionic species by electrostatic attraction. As water containing undesired ions passes through a column of resin beds, charged ions on the resin surface are exchanged for the undesired species in the water. The resin, when saturated with the undesired species, is regenerated with a solution of the exchangeable ion (USEPA, 1998b). Generally, resins can be categorized as anion exchange or cation exchange resins. Anion exchange resins selectively remove anionic species such as nitrate (NO3-), sulfate (SO4 2-), or fluoride (F-) and exchange them for hydroxyl (OH-) or chloride (Cl-) ions. Cation exchange resins are used to remove undesired cations such as cadmium (Cd2+) or barium (Ba2+) from water and exchange them for hydrogen ions (H+), sodium ions (Na+) or potassium ions (K+) (USEPA, 1998b).

The pH of the source water is important when employing IX resins. For example, uranium exists in water at pH levels of 6.0 and higher as a carbonate complex, which is an anion, and has a strong affinity for anion resin in the chloride form. The process is effective on water with a pH of up to 8.2. A higher pH could result in uranium precipitation; a lower pH changes the nature of uranium to non-ionic and/or cationic species, which would prevent the exchange reaction from operating efficiently. It is advisable to control the inlet water pH to above 6.0. Sudden pH changes to below 5.6 can dump any previously removed uranium off the resin (DeSilva 1996).

7.4.2. Sorption Technologies

Adsorption involves the removal of ions and molecules from solution and concentrating them on the surface of adsorbents. Adsorption is driven by the interfacial forces of the ions and the adsorbent. Adsorption media employed at drinking water plants include granular activated carbon, activated alumina, and iron media. Sorption technologies are used for the removal of organics, compounds contributing to objectionable taste and odor, and inorganic contaminants such as arsenic.

7.4.3. Reverse Osmosis (RO)

RO resembles membrane filtration processes in that minerals in water are removed by the use of a membrane. However, unlike membrane filtration where water is forced through a media leaving behind the contaminant, RO uses hydraulic pressure to oppose the liquid osmotic pressure across a semi-permeable membrane, forcing the water from the concentrated solution side to the dilute solution side. Thus, the RO membrane allows the passage of the solvent (water) but not the dissolved solids (solutes). Since the membrane is non-porous, the water does not travel through pores, but rather dissolves into the membrane, diffuses across, and then dissolves into the permeate (USEPA, 1998b). RO can effectively remove nearly all contaminants from water including arsenic, barium, cadmium, chromium, radium, natural organic substances, pesticides, and microbiological contaminants. RO produces demineralized water and also a brine residual for which proper disposal is required.

7.5. OTHER TECHNOLOGIES

7.5.1. Aeration Technologies

Aeration technologies are typically used for removal of volatile organic compounds or radon and for removal of excess carbon dioxide. Aeration involves the contacting of the water with air wherein the target chemical is transferred from the water to the air stream. There are a number of methods used for the mixing of air and water including packed aeration towers, shallow tray air strippers, mechanical aeration, and spray aeration.

7.5.2. Softening

Softening is used to remove calcium and magnesium ions from water. Types of technologies used include ion exchange, chemical flocculation, and precipitation.

7.5.3. Electrodialysis

Electrodialysis (ED) is less commonly used for chemical removal. It is a process in which ions are transferred through ion-selective membranes by means of an electromotive force from a less concentrated solution to a more concentrated solution (USEPA,

2003a). ED is a very effective in removing fluoride and nitrate, and can also remove barium, cadmium, and selenium (NDWC, 1997).

7.5.4. POU/POE Treatment

In some cases, small drinking water treatment systems such as point-of-use (POU) or point-of-entry (POE) devices may be appropriate to provide safe drinking water to individual homes, businesses, or apartment buildings. Such consumers may not have the financial resources, technical ability, or physical space to own and operate centralized treatment plants.

POU devices are utilized at specific plumbing fixtures in a building/residence (e.g., kitchen faucet), treating only the water flowing from that fixture, and POE devices are installed in the water supply line just outside a building/residence, treating all water before entry. POU/POE treatment is applied to reduce levels of organic and inorganic contaminants, turbidity, microorganisms including cysts, and many other contaminants. The same technologies used in treatment plants for community water systems can be used in POU/POE treatment.

There are specific conditions placed on the use of POU devices. Only PWS with less than 200 service connections can use POU devices. In addition, a PWS is not allowed to use POU devices unless a public hearing conducted in the community served by the PWS finds that there is no substantial community opposition to the installation of POU devices; and the use of POU devices is limited to not more than three years or until funding for centralized treatment is available, whichever occurs first. Furthermore, if chosen as the method of compliance with the Safe Drinking Water Act, POU devices would be required in every home unless there is a mix of treatment systems, such that a portion of the community is served from a central facility and the rest by POU devices.

In 2010, emergency regulations were adopted allowing the use of POU treatment devices by public water systems as a means of compliance with MCLs. These were effective until January 1, 2014. On September 22, 2011, emergency regulations were adopted for POE treatment devices. Final regulations are being prepared and will be moved for adoption through the normal regulatory process.

Guidance on the use of POU and POE by water systems is available from several sources. USEPA has produced two reports: “Investigation of the Capability of Point-of-Use/Point-of-Entry Treatment Devices as a Means of Providing Water Security,” (February 2006) and “Point-of-Use or Point-of-Entry Treatment Options for Small Water Systems,” (April 2006), as well as a report on small water system treatment technologies including POU and POE devices: “Small Drinking Water Systems: State of the Industry and Treatment Technologies to Meet the Safe Drinking Water Act Requirements,” (November 2007). The latter can be found at: http://www.epa.gov/nrmrl/wswrd/dw/smallsystems/pubs/600x05021.pdf.

The State of Arizona Department of Environmental Quality prepared a guidance document, “Arizona Point-of-Use Compliance Program Guidance,” (July 2005). Massachusetts Department of Environmental Protection adopted POU and POE Device Regulations, 310 CMR 22.00. The Water Quality Association has produced technical documents on POU devices that can be obtained at: http://www.wqa.org/pdf/technical/finalbarrier_handoutfinal0213.v3.pdf and http://www.wqa.org/pdf/technical/wqaconsumertrifoldfinal0213.v3.pdf.

Lists of treatment technologies for disinfection, filtration, inorganic contaminants, volatile organic contaminants, synthetic organic contaminants, and radionuclides that have been used or tested by California water systems are provided in Appendix 4.

7.6. OVERALL ESTIMATED COST OF COMPLIANCE PER CONTAMINANT

In the last 20 years, three primary drinking water standards with new MCLs and monitoring requirements were adopted, including MTBE (2000), perchlorate (2007), and arsenic (2008) under the California SDWA. Cost estimates for compliance with the MCLs will be summarized in this section.

7.6.1. MTBE

MTBE is a colorless, liquid hydrocarbon that had been used as an octane booster in gasoline since the 1970s. Highly mobile in soils (through which it rapidly migrates to groundwater), very soluble in water, and extremely slow to biodegrade (or possibly nonbiodegradable), MTBE has been found in shallow groundwater throughout the United States. In California, MTBE contamination of groundwater was principally the result of leaks from underground gasoline storage tanks. Contamination of surface water was also found due to the use of gasoline powered motor craft. As of January 1, 2004, MTBE has been banned from use in California.

The estimated cost of compliance with the MCL for MTBE was associated with monitoring costs, which were estimated to be approximately $4.5 million. There were no water sources out of compliance at the time the MCL was proposed. A complete discussion of the estimated cost of compliance can be found in the Final Statement of Reasons rulemaking document at: http://www.cdph.ca.gov/certlic/drinkingwater/Pages/MTBE.aspx**.**

Since the adoption of the MCL in 2000, 24 sources have reported levels above the MCL. Some of these sources are now inactive or used as standby sources. Funding was provided for mitigation to some affected public water systems through the Drinking Water Treatment and Research Fund (H&S Code Section 116367, et seq.). A summary of the funding program for MTBE and other oxygenates and a report on the public water systems funded under the program can be found at: http://www.cdph.ca.gov/services/funding/Pages/DWTRF.aspx.

7.6.2. Perchlorate

Perchlorate results from the dissociation of perchlorate-containing salts such as ammonia perchlorate (a chemical used in the manufacture of rockets, fireworks, and explosives). Ammonium perchlorate is used as a solid rocket propellant at aerospace development and testing facilities. In California, perchlorate contamination of groundwater has emerged primarily near such facilities. Contamination has also been found in a surface water source, the Colorado River, as the result of contamination from historic ammonium perchlorate manufacturing facilities in the state of Nevada.

The estimated cost of compliance with the MCL for perchlorate was associated with monitoring costs, which were estimated to be approximately $968,000 during the first year of implementation, and subsequent ongoing annualized monitoring costs into the future at $500,300. At the time the MCL was proposed, 97 water sources were determined to be out of compliance. It was estimated that the capital cost to treat those sources was approximately $70.5 million. When including operation and maintenance costs, the total estimated annualized cost was $23.7 million. A complete discussion of the estimated costs of compliance can be found in the Final Statement of Reasons rulemaking document at: http://www.cdph.ca.gov/services/DPOPP/regs/Pages/R-16-04-PerchlorateinDrinkingWater.aspx.

7.6.3. Arsenic

Arsenic is a naturally occurring element that is found throughout California. Anthropogenic (human-caused) activities are not a principal source of arsenic contamination of drinking water sources; however, there are a number of arsenic-containing compounds that have been used commercially as an alloy with other metals and in the manufacture of semiconductors. Arsenic and its compounds have also been used in the production of pesticides, treated wood products, herbicides, and insecticides although that use has diminished. Arsenic is predominately found in groundwater sources although it is also detected in surface waters.

The estimated cost of compliance with the arsenic MCL was associated with monitoring, treatment, and the disposal of treatment residual material. A total of 493 water sources were determined to be out of compliance. The total estimated annualized cost including monitoring, treatment, and residual disposal was $230.2 million. A complete discussion of the estimated cost of compliance can be found in the final Statement of Reasons rulemaking document at:
http://www.cdph.ca.gov/certlic/drinkingwater/Pages/Arsenic.aspx.

7.7. CONCLUSION AND RECOMMENDATIONS

Conclusions

For all contaminants that have MCLs, there exist methods of treatment that will bring the affected PWS into compliance with the MCLs. Almost all large- and medium-sized water systems have installed the necessary treatment systems to come into compliance with MCLs. However, small water systems may have challenges in installing and operating the necessary treatment facilities, though funding sources are available. Funding for continued operations and maintenance can be problematic for small water systems since their small rate-payer base and frequent disadvantaged community status make it difficult to collect adequate rates to provide treatment. For example, there is an arsenic treatment facility in a small community in the San Joaquin Valley that was constructed and paid for by federal community development funds, but the facility is not presently in operation because the PWS cannot afford to pay the operational costs, which must be totally absorbed by the ratepayers of the PWS. The federal and state funding programs available to the State Water Board to assist PWS prohibit the use of those funds for operational and maintenance costs. Under these programs before funding of treatment facilities can be provided the water system must demonstrate the TMF capacity to operate and maintain the facility after construction. Therefore, the lack of a sustainable revenue source to fund operations represents the major reason for the lack of construction of treatment facilities and the high incidence of continued noncompliance with drinking water standards among small water systems. Based on state agencies' experience in certain financial assistance programs, there is a significant potential for fraud, waste, and abuse if the State were to provide funding for operations and maintenance and other ongoing, non-capital costs. Strong program oversight should ensure that potential fraud, waste and abuse of government funding is avoided.

Recommandations

7-1 Funding should be provided for research and demonstration grants to develop new treatment processes or improve the cost efficiency of existing treatment processes for small water systems, including POU/POE devices.

7-2 The State Water Board recommends enactment of legislation to allow expanded use of point of use and point of entry treatment by public water systems.

REFERENCES

Arizona Department of Environmental Quality, Arizona Point of Use Compliance Program Guidance, (July 2005)

Massachusetts Department of Environmental Protection adopted Point-of–Use and Point-of-Entry Devices Regulations, 310 CMR 22.00

USEPA, Investigation of the Capability of Point-of-Use/Point-of-Entry Treatment Devices as a Means of Providing Water Security, (February 2006)

USEPA, Point-of-Use or Point-of-Entry Treatment Options for Small Water Systems (April 2006)

USEPA, Small Drinking Water Systems: State of the Industry and Treatment Technologies to Meet the Safe Drinking Water Act Requirements, (November 2007). Available at: http://www.epa.gov/nrmrl/wswrd/dw/smallsystems/pubs/600x05021.pdf.

CHAPTER 8. FINANCIAL ASPECTS

8.1. COST OF DRINKING WATER

Historically in California, consumers have maintained an attitude that plentiful water of the highest quality is their right, but have not always been willing to pay the cost associated with the water they use. Water has traditionally been undervalued because of its perceived abundance in California. Although water covers nearly three-quarters of the earth's surface, only 0.033 percent of the world's total supply is fresh water available for human use (AWWA 1989). Water is essential to every form of life, but is often taken for granted by consumers (ASDWA 1990). Most homeowners do not really appreciate how intrinsic the availability of safe drinking water is to the value of real property. Because of these attitudes, there have been substantial controversies in California communities regarding water rate increases and metering of service connections in unmetered water systems.

The era of inexpensive water, however, is coming to an end. This change may be the result of a number of factors:

- Court action regarding water allocations of Colorado River waters resulting in a decrease in California's allotment has required utilities throughout Southern California to switch to more costly sources of water and to promote water conservation measures.
- Increases in cost associated with producing water such as electricity, chemicals, etc.
- Costs associated with replacing infrastructure as components originally brought in to service 25 to 75 years ago (distribution pipes, storage tanks, treatment plants, wells, etc.), reach the end of their useful life.
- New, enhanced, or more restrictive drinking water standards have caused most water systems to add treatment facilities, increase treatment chemical use, or improve their existing treatment facilities.
- Drought continues to place additional stress on California's water supplies.

Public policy has focused on the right of Californians to have access to high quality drinking water. Recent legislation (Assembly Bill 685, Chapter 524, Statutes of 2012) established as state policy that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking and sanitation. H&S Code Section 116270(a) states "Every citizen of California has the right to pure and safe drinking water." As drinking water standards become more stringent, there must be a realization that with the greater assurance of the safety of the water and reduced risks, there will be associated increases in the cost to provide that assurance, through the use of high-cost analytical methodology and treatment techniques, as well as increased regulatory controls and oversight.

In many PWS, water rates have been kept artificially low by deferring expenditures for needed maintenance and replacement of water treatment facilities and distribution systems (ASDWA 1990). This has resulted in deficient operation and maintenance programs, with many systems now facing the need for early replacement of outdated or severely deteriorated infrastructure such as leaking mains and deficient storage capacity. Some water systems have resorted to lining old water pipes instead of replacing them to buy time until the pipes can be replaced. Other programs such as routine water main flushing and valve maintenance, which improve water system efficiency, have not been implemented because of cost considerations. The failure to implement routine maintenance can have adverse water quality impacts when problems occur in the distribution system and control features do not work correctly (e.g., isolation valves that cannot be closed or reopened).

The increased cost of providing safe drinking water is also the result of the need to provide increased treatment to water sources to render them potable, as these sources were contaminated due to increased population densities, urbanization, pollution from industries, and waste facilities as well as natural contaminants and more stringent regulations to protect public health. Regulatory controls by both the state and USEPA have required increased monitoring for detection of chemical and microbial contaminants. Improved analytical methodologies have allowed for the detection of chemicals at much lower concentrations and new microorganisms of health concern. However, these improved methods require more sophisticated instrumentation and result in increased monitoring cost.

Finally, there are both direct and indirect costs associated with water conservation and drought. While water conservation conserves a scarce resource -- whether in response to state mandates, drought, or climate change concerns -- it also reduces water sales and revenues in systems with metered rates, usually at a level that is not directly proportional to a corresponding reduction to the costs of providing service. And the tiered/inclined rate structure increasingly used by water systems (lower rates for less consumption) tends to reduce revenues. So conservation can result in a utility's need to actually raise metered rates to cover fixed costs that are not directly related to the volume of water used by customers.

Consumer acceptance of rate increases is also a challenge, and depends on an understanding of the factors described above as well as the value of safe public water for property, fire protection, sanitation needs, industries that create jobs for communities, and a host of other community benefits (parks, recreation facilities, public facilities, etc.). Proposition 218 has memorialized these concerns and continues to pose challenges in providing adequate rate-based revenues.

8.2. "COST OF WATER" SURVEY

To determine the cost of drinking water in California for the 1993 Plan, the "Survey of Community Water Systems in California," was mailed to all public water systems in

California in early 1990 and 1,083 responses were used in the final report (henceforth referred to as the 1991 survey or 1991 Morgan and Mercer survey).

In 2012, to obtain current information, water rate information was collected as a part of the electronic annual report (e-AR) that all water systems are required to submit. From this survey, 1,134 systems were selected as having sufficiently detailed responses for use in this report. The 2012 survey used a different survey tool and methodology than the 1991 survey and includes some differences as a result of changes in how water systems currently bill for water. Specifically, where most systems in 1991 were either billing on a flat rate basis or on a metered rate basis, there are currently a greater number of rate structures in use including:

1) Flat base rates (same as flat rate used in 1991 survey).

2) Variable base rates. A flat rate usually based on pipe or meter size and used as an indirect measure of potential water use.

3) Uniform usage rate. A metered rate based on a uniform quantity charge for water.

4) Variable usage rate. A metered rate where the water rate charges are based on what is often described as a tiered rate, with different rates for different ranges of consumption during a billing period (usually, but not always, the rate increases as consumption goes up). Most utilities that use a variable rate use an inclining rate structure. An inclining rate structure is based on the rate per unit increasing as the consumption goes up. The declining rate structure that had historically been used is based on the rate per unit decreasing with increasing consumption. This declining rate structure has almost completely disappeared as water shortages and water conservation measures discourage its use. The 2011 California-Nevada AWWA Water Rate Survey found that the trend is toward using the inclining rate structure.

5) Flat base rate and variable usage rate combination. This rate structure is used mostly by systems that may be transitioning between unmetered and metered connections. It can also represent utilities that are otherwise billing on a quantity basis, but have set a minimum charge per billing cycle. It can also include utilities that have a “blended” billing system that has a flat rate for a base amount of water and then has an incremental quantity based charge for usage above that amount.

6) Variable base rate and variable usage rate combination. This is essentially the same option and variation as the above except the variable base rate portion of the charge may be based on meter size, property size, or some other factor used to create customer classes.

7) Other, often unique, ways of billing customers and not included in the above descriptions.

Table 8.1 shows a comparison of the consumer monthly water costs between the 1991 and 2012 surveys.

Table 8.1
Comparison of Changes to Consumer Monthly Water Costs by Rate Type
1991 and 2012

Rate Type	1991 Survey (Morgan and Mercer)		2012 Survey e-AR report from PWS's	
	Systems Surveyed	Average Water Cost in 2012 $'s (in 1990 $'s)	Systems Surveyed	Average Water Cost in 2012 $'s
Flat Base Rate (flat rate)	524	$34.56 ($19.31)	211	$56.08
Uniform Usage Rate (metered rate)	559	$38.12 ($21.30)	67	$62.08
Variable Base Rate	NA	NA	21	$44.97
Variable Usage Rate (metered rate)	NA	NA	77	$67.10
Flat Base Rate + Uniform Usage Rate		NA	179	$47.35
Flat Base Rate + Variable Usage Rate	NA	NA	282	$56.64
Variable Base Rate + Variable Usage Rate	NA	NA	187	58.35
Other rate base.	NA	NA	106	$48.71
Total Systems Surveyed	**1,083**	$36.40	**1,130**	$55.42

8.2.1. Type of Ownership

In the 2012 survey, four classes of ownership were analyzed versus only three classes in 1991. This report includes the following types of ownership:

- Publicly owned, mostly consisting of cities, counties, and special districts (included in both studies)
- PUC regulated, investor-owned (included in both studies)
- Mutual water companies (included in both studies)
- Privately owned, non-PUC regulated. This group includes mobile home parks, employee housing such as farmworker housing, apartments, condominium developments, and other facilities owned by individuals or partnerships, but

exempted from most of PUC's rate setting requirements (included only in the 2012 survey).

Table 8.2 compares monthly water costs, water system ownership type, and water rate type between the 1991 Morgan and Mercer survey and the 2012 survey.

Table 8.2
Average Consumer Monthly Water Costs by Ownership Type and Rate Type

Ownership Type	Rate Type	1991 Survey (Morgan and Mercer) as 2012 $'s	2012 e-AR report from PWS as 2012 $'s
Local Government	**Avg. Local Govt.**		**$52.51**
	Unmetered Avg.	**$31.98**[/1]	**$49.82**
	Flat Base Rate		$51.75
	Variable Base Rate		$41.94
	Other Rate Structure		$49.27
	Metered Avg.	**$36.81**[/2]	**$53.37**
	Uniform Usage Rate		$50.96
	Variable Usage Rate		$67.64
	Flat Base +Uniform Usage Rate		$45.38
	Flat Base + Variable Usage Rate		$54.37
	Variable Base + Variable Usage Rate		$53.87
Public Utility Company	**Avg. PUC Regulated.**		**$58.05**
	Unmetered Avg.	**$24.46**[/1]	**$50.99**
	Flat Base Rate		$54.34
	Variable Base Rate		$51.47
	Other Rate Structure		$47.84
	Metered Avg.	**$37.01**[/2]	**$60.76**
	Uniform Usage Rate		$65.01
	Variable Usage Rate		$54.30
	Flat Base +Uniform Usage Rate		$50.63
	Flat Base + Variable Usage Rate		$59.35
	Variable Base + Variable Usage Rate		$68.48
Mutual Water Company	**Avg. Mutual W.Co.**		**$64.10**
	Unmetered Avg.	**$35.31**[/1]	**$61.32**
	Flat Base Rate		$62.74

Ownership Type	Rate Type	1991 Survey (Morgan and Mercer) as 2012 $'s	2012 e-AR report from PWS as 2012 $'s
	Variable Base Rate		$49.98
	Other Rate Structure		$45.51
	Metered Avg.	**$50.47**[/2]	**$66.62**
	Uniform Usage Rate		$95.94
	Variable Usage Rate		$71.63
	Flat Base +Uniform Usage Rate		$54.50
	Flat Base + Variable Usage Rate		$62.83
	Variable Base + Variable Usage Rate		$85.94
Private Non-PUC	**Avg. Private Non-PUC**		**$33.78**
	Unmetered Avg.	**Not tracked**	**$19.86**
	Flat Base Rate		$19.86
	Variable Base Rate		
	Other Rate Structure		
	Metered Avg.	**Not tracked**	**$45.17**
	Uniform Usage Rate		$70.52
	Variable Usage Rate		
	Flat Base +Uniform Usage Rate		$32.06
	Flat Base + Variable Usage Rate		$45.52
	Variable Base + Variable Usage Rate		

Notes:
/1 Described in prior report as "unmetered rate" and probably includes both flat base rate, variable base rate and other utilities.
/2 Described in prior report as "metered rate" and probably includes both uniform and variable usage rate utilities.

In the current study, the lowest rates are seen in the non-PUC regulated private systems. Because they serve facilities such as mobile home parks, employee housing such as farmworker housing, apartments, condominiums, and similar facilities, they lack the extensive water delivery infrastructure (storage and distribution systems) found in other utilities. In addition, since water delivery is not their main business pursuit, much of their normal infrastructure costs are probably carried as a component of rent or facility use fees other than for water. The figures for these systems, while atypical of overall water

costs in California, are probably fairly indicative of the average water production cost component (pumping and treatment costs) incurred by these systems.

The next lowest group is the publicly owned water systems. Publicly owned systems have other resources from which to generate revenues that are not available to the investor-owned and mutual water companies, such as taxation and special assessments and other user charges. The investor-owned and mutual water companies must generate all or most of their revenues through the water rates. While larger publicly owned systems still have some advantages due to their size, which provides them some economy of scale when it comes to the costs of producing water, some of the other advantages listed above are either greatly reduced or have disappeared.

The greatest impact on these publicly owned systems was the passage of Proposition 218 in 1996. According to the California Legislative Analyst's Office, "In general, the intent of Proposition 218 is to ensure that all taxes and most charges on property owners are subject to voter approval. In addition, Proposition 218 seeks to curb some perceived abuses in the use of assessments and property related fees, specifically the use of these revenue-raising tools to pay for general governmental services rather than property related service," (California Legislative Analyst's Office, December 1996).

While Proposition 218 brought about some immediate changes, details as to how the provisions apply to water rates are still open to interpretation by the courts. For example, in August 2011, the Second Appellate District, Division Seven, published a finding in the case of City of Palmdale v. Palmdale Water District, et al., that place some limits on the ability of publicly owned water systems to establish tiered rates that are in violation of the proportionality clause of Proposition 218 (Article XII D, Section 6, subdivision (b)(3)). At issue was a tiered rate charged by Palmdale Water District to encourage conservation by creating a tiered rate structure based on applying different rates based on usage for different classes of users (e.g., residential, industrial, irrigation, etc.). The Court held that tiered rates to encourage water conservation are constitutional, but the Water District failed to demonstrate that moving irrigation users between tiers more rapidly than other user classes was related to the actual cost of producing water and was, therefore, not allowed under Proposition 218. In adopting the rate that was found in violation of Proposition 218, the District's intent was to address increased costs and decreased water use by adopting a rate structure that provided the most stable revenue stream to operate the system. In the Court's opinion, the rate alternative that was rejected by the District in their considerations, a cost of service option, was defensible under Proposition 218, but was rejected by the utility since it would result in greater fluctuations in revenue during the year due to seasonal demands by irrigation users.

The next highest average rate, as seen in Table 8.2, are PUC-regulated utilities. With limited exceptions, PUC-regulated systems fall in a size range described in the discussion on size, below, as intermediate to large (over 200 connections). For the most part, this is driven by the simple economics of investment; smaller systems may generally lack a revenue stream sufficient to generate a profit margin attractive to investors.

The highest average water rates are seen in mutual water companies. These systems tend to make up a high percentage of the inventory of intermediate and small systems (less than 1,000 connections). Most came into being during the post-war housing boom starting in the early 1950s and through the early 1980s. Most were originally formed by land developers to serve land subdivisions. In mutual water companies, shares in the company are conveyed with the land title, so a homeowner can exercise the one voting share that goes with the property. This tends to keep these water systems somewhat closer to their rate payers than other types of systems, except when the homes are rented to tenants who must pay the water rates but are not able to vote.

Clearly, some things have changed since the 1991 survey, where water rates in mutual water companies were seen as undervaluing the water being provided, particularly in unmetered systems. While the majority of mutual water companies surveyed in 2012 are still using a flat rate fee structure, the average rates are now higher than most other metered and unmetered rates charged by systems of other ownership types.

8.2.2. Utility Size

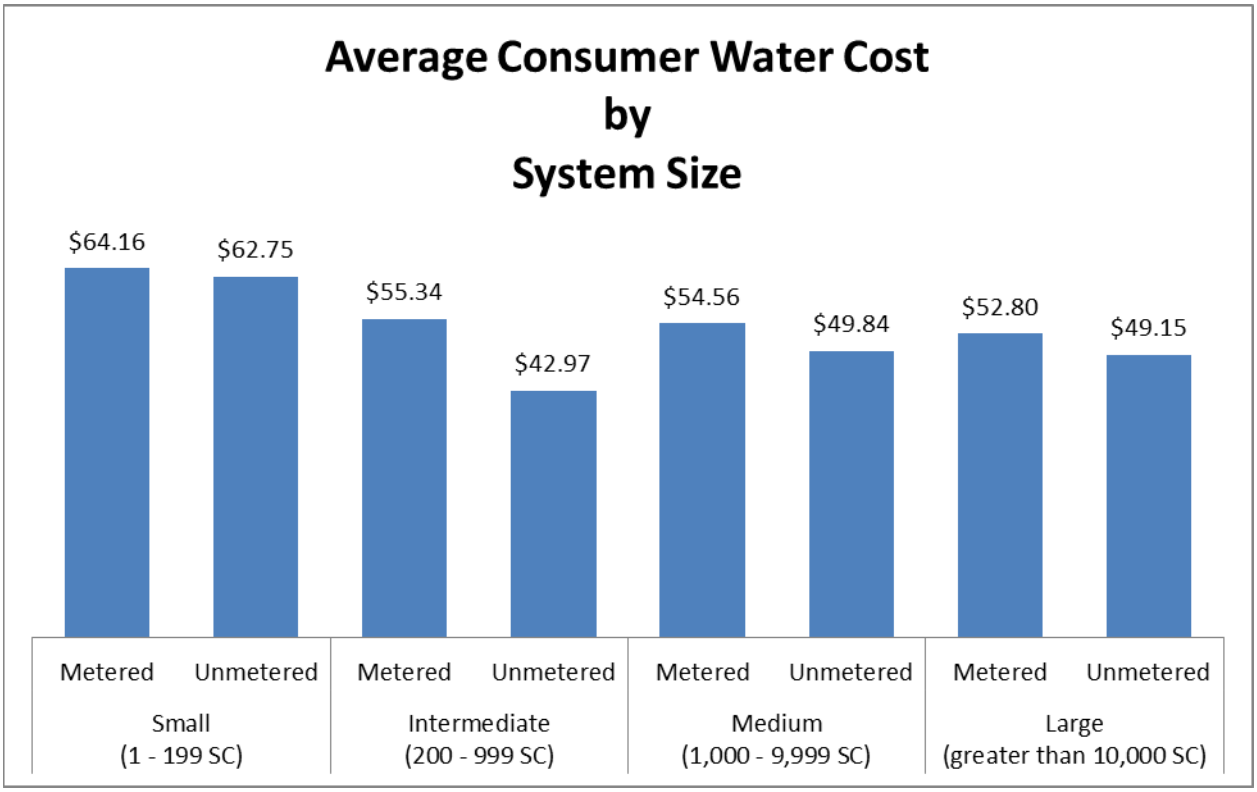
The monthly costs were analyzed using the following size classifications: small (15 to 199 service connections), intermediate (200 to 999 service connections), medium (1,000 to 9,999 service connections), and large (10,000 or more service connections). The classifications were identified to provide breakdown of cost by size of system, and do not correspond to the regulatory definitions for large and small water systems. As in the 1991 Morgan and Mercer survey, on average, customers in the small systems pay more for drinking water than customers in the large water systems. In 1991, small systems paid about 40 percent more for water; in the 2012 survey this differential was down to 22 percent more. There are a number of reasons for the generally higher rates still seen in these systems. These include:

- The majority of small systems are located in more rural areas where sanitary sewer is unavailable. The homes served by these systems depend on septic tank systems for the disposal of sewage waste. Since the late 1960s land development standards have generally required minimum lot sizes of 20,000 square feet (roughly ½ acre) in areas without sewer, whereas the typical urban residential lot is in range of 5,000 to 10,000 square feet.
- Rural zoning requirements can increase minimum lot sizes in these systems to the one acre to five acre range, with some running to even larger lot sizes.
- With the increased lot size in rural residential developments, landscape uses for domestic water are significantly higher.
- Due to increased available land and less restrictive zoning, domestic water is also used to support small scale agricultural uses, such as animal ranches and orchards.
- Smaller systems lack the economy of scale found in systems with more than 200 connections. They typically cannot afford to have full-time technical support and,

therefore, contract for much of the work and are unable to take advantage of quantity discounts on materials needed to run the systems.

The difference between average rates in intermediate, medium, and large systems have become less significant, with large systems having rates that were one percent lower than intermediate systems and two percent lower than medium systems.

Figure 8.1



8.3. HOW WATER IS BILLED

In the 1991 Morgan and Mercer survey, data on water billing was reported as simply flat rate or metered. If there were variations within these categories they were either not captured or did not exist in significant numbers. In the intervening years, water systems and the way they bill for water have become more sophisticated. There are a number of forces that are driving these changes, including:

- Population growth and increased water demands.
- Increased water conservation awareness through statewide initiatives by the Department of Water Resources.

- Increased water conservation awareness by water systems driven by periods of drought resulting in water shortages and the lowering of reservoir and groundwater levels, the latter exacerbated by overdraft.
- Increases in electrical rates that have increased the cost to produce water.
- Increases in the number of systems that are providing advanced treatment to meet more stringent standards of potability and the increases in the cost of producing treated water for consumers.
- Increased educational outreach to systems, training even smaller systems in some of the basics of rate setting.
- Cost associated with infrastructure replacement for all systems, but particularly in smaller systems without capital improvement plans.

In the 2012 survey, the data show that there was a much greater diversity in how public water systems structure water rates. The 2012 survey did show the same trend in water systems using the inclining rate structure as in the 2011 California-Nevada AWWA Water Rate Survey (Table 8.3).

Table 8.3
Percentage of Community Systems, by Rate Type

General Type of Rate Structure		Percent of Systems
Unmetered	Flat Base Rate	18.2
	Variable Base Rate	1.9
	Other Rate Structure	9.5
Metered	Uniform Usage Rate	5.9
	Variable Usage Rate	6.9
	Flat Base Rate plus Uniform Usage Rate	15.8
	Flat Base Rate plus Variable Usage Rate	25.0
	Variable Base Rate plus Variable Usage Rate	17.0

Water Source and Treatment

Due to the constraints on time and resources, the 2012 e-AR survey did not take into account sources of water with regard to water rates. However, many of the findings of the 1991 Morgan and Mercer survey appear to remain valid today. Specifically, that

survey found that: “Overall, treated surface water is the most expensive source of supply for California consumers. The cost to provide treatment to groundwater is very similar, at only two percent to three percent lower. This is due to the high capital cost to construct water treatment facilities and the high ongoing costs to operate and maintain these facilities. With surface water, all water delivered to customers must be treated, whereas for groundwater, if treatment is provided due to chemical or microbiological contamination, it is usually on a source by source basis; few utilities that use groundwater are required to provide treatment on all wells serving their system. Of the utilities using surface water, almost all will also have groundwater sources that are used as emergency sources or to buffer seasonal or peak day demands.”

What has changed since the 1991 Morgan and Mercer survey is an increase in the number of groundwater sources that now require treatment to meet primary drinking water standards. Consequently, the increase in the number of systems now providing treatment may account for a significant portion of the 52 percent increase in average water rates when compared to inflation adjusted averages from the 1991 survey. However, further study would have to be undertaken to determine if that assumption is true.

8.4 REGIONAL VARIATIONS

A significant regional variation occurs in the cost of drinking water. Applying the approach used in the 1993 Plan, the state was divided into six areas that conform roughly to similar watershed, climatic, or wholesale service areas. The purpose was to set boundaries to include similar water sources, water use, and consumption characteristics within the same regions. These regions have been identified in Table 8.4 as the Bay Area, Central Coast, Central Valley/Agricultural (includes Imperial County), Foothill, Mountain/Desert, and Southern California.

Table 8.4
Average Consumer Monthly Cost of Drinking Water by Region[a]

	Metered		Unmetered	
Region	1991 Average Monthly Bill* (in 2012 $’s)	2012 DPH eAR Average Monthly Bill	1991 Average Monthly Bill* (in 2012 $’s)	2012 eAR Average Monthly Bill
Bay Area	$36.85	$67.49	$32.15	$71.52
Central Coast	$47.60	$68.31	$39.96	$59.65
Southern CA	$41.90	$62.56	$32.91	$55.01

Foothill	$28.93	$48.30	$30.68	$47.87
Central Valley/Ag	$30.29	$46.59	$27.15	$51.25
Mountain/Desert	$26.99	$44.38	$26.95	$41.36

* Original data from Morgan and Mercer 1991, Table 9, as published in the 1993 Safe Drinking Water Plan

There are several reasons why water costs vary significantly throughout California. One reason, as discussed previously, is the variation in the source of the water and the type of treatment that may be required. For example, surface water is more expensive due to the high level of treatment required to meet drinking water standards. California's ongoing cycle of periodic droughts also has an impact on water rates by forcing communities to look to alternative, more costly, sources of water and to increase rates to make up for lost revenues due to water conservation. Systems in all parts of California are also aging and the cost of infrastructure replacement and differences in the construction costs in various parts of the state can impact rates. Population growth and the impact on water supplies can also play a role in parts of the state.

This regional cost of water was also reflected by the 2011 California-Nevada AWWA Water Rate Survey. This survey also found that for systems with metered rates, the Central Coast had the highest rates and the Central Valley had the lowest.

In comparing inflation adjusted numbers between the 1991 survey and the 2012 survey, what stands out are that rates have increased far more than what inflation alone can account for. In fact, on a statewide basis the average increase is between 60 percent higher in metered systems and 74 percent higher in unmetered systems. As discussed in prior chapters, regulatory changes have had a significant impact, particularly on smaller systems. Some of the major impacts are from the rules adopted since 1991 and other factors listed below:

- In 1999 (initial guidelines) or 2001 (final guidelines), USEPA required states to adopt added requirements that all community water systems be under the oversight of a licensed Distribution System Operator. Prior to this time, in California, only systems treating water to meet a primary drinking water standard were required to have a trained operator (Water Treatment Plant Operator). To meet the new requirements, many smaller systems had to hire staff or obtain the services of a contract operator.
- Many systems originally brought online in the 1950s, 1960s, and 1970s are at an age where critical infrastructure has begun to fail due to age or poor maintenance practices and must be replaced. Construction costs can vary widely from region to region.
- More systems statewide and particularly in certain geographic regions are now dealing with the cost of treatment needed to address new and more stringent drinking water standards for contaminants found in groundwater.

- Population changes, driving the need to develop new sources of water. For example, between 2004 and 2006, 12,567 acres of land in San Luis Obispo were converted from agricultural use to non-agricultural uses such as residential. Concurrently, water systems in San Luis Obispo County were completing the Nacimiento Water Project, a 45-mile pipeline to move 15,750 acre-feet of water per year from Nacimiento Reservoir to the San Luis Obispo metropolitan area to meet water demands. This project was completed at a cost of about $176 million and in 2011 began providing raw surface water to treatment plants operated by the City of Paso Robles, Templeton Community Services District, Atascadero Mutual Water Company, City of San Luis Obispo, and CSA #10 Zone A.
- New regulations adopted since 1991 have increased monitoring cost for all systems, and systems using surface water have had to make changes in treatment processes.

In the 1991 survey, Morgan and Mercer attempted to quantify the impact that new requirements in effect at the time of the survey would have on water rates. The following table looks at the rates from 1991 and the estimated adjustments to bring them to the current standards of the day, and compares this with current rates. There are differences between how closely smaller systems match the projection and what can be said for larger systems. In all cases the differential is explainable as a result of the impact of new requirements. However, since 1991, there has been a greater awareness of the potential impacts of new requirements on the affordability of water in smaller systems. Since 1991, considerable effort has been placed on structuring standards and requirements that limit the costs incurred by small systems, while still providing an adequate level of public health protection. Much work, however, remains to be done to address the Human Right to Water for customers of California's small PWS that deliver water that does not meet standards.

Table 8.5
Additional Costs for a "Typical" Water System to Meet Current Regulations
($/service connection/month)

	Small	Intermediate	Medium	Large
1991 Consumer Water Costs (adjusted to 2012 $'s)	$43.90	$36.95	$35.87	$35.20
Additional Cost/Month to Meet 1991 requirements (adjusted to 2012 $'s)	$15.96	$3.31	$2.26	$2.26
1991 Adjusted Consumer Water Costs to include 1991 requirements (adjusted to 2012 $'s)	$59.86	$40.26	$38.87	$37.46
Current 2012 Consumer Water Costs	$63.56	$52.62	$53.12	$52.01

8.5. WATER-RELATED IMPACTS ON CONSUMERS

In addition to the price of water, there are additional costs or charges to the customer for being provided a potable water supply through a public water supply system. These can include connection fees, assessments, standby fees, and property taxes from which revenues are used by the utility to pay annual operation and maintenance and to repay debt. Of the systems used in the 2012 survey, nearly 19 percent of systems indicated they have imposed surcharges on top of their existing water rates to cover everything from improvements, cost of treatment, etc., to fire suppression surcharges.
Other costs to the consumer are more difficult to assess because they are "hidden" or intangible costs. As an example, if a water utility serving a residence is not in compliance with all regulations, including drinking water standards, the Department of Housing and Urban Development (HUD) or private lenders may deny mortgage financing to the potential borrowers. All customers served by that system could experience difficulties in selling their homes until the water system comes into compliance with drinking water standards. What financing that is available may be at a higher rate or require a larger down payment, due to the increased risk to the value of the property. In addition, problems with source quantity, storage capacity, or distribution piping can result in increased premiums for fire insurance. The ability of a water system to address such issues is related to size, with smaller systems requiring more time to respond and make repairs or corrections.

There are also the impacts, both financial and to public health, when treatment cost cannot be borne by a utility. The impacts of this can best be demonstrated by the following case study of the Lanare CSD, a small community water system located in rural

Fresno County. Lanare CSD currently serves 160 services connections and an approximate population of 660.

CASE STUDY: Lanare CSD

In 2006, the Lanare CSD completed the installation of an arsenic treatment plant in response to a violation of the federal arsenic MCL of 10 µg/L. Funding for the treatment plant was provided by a Fresno County Community Development Block Grant. There were no records of historical water production or usage for use in the engineering design and to estimate operation and maintenance (O&M) costs. As a result, during the first six months of operation the amount of chemical used in the treatment process was higher than projected due to the excessive water usage. The arsenic treatment plant was shut down in June 2007 because the water rates were insufficient to cover the operation of the arsenic treatment plant. It was later found that there were unauthorized agricultural users on the water system, including animal operations and crop irrigation.

As a result of the debt incurred for operating the plant along with other debt accrued by the District board, the water system was not financially sound. There were also specific failures to maintain adequate financial records, failure to conduct appropriate water quality monitoring and reporting, and a general lack of understanding by the Lanare CSD Board of their responsibilities.

In 2008, the Fresno County Grand Jury investigated the Lanare CSD and identified issues that needed to be addressed to correct an imminent state of emergency within the water system. Due to their poor fiscal practices and significant debt, as well as misuse of other grant funds previously provided to the Lanare CSD Board, CDPH determined the Lanare CSD lacked the ability to adequately address the fiscal and water quality problems that existed. From 2008 to 2010, CDPH expended much effort to work with the District and the general manager. CDPH provided $30,000 in emergency grant funds to make repairs to system wells. The Lanare CSD Board was unable to establish the necessary reserves to make these emergency repairs on their own. CDPH directed its contractor, Self Help Enterprises, to assist the Lanare CSD Board in adopting increased water rates under the Proposition 218 procedural requirements. In general, the water system facilities were in a state of significant disrepair, and the Board was unable to manage the fiscal responsibilities on their own. CDPH determined the issues identified by the Fresno County Grand Jury had not been addressed and the state of emergency continued to exist. In August 2010, CDPH successfully petitioned the Fresno County Superior Court to appoint a receiver to oversee the water system serving the residents within the Lanare CSD.

Since then, the Court-ordered receiver has been in place and the receiver has done the following:

- *Established a budget that includes accrual of reserves.*

- *Established procedures for receiving monthly water fees from customers and customer shutoff for nonpayment.*
- *Paid some of the debt owed by Lanare CSD. The CSD has not paid on the major debt owed to the operator of the arsenic treatment plant or to one of the construction contractors that installed pipeline associated with the arsenic treatment plant.*
- *Addressed water system deficiencies, such as repair of water main leaks, repair of well sites, and replacement of fire hydrants that did not meet fire code.*
- *Received DWSRF and DWR funding for water meter installation for each connection. This project was funded by CDPH in March 2012, and the water meter installation was completed in December 2012. Customers began paying a metered rate in June 2013 following a meter education period where water users received comparison bills that showed the old flat rate and new metered rate. Installation of water meters was a critical step before the ongoing arsenic MCL violation could be addressed. Agricultural usage must be eliminated or agricultural users must pay a rate that supports the cost of providing treated water.*
- *Completed a planning study using Proposition 84 funds to identify a solution to the arsenic MCL violation. This planning study was funded by CDPH in December 2012 and was completed in June 2014. The study evaluated three major alternatives, including: (1) consolidation with Riverdale PUD, (2) the construction of a well within the Lanare service area that meets the arsenic MCL, and (3) reactivation of the arsenic treatment plant. Based on an evaluation of the ongoing O&M costs and impacts to Lanare resident's water rates, construction of two wells within the community was selected as the proposed project. A nested test well demonstrated over multiple sample events that water existed at two depths that was significantly below the arsenic MCL.*
- *Subsequently submitted an application for DWSRF funding of the construction project, which will include construction of two new wells and will also include replacement of the aged distribution systems, which was identified during the water meter project to be significantly deteriorated and to have other problems related to pipeline extensions over the years that were not designed per California Water Works Standards. The planning study identified an estimated cost for construction of the project to be approximately $6,420,000. Funds from Proposition 84 will be applied to the construction of the two new wells, while DWRSF funds will be used for replacement of the distribution system. Under the current timeline, it is anticipated that the construction project could be completed within three years.*

Lanare CSD is a good example of how a community needs to fully understand and account for water use within its distribution system, particularly prior to looking at treatment options. It is also an example of how a preferred treatment option has to be chosen on the basis of both initial cost and ongoing operation and maintenance costs.

The best treatment system available is of little use if a system cannot afford to keep it in operation.

8.6. FACTORS AFFECTING THE COST OF WATER

8.6.1. Water Rates

Even though smaller water systems currently have some of the highest water rates for drinking water in the state, the small systems generally still have an inadequate rate structure to provide for system replacement needs and improvements to meet new drinking water standards. Although the current cost of water is higher in smaller water systems than in larger water systems, this does not equate to better quality water or service. In many cases, small systems are in poor physical condition, and this in turn results in a higher rate of noncompliance. In other words, smaller water system customers are paying more and receiving less than customers in large water systems.

If small- to medium-sized systems continue to charge insufficient water rates, noncompliance will increase due to a failure to plan for and implement rate structure changes to replace deteriorating infrastructure without significant outside financial help. Without a rapid reassessment of the adequacy of existing water rates, almost all water systems in California will be faced with source, storage, and distribution issues that impact the ability to provide safe water.

8.6.2. Variable Costs versus Fixed Costs

Water systems need to factor in their rates the requirements to meet fixed costs of water and variable costs of water. Variable costs are expenses that fluctuate based on the amount of water produced such as energy, chemical costs, labor, and gasoline for vehicles. Fixed costs are costs that are incurred regardless of the volume of production, such as employee salaries and infrastructure financing costs to maintain treatment facilities and the distribution system or to build a treatment plant or new well.

Water systems that do not factor fixed costs into their rates and use only flat or variable rates can see the revenue from their rates greatly fluctuate due to various factors such as weather and drought. Systems that set their rates to a combination of Flat Base Rate and Variable Usage Rates will be able to better handle changes in consumption that impacts revenues. The Flat Base Rate can address the fixed costs while the usage rates can address the variable costs. As conservation becomes more prevalent, usage rates will have to increase to make up for the lower consumption, but the base rates will not have to change since they are based on fixed costs.

8.6.3. Future Cost of Drinking Water

Based on the noted factors including more stringent regulations, increased costs of treatment, climate change, water conservation, location of water sources, and deteriorating infrastructure, the future cost of providing drinking water will only increase.

Thousands of water utilities in the state that, as noted earlier, are governed on a local level and rates are based on local conditions of source, water availability, size, and local water quality issues. One size does not fit all for water utilities in California.

In general, large water systems and most medium-sized water systems will be able to deal with these cost increases given their economies of scale. However, for small water systems, particularly those that serve disadvantaged communities, the increasing costs will be insurmountable. Although many small water systems making infrastructure improvements or installing treatment to meet drinking water standards can receive financial assistance through grants to construct these capital improvements, they do not have the financial capacity to operate the system particularly sophisticated treatment facilities needed to address contaminants such as arsenic and nitrate. In general, the small water systems may not be viable in California and consolidation and regionalization may be the only option for many existing systems. The formation of new small water systems should be discouraged.

8.6.4. Cost to the Individual Customer

California's Human Right to Water law refers to drinking water that is affordable. Affordability of water is directly related to access to water and is an essential component of the Human Right to Water. High water rates can make water inaccessible to certain segments of California's population, disproportionately affecting residents of disadvantaged communities and thus creating or sustaining inequalities in access to safe drinking water.

The Pacific Institute initial report, "Assessing Water Affordability, A Pilot Study in Two Regions of California," August 2013 states, "Water rate affordability is a central element to water access. Cost makes water excludable and inaccessible to those who cannot afford it. Water affordability is also a major concern to public welfare, safety, and security."

Affordability is generally viewed from the community level. To determine if the cost of water is affordable, the current practice is to compare the annual cost of water service to the median household income within the community. When the cost exceeds a certain percentage of the community's median household income, the water service cost is considered unaffordable for the community's customers.

The Pacific Institute report showed that using this approach to determine affordability ignores the fact that, while at the community level the cost of water service may be considered affordable, those households whose income is below the median level of the

community are paying a higher percentage of their income for water service and, therefore, are unlikely to be able to afford that cost. The report also found that this situation was not just confined to households in small disadvantaged communities, but was associated with households served by water systems in the metropolitan areas as well.

Some large water systems have taken steps to address this issue by providing rate subsidies to low-income households similar to what is done within the electricity sector. However, this option is only available to systems with large economies of scale that can spread the cost of subsidization over their sizeable customer base. Furthermore, given the provisions of Proposition 218, which appear to preclude publicly-owned PWS from providing such subsidies, it is unclear whether or not they will be permitted in the future. In addition, the PUC has required the large investor-owned water companies (Class A) to provide rate relief to households that meet specific income conditions. PUC also has an extensive rate relief program within the energy sector that is implemented by the electric utilities. Federal assistance through the Low-Income Home Energy Assistance Program is also available to low-income households to mitigate energy costs.

The Division of Financial Assistance will be developing guidelines for Proposition 1 funding.

8.7. METHODS OF FINANCING

Water systems need funds for capital improvements. New or upgraded facilities may be necessary to meet more stringent regulatory requirements. In addition, aging water system infrastructure nearing or beyond the end of its useful life must be replaced.

Morgan and Mercer (1991) states, "The ability of water suppliers to raise funds for new raw water sources and treatment facilities to meet new and future regulations depends on conditions in the credit markets and the financial condition of the suppliers including their previously incurred indebtedness. Various legal constraints in financial instruments and the tax policies of the federal and state governments are important factors in financing choices."

8.7.1. Self-Financing

Self-financing, commonly termed “pay-as-you-go,” is a form of non-debt financing. If a water system has a rate structure that includes a contribution toward reserves and a capital improvement plan, the system can use reserves generated from accumulated revenues and other income to pay for system improvements and infrastructure replacement in lieu of incurring debt. For new systems, the difference in monthly water rates necessary to fund such plans can be under $1.00/month. The power behind this is that funds accumulated over the 25 to 75 year life span of core water systems components allow for their eventual replacement with the savings the water system has accumulated for this purpose. Funding of capital improvement plans is a core requirement in deciding whether new systems are capable of meeting the financial,

managerial, and technical capability requirement contained in H&S Code Section 116540, and as a loan requirement for systems obtaining monies through the DWSRF.

The ability of public water systems to use reserves depends upon their maintenance of a reserve account with a positive balance. One investment strategy may involve increasing revenue for several years prior to project construction, through increases in water rates or other charges, in order to generate some or all of the project capital funding. Very few PWS are able to generate this reserve based on accumulated revenues.

However, reserves, if any, held by existing small systems are generally insignificant in comparison to capital project funding requirements. Because of the low reserves held by existing smaller systems and the limited number of systems that generally maintain a reserve account, self-financing may not be a viable option except under certain circumstances. Self-financing may be viable for capital expenditures if the project may be broken into several phases and constructed individually over time. This can delay compliance in systems seeking to treat water in order to meet a primary drinking water standard.

8.7.2. Short-Term Debt Financing

Short-term debt financing typically includes short-term borrowing instruments with maturities of less than one year, including bond-, tax-, grant-, and revenue-anticipation notes, which are notes with a fixed interest rate; tax-exempt commercial paper, which is a short-term, unsecured promissory note backed by a line of credit or a letter of credit from one or more banks; and tax-exempt variable rate (or floating-rate) monthly demand notes. The security for these short-term financing instruments ranges from anticipated tax revenues to lines or letters of credit. Short-term financing has been common with investor-owned utilities, but historically has seen limited use by municipal (publicly owned) water systems (AWWA 1988). Short-term financing instruments for capital improvement projects are commonly used to fund plans and specification costs, followed by a permanent, long-term financing package covering the actual improvements.

8.7.3. Long-Term Debt Financing

Capital improvements may be financed through long-term debt so that the cost of the project is spread out over its useful life. There are a myriad of long-term financing instruments currently available. Conventional methods are those that have been used and proven effective over the years. However, a system with no history of accumulating reserves or inadequate rate structures may have difficulties in demonstrating its ability to repay such loans.

8.7.4. Conventional Long-Term Financing

Conventional long-term financing methods include the issuance of general obligation (GO) bonds, revenue bonds, and limited obligation bonds, which are typically limited to

use by publicly owned agencies. The costs associated with bond issuance, including future customer water rate structures, must be considered in determining the feasibility of these mechanisms for financing. Fees of two percent of principal are common for large issues and may be higher for small issues.

8.7.5. Privatization

Privatization can be defined as private sector involvement in the design, financing, construction, ownership, and/or operation of a facility that will provide services to the public sector (Raftelis 1989). Privatization of water facilities can be a way for local governments to work with the private sector in obtaining financing and/or construction for needed facilities. Privatization is also a possible solution to the increasingly difficult task of managing water systems, which are faced with more stringent regulations that require the implementation of advanced treatment technologies and complex monitoring schedules. In particular, a number of city water departments are now being leased to PUC-regulated, investor-owned, water utilities. For example, California Water Service Company operates two leased water systems, the City of Hawthorne and the City of Commerce.

8.7.6. Credit Substitution and Credit Enhancement

Credit substitution refers to an issuer's purchase of outside support that substitutes for the issuer's own credit on a particular bond or note issue (Moody 1989). These can include commercial bank or thrift institution letters of credit, bond insurance, and guarantees. Through credit substitution, the issuer can improve the credit quality of its bonds or provide support for some portion of a financing for which its own resources may be inadequate. As a result, the issue generally carries a lower interest cost, which may offset the cost of purchasing the form of credit substitution used.

Guarantees have been employed by several states as public credit enhancements, which support debt issued by local governments (Standard & Poor 1989). This form of enhancement is a very low cost-effective way for states to assist localities within their jurisdictions to reduce borrowing costs. The programs use state aid entitlements as a form of guarantee that debt service obligations will be met. If a local agency cannot meet its repayment obligation on a qualified bond, the state withholds sufficient aid to meet debt service. As a result of the credit enhancing value of these programs, local governments can achieve substantial interest savings, and the programs are virtually cost-free for the state governments that administer them.

8.8. FEASIBILITY OF FINANCING OPTIONS

Feasible financing mechanisms vary by the type of ownership and size of the water system. Specific benefits or limitations associated with ownership and size are discussed below.

8.8.1. Publicly Owned Water System Financing

In general, the publicly owned systems such as municipal, district, or government water systems have a greater availability of financing options than do the investor-owned and mutual water companies. Many long- and short-term financing instruments will be tax-exempt for investors in the bonds of publicly owned agencies, increasing their attractiveness and reducing the interest rate the systems must pay. Publicly owned systems of sufficient size can issue tax-exempt notes and bonds, assess property taxes, issue special assessment bonds, and enter into public/private partnerships to finance water system capital improvements. There are many types of bonds that publicly owned agencies can issue, each with its own structure, advantages and disadvantages. The ability of a publicly owned system to finance a capital improvement project through these means is largely dependent upon the size and type of publicly owned water system, and rate payer support. In the case of water systems operated by a school or state park (classified as nontransient, noncommunity water systems under the regulatory definition), there are no "paying" water customers. Publicly owned water systems falling into the nontransient, noncommunity water system regulatory classification often rely upon the financing powers of their larger governing body, such as the school district, county, or state (in the case of government-owned systems) for financing large capital improvement projects.

Local, state, and federally owned systems have unique problems in attempting to comply with the California SDWA in that budgets for major improvements are controlled by the governing body and must be prioritized along with other expenditures.

8.8.2. Water District Financing

Local special-purpose districts may provide a reasonable solution to some financial constraints. Municipalities can be restricted by debt limitations and tax base limitations as a result of Propositions 13 and 218, as well as restrictions based on political boundaries. However, a special-purpose district can establish boundaries to surround the geographic area of need and has the availability of a variety of financing mechanisms such as bond issuance, special assessments, fees, and special charges.

Privately owned water systems in California, including both investor-owned and mutual water companies, have been looking into forming as public agencies such as special districts to resolve financial problems. Although privately owned water systems are presently eligible to participate in state and federal loan and grant financial assistance programs as a public agency, they may have greater access to public funding as well as being able to issue special assessments.

Special-purpose districts can also be formed to provide water service. In most cases these organizations are created by action of LAFCOs and the county boards of supervisors as a result of a petition from either the customers or the water utility owners. In a few cases, regional entities have been created through an act of the Legislature.

Not all counties in the state, however, readily approve the formation of new entities, making it more difficult to become a publicly owned utility.

8.8.3. Investor-Owned Water System Financing

Investor-owned water utilities have the capability of issuing equity stock (common and preferred stock) and to sell taxable bonds of their company. The PUC must give authorization prior to the issuance of any stocks or bonds of an investor-owned water company. This method of financing capital improvement projects is limited primarily to the large PUC-regulated investor water systems that have stock. The smaller investor-owned systems, which are generally owned by families or individuals, do not issue stock and, like smaller publicly owned systems, lack the rate base to make other financing options usable. PUC-regulated investor-owned water systems are not able to accumulate reserves, so infrastructure replacement must be financed by incurring debt and recovering cost through obtaining PUC approval of necessary rate adjustments. Investor-owned utilities may use both short- and long-term financial instruments such as taxable notes and bonds.

Very small investor-owned water systems typically are owned by individuals as sole proprietors or small partnerships. These systems have very few options for funding other than water rates or possibly subsidies from other income sources.

8.8.4. Mutual Water Company Financing

Mutual water companies have the ability to assess members to raise capital. This does not require the approval by members, nor by any outside agency. The amount of the assessment may be limited, however, by the ability of the members to pay. As a requirement of formation of a mutual water company by the Department of Business Oversight (which includes the former Department of Corporations), a sinking fund must be established that provides for capital replacement of water facilities at the end of their useful life. This sinking fund, or reserve, is a means to maintain the integrity of the system's existing infrastructure, but may not be available or adequate to fund the high costs necessary to meet new regulations adopted after the formation of the mutual water company. As a matter of practice, most existing mutual water companies have failed to meet this requirement. Mutual water companies of sufficient size may also use short- and long-term financing instruments such as taxable bonds and notes.

8.8.5. Small System Financing

A smaller publicly owned water system may be unable to secure financing because either the cost of that method (such as the cost of issuing bonds) or the amount of funds needed to make the improvement exceeds the ability of the customers to repay the debt. Because of the limited availability and economic feasibility of most traditional financing mechanisms for the smaller water systems, many look to state and federal financial assistance programs to finance necessary capital improvement projects to assure a safe and potable water supply.

8.9. FINANCIAL ASSISTANCE PROGRAMS

There are numerous state and federal financial assistance programs available to water utilities.

8.9.1. Current State Water Board Funding Programs

The State Water Board, Division of Financial Assistance administers multiple funding programs to assist water systems to achieve and maintain compliance with safe drinking water standards. These programs use federal funds and state funds to address the highest priorities of the total infrastructure need.

8.9.1.1. Drinking Water State Revolving Fund

The largest Drinking Water funding program the State Water Board administers is the Drinking Water State Revolving Fund (DWSRF). USEPA provides DWSRF funds to states, including California, in the form of annual Capitalization Grants. States, in turn, provide low-interest loans and other assistance to PWS for infrastructure improvements. In order to receive a federal DWSRF Capitalization Grant, states must have statutory authority for the program and must provide a state match equal to 20 percent of each annual Capitalization Grant. California's current share of the national DWSRF is 9.35 percent (the highest allocation of all states, as appropriate given that it has the greatest infrastructure needs of any state).

California has had an ongoing DWSRF program since 1998. Approximately 80 percent of the total California DWSRF funds are distributed as zero-interest or low-interest loans to PWS. Systems serving disadvantaged communities, those with a median household income (MHI) less than or equal to 80 percent of the statewide MHI, are eligible for zero-percent loans. Systems serving no disadvantaged communities receive an interest rate that is up to one-half the state's GO bond rate. In general, the loans have a 20-year repayment term. All loans are secured; the security varies, but is most often provided by user water rates, charges, and/or surcharges. The DWSRF program loans now generate a steady repayment stream, currently over $40 million per year. Total funding provided to PWS in executed loans and grants to date is over $1.3 billion.

Other funds in the DWSRF can be provided as principal forgiveness loans, commonly called grants. For water systems determined to serve a disadvantaged community, the program provides not only zero-percent interest rate loans, but can provide some grant funds as needed for affordability, up to 80 percent of the project cost. Severely disadvantaged communities are eligible for grants for up to 100 percent of the project costs. A severely disadvantaged community has an MHI less than 60 percent of the statewide MHI. Not more than 30 percent and not less than 20 percent of the total amount of the annual DWSRF Capitalization Grant may be expended as grants to disadvantaged communities. In addition, at least 15 percent of all DWSRF funds is required to be expended in the form of loans or grants to PWS that regularly serve fewer than 10,000 persons.

The following discussion describes the current practices of the DWSRF. The State Water Board adopted a policy handbook in October 2014 that went into effect on January 1, 2015.

In accordance with federal requirements and state law, the State Water Board establishes priority for DWSRF funding based on the risk to public health. Each pre-application for funding is evaluated and, if eligible for funding, is assigned a category based on the problem to be addressed. To the maximum extent practicable, priority will be given to projects which: 1) address the most serious risk to human health, 2) are necessary to ensure compliance with the requirements of the SDWA, and 3) assist systems most in need on a per household basis. Projects are ranked by the categories established below to achieve these objectives:
Category A - Immediate Health Risk
Category B - Untreated or At-Risk Sources
Category C - Compliance or Shortage Problems
Category D - Inadequate Reliability
Category E - Secondary Risks
Category F - Other Projects

A more detailed description of the funding priority system can be found at: http://www.waterboards.ca.gov/drinking_water/services/funding/documents/srf/dwsrf_policy/dwsrf_policy_final.pdf

The Division of Financial Assistance (DFA) will review and approve financing for projects on the Comprehensive List with complete applications in the order they are ranked – Category A being the highest priority and Category F being the lowest priority. If the State Water Board lacks sufficient funds, whether in the form of a loan or principal forgiveness, to finance all projects with a complete application, then DFA will first fund projects based on the categories established above. DFA may bypass any project where it determines that it is not currently feasible to fund the project. Bypassed projects will remain on the comprehensive list and may be funded at a later date when it does become feasible to fund the project.

DFA may limit funding to costs necessary to enable a public water system to meet primary drinking water standards, as defined in the California Health and Safety Code, commencing with Section 116270. Lack of funding does not affect the requirement that a funded system must meet TMF.

Other factors are used in prioritizing the review of projects within a category, and do not affect a project's category. A project that includes or supports one or more of the following will receive priority over other projects within the same category: Disadvantaged Communities: The project benefits a DAC or SDAC. Consolidation: The project will result in the consolidation of water systems.

At least annually DFA will prepare an Intended Use Plan (IUP) for the State Water Board's consideration for delivery to the USEPA. The State Water Board may establish various requirements, conditions, and incentives in the IUP. The IUP will provide information necessary to satisfy USEPA's requirements, including the availability of and applicable limitations on principal forgiveness, the threshold for projects subject to federal cross-cutting requirements, set-aside activities, the availability of refinancing, and a Fundable List of projects anticipated to receive funding based on their ranking, their estimated "readiness to proceed" to funding in that particular year, and the amount of funds available for the year. The Executive Director may amend the IUP for good cause after public review.

A PWS that serves a DAC with financial hardship is eligible for zero percent (0%) interest rate financing. The criteria for determining such financial hardship is included in Appendix E of Policy for Implementing the Drinking Water State Revolving Fund. In addition, the repayment term may be extended to thirty (30) years, provided the repayment term does not exceed the useful life of the project.

A water system which is owned by a public agency or a not-for-profit water company, and whose service area is classified as a DAC may also receive principal forgiveness for a planning/design or construction project. Principal forgiveness will only be offered if the DAC cannot afford to repay all or part of a loan at the time of the project's credit evaluation. The criteria for determining a DAC's ability to afford a loan are included in Appendix E of Policy for Implementing the Drinking Water State Revolving Fund.

Small community water systems that are owned by a public agency or a not-for-profit water company that serves a SDAC may be eligible to receive up to one hundred percent (100%) principal forgiveness for a planning/design or construction project, as established in the IUP. A public water system owned by a public school district is determined to serve a SDAC and is deemed to have no ability to repay any financing.

8.9.1.2. American Recovery and Reinvestment Act

The American Recovery and Reinvestment Act (ARRA) was signed by President Obama on February 17, 2009. ARRA allocated $2 billion nationally for safe drinking water infrastructure improvements. California's share of these funds was $159 million, and was administered by CDPH through the DWSRF program prior to the transfer of the drinking water program to the State Water Board. The ARRA funds were a one-time opportunity for the state and did not require matching funds from the state.

Funding agreements were issued, totaling $149 million to 51 projects statewide. These 51 projects are distributed among 47 community drinking water systems. The funds were committed to drinking water infrastructure projects that were "ready to proceed." All funding agreements were issued by December 2009, and all projects were under construction by February 2010.

8.9.1.3. Proposition 50

Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002 (Water Code Section 79500, et seq.) was passed by California voters in the November 2002 general election. With the transfer of the drinking water program, the State Water Board is now responsible for portions of the Act that deal with water security, safe drinking water, and treatment technology. By approving this bond measure, $485 million was allocated to address drinking water quality issues in California. Proposition 50 authorized up to five percent of the funding to be used by for administration of the funding programs; in addition, 3.5 percent must be allocated for bond costs. Within Proposition 50, the State Water Board is responsible for multiple funding programs, specifically:

Chapter 3, Water Security

Water Code Section 79520 provides $50 million for the purpose of protecting state, local, and regional drinking water systems from terrorist attacks or deliberate acts of destruction or degradation. The funds could be used for projects designed to prevent damage to water treatment, distribution, and supply facilities to prevent disruption of drinking water deliveries, and to protect drinking water supplies from intentional contamination. Criteria were developed that prioritized Chapter 3 funding to water systems to construct emergency interties with adjacent water systems. Emergency intertie connections ensure there is an alternate connection to a water system should there be a disruption in water supplies in emergencies such as natural catastrophes or terrorist attacks. This provides additional assurance of continuous water supplies to the largest populations.

Chapter 4, Safe Drinking Water

Water Code Section 79530 provides funding for grants for public water system infrastructure improvements and related actions to achieve safe drinking water standards.

(Chapter 4a) provides $70 million in funding for grants to small community water systems (less than or equal to 1,000 service connections or less than or equal to 3,300 persons) to upgrade monitoring, treatment, or distribution infrastructure; grants for community water quality monitoring facilities equipment; grants for drinking water source protection; and grants for treatment facilities necessary to meet disinfectant byproduct safe drinking water standards. Criteria were developed that prioritized Chapter 4a funding to water systems based on public health risk, using the DWSRF categories as well as other criteria specific to the funding section. In addition, the criteria give priority to disadvantaged communities within each category.

(Chapter 4b) provides $260 million for grants to Southern California water agencies to assist in meeting the state's commitment to reduce Colorado River water use to 4.4 million acre-feet per year. Criteria were developed that prioritized Chapter 4b funding to

water systems in accordance with the bond language. Projects are assigned points based on three criteria. The points for each criterion are added together to determine a score for each project. The projects were then ranked by that score from lowest to highest. Criterion 1 ranked projects by Proposition 50/AB 1747 categories and by water system population (from highest to lowest) within a category. Criterion 2 ranked projects by reduction of annual volume of Colorado River water demand. Criterion 3 ranked projects by the cost per volume of demand reduced.

8.9.1.4. Proposition 84

Proposition 84, the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Act of 2006 (Public Resources Code Section 75001, et seq.), was passed by California voters in the November 2006 general election. With the transfer of the drinking water regulatory program, the State Water Board is now responsible for administering those portions of the Act previously administered by CDPH. This bond measure allocated $300 million to address drinking water and other water quality issues in California. Proposition 84 authorizes up to five percent of the funding to be used by the State Water Board for administration of the funding programs; in addition, 3.5 percent must be allocated for bond costs. Within Proposition 84, the State Water Board is responsible for multiple funding programs, specifically:

Section 75021 ($10 million) provides funding for grants and direct expenditures to fund emergency and urgent actions to ensure safe drinking water supplies. Criteria were developed that determine the eligibility of projects for Emergency Grants. All requests that meet the eligibility criteria will be funded until the funds are exhausted. Factors that the State Water Board considers include: the degree of contamination; the nature of the contaminants; whether the health hazard is acute (short-term) or chronic (long-term); the length of time to which consumers have been or will be exposed; any actual or suspected illnesses; any actions taken by the local Health Officer or the local Director of Environmental Health; if there are other sources of funds to resolve the public health threat or emergency; duration and extent of a water outage, as a result of an emergency; and duration and extent of loss of power, as a result of an emergency. The criteria were revised in December 2012 to expand the allowable uses of the funding to address an urgent need for interim water supplies to public water systems that serve severely disadvantaged communities and lack the technical and financial capability to deliver water that meets primary safe drinking water standards.

Section 75022 ($180 million*) provides grants for small community drinking water system infrastructure improvements for chemical and nitrate contaminants and related actions to meet safe drinking water standards. Criteria were developed that prioritize eligible projects in accordance with the bond language and subsequent legislation. Projects were scored based on Ranking Points that are based on the regulatory status of the principal contaminant to be addressed; the health risk associated with the principal contaminant to be addressed; the number of contaminants in the project's drinking water supply that exceed a primary drinking water standard; the MHI of the applicant water

system; whether the project includes consolidation; and whether the proposed project is part of a regional project.

*Of the total funding, $7.5 million is allocated, pursuant to the 2011-12 Budget Act, to projects in the City of Santa Ana and City of Maywood.

Section 75025 ($60 million*) provides funding for immediate projects needed to protect public health by preventing or reducing the contamination of groundwater that serves as a major source of drinking water for a community. Criteria were developed that prioritized eligible projects in accordance with the bond language and subsequent legislation. Projects were scored by Ranking Points, which are based on the regulatory status of the principal contaminant to be addressed; the health risk associated with the principal contaminant to be addressed; the number of contaminants in the project's drinking water supply that exceed a primary drinking water standard; the MHI of the applicant water system; whether the project includes consolidation; and whether the proposed project is part of a regional project.

* $2 million is allocated, pursuant to SB X2 1, to the State Water Board to develop pilot projects in the Tulare Lake Basin and the Salinas Valley that focus on nitrate contamination.

8.9.2. Funding Agreements and Expenditures in FY 2011-12 and FY 2012-13

Summary information on the execution of funding agreements and expenditures in FY 2011-12 and FY 2012-13 by funding programs previously administered by CDPH is provided below. A more detailed presentation of the funding agreements and expenditures including specific water systems that were funded is provided in Appendix 7.

Summary of all FY 2011-12 Funding Programs:

- All funding programs provided a total of $289,952,681 in funding for FY 2011–12 for 72 projects.
- All funding programs provided a total of $9,268,551 in funding for 32 planning projects.
- All funding programs provided a total of $280,269,984 in funding for 35 construction projects.
- All funding programs provided a total of $33,075,552 in funding to a total of 55 small water system projects including schools.
    - DWSRF Small Water definition applied: (water systems with <10,000 population)

    - Prop 50 and 84 Small Water definition applied: (water systems with <1,000 service connections or < 3,300 population)

- All funding programs provided a total of $241,500,391 in funding to disadvantage communities.
- All funding programs provided a total of $414,146 in funding for five emergency projects.
- All funding programs completed 40 construction projects.

Summary of all FY 2012-13 Funding Programs:

- All funding programs provided a total of $419,499,861 in funding for the 2012–13 FY for 129 projects.
- All funding programs provided a total of $21,385,930 in funding for 54 planning projects.
- All funding programs provided a total of $396,971,251 in funding for 55 construction projects.
- All funding programs provided a total of $85,524,999 in funding to a total of 86 small water system projects including schools.
    - SRF Small Water definition applied: (water systems with < 10,000 population)
    - Prop 50 & 84 Small water system definition applied: (water systems with <1,000 service connections or < 3,300 population)
- All funding programs provided a total of $331,207,731 in funding to disadvantaged communities.
- All funding programs provided a total of $240,875,969 as loan and $178,623,892 as grant.
- All funding programs provided a total of $1,142,679 in funding for 20 emergency projects.
- All funding programs completed a total of 63 construction projects.

A summary of the total expenditures through FY 2012-13 by funding programs is provided in Table 8.6, as well as details on level of need, as measured by unfunded projects on the PPL and the infrastructure needs of California water systems identified in the 2011 USEPA needs survey.

Table 8.6

Funding Source	Total of Funded Projects		Unfunded Projects	Infrastructure Needs – 2011 USEPA Needs Survey
	#Systems	$M's	PPL as $M's	$M's
DWSRF	224	1,351	11,700	44,513
ARRA	51	150		
P-50	78	295	366	
P-84	88	81	174	
Total	**441**	$1,877	$12,240	

8.10. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Since the publication of the 1993 Safe Drinking Water Plan, water costs have, on average, increased about 45 percent within all size groups (range of 42 to 47 percent). Water costs average highest in the Bay Area, Central Coast, and Southern California and lowest in the Central Valley/Agricultural (including Imperial County), Foothill, and Mountain/Desert regions. Aside from inflation, a number of factors have contributed to the increase in water costs including new regulatory requirements, infrastructure maintenance and upgrades, treatment of contaminated sources, and new water source development to address population growth demands.

Approximately 70 percent of the PWS surveyed for this Plan reported having meters, while slightly more than 50 percent of the PWS were metered when surveyed in 1991. On average, customers of small water systems (PWS serving less than 200 service connections) pay more for water by approximately 20 percent than those customers served by systems within the three other size groups (intermediate, medium, and large). However, even though customers of small water systems pay more for water service, the water rates charged by many small systems are insufficient to fully fund costs for operation and maintenance, reserves, and capital investments. Their ability to charge sufficient rates is limited due to the lack of economies of scale.

The cost of water is unaffordable for a segment of the customers served by essentially all water systems, but particularly customers in disadvantaged communities served by small PWS. Recent research has shown there are customers served by public water systems in both urban/suburban areas and rural areas who pay more of their annual income for water service than is considered affordable, based on commonly used affordability criteria. The State Water Board is committed to pursuing initiatives that ensure safe drinking water is affordable to customers of PWS.

Over the past two decades a significant investment has been made at the federal and state level to provide funding for water system infrastructure improvements intended to

achieve compliance with regulatory requirements. The federal/state DWSRF, ARRA, and the state Propositions 50 and 84 have combined to provide hundreds of millions of dollars to eligible water systems. Efforts have been made to use some of these funds to address the needs of small water systems that serve disadvantaged communities. The DWSRF requires a certain percentage of funding be applied to the needs of disadvantaged communities that otherwise would not have the financial capacity to address their infrastructure needs. Proposition 84 has provision for emergency grants to address the urgent needs of communities particularly disadvantaged communities that have significant water quality problems. However, both Propositions 50 and 84 funding will soon be exhausted.

Recommendations

8-1 The State Water Board recommends enactment of legislation to require that all PWS customers be metered, and that each customer be charged based on the amount of water used, be extended to all community water systems (i.e., include non-urban/small systems). Funding for this is available through both grants and loans.

8-2 Proposition 218 has made it difficult for water systems of all sizes to increase their rates to address critical infrastructure issues. Consumers may not understand the costs associated with new treatment systems and otherwise supplying safe drinking water. The State Water Board will collaborate with the water utility industry, public interest groups, local non-profit organizations and other organizations to develop strategies to educate consumers on the factors that affect the cost of operating a water system. The State Water Board will develop fact sheets to communicate these issues to the public.

8-3 As part of its Capacity Development Program, the State Water Board will continue to encourage community water systems to adopt an assets management plan for infrastructure replacement, as part of their rate setting process.

8-4 Options should be developed and evaluated for making drinking water affordable for all low income households, including evaluating the potential for establishing an appropriate water service subsidization program to low-income families and individuals served by a PWS that charges unaffordable rates. As a guiding human right principle, the cost of water should not pose a barrier to access.

8-5 The State Water Board recommends enactment of legislation in support of consolidation where feasible and appropriate. Specifically, whenever: 1) a public water system lacking adequate TMF capacity applies for state funding to address compliance with drinking water standards or infrastructure or source reliability issues; 2) the applicant public water system is nearby a public water system with adequate TMF capacity that is willing to consolidate; and 3) consolidation is determined to be an appropriate and feasible solution, the applicant public water

system should be required to consolidate with the compliant public water system in order to receive financial assistance. Legal barriers should also be addressed, such as potential expansion of the liability protection afforded by SB 1130 (2014). Financial assistance to facilitate consolidation should be made available through sources such as the DWSRF and/or the 2014 Water Bond. The State Water Board will use the Transition Advisory Group as a forum to address barriers to consolidation and receive recommendations on a potential legislative mandate for consolidation where appropriate.

8-6 As stated in the Governor's Budget, "[a]n estimated 500 public water systems in disadvantaged communities rely on sources of drinking water that fall short of state and federal safe drinking water standards. Many of these systems are located in low-income communities, both urban and rural, that already pay high rates for the substandard tap water they receive. Although funding sources are available to assist communities with needed capital improvements, communities often lack the governance infrastructure, technical expertise and ability to pay for the ongoing operations and maintenance costs to treat the water to safe levels. Overcoming these problems requires innovative approaches. Accordingly, the Administration will work with local governments, communities and dischargers on strategies to bring these systems into compliance, including governance, technical assistance, capital improvements, and ongoing operations and maintenance costs." The State Water Board will work with stakeholders and the Legislature on this effort.

8-7 Funding should be provided to continue emergency grant funds to disadvantaged communities that have serious water quality problems.

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CHAPTER 9. DRINKING WATER SECURITY AND EMERGENCY PREPAREDNESS

9.1. BACKGROUND

Water security has two principal objectives: 1) assure that high quality sources of drinking water are reliably available to all Californians; and 2) ensure that measures are in place to prevent deliberate contamination of drinking water.

Concern over and efforts toward maintaining reliable sources of drinking water remain the focus of California's water resource management strategies in the subsequent decades. Continued growth as evidenced by increases in population (California's population has increased from approximately 30 million at the time of the 1993 Plan to about 38 million by January 2013) and housing (housing units increased by 27 percent from 2011 to 2012) has caused water systems to seek new sources, expand storage capacity, and improve conservation efforts. In addition, the early effects of climate change and the current drought have raised this issue to a heightened level. As a result, in January 2014, the Governor announced the development of the State Water Action Plan (Action Plan), which contains measures designed to ensure the maintenance and reliability of drinking water sources. All state agencies dealing with water resources and water quality will play a collaborative role in implementing the Action Plan. A copy of the Action Plan can be found at: http://www.calepa.ca.gov/Publications/Reports/2014/WaterPlan.pdf.

Terrorism as a water security matter has become a national concern in prevention of water contamination. Terrorism was not on the radar until the events of September 11, 2001 (9/11), when terrorists crashed planes into the World Trade Center, the Pentagon, and a field near Shanksville, Pennsylvania. The events of 9/11 focused the nation on security issues. The President of the United States issued Presidential Directives and along with Congress passed legislation on improving overall national security. The Public Health Security and Bioterrorism Preparedness and Response Act of 2002 (PL107-188), known as the Bioterrorism Act, was passed to improve overall national security. Title 4 of the Bioterrorism Act was directed at Drinking Water Security.

The Bioterrorism Act required USEPA to modify the SDWA to require PWS to improve security. Water systems were also considered as critical infrastructure from Homeland Security Presidential Directive 7 (HSPD 7) 2003.

9.2. DRINKING WATER SECURITY

After 9/11 and in response to the Bioterrorism Act, several Homeland Security positions have been established within the Drinking Water Program to work with PWS on drinking water security issues. The Drinking Water Program assisted PWS in complying with USEPA enacted regulations that required all PWS serving a population above 1,000 to conduct a vulnerability assessment (VA) of their water system and to update their

emergency response plan (ERP) to include how they would address those vulnerabilities in the event an incident impacted those critical infrastructures.

The Drinking Water Program provided guidance and training to PWS in conducting a VA and what was needed to update their ERP. A contract was executed with an engineering consulting firm to provide training and assistance to the medium and smaller PWS. The support by PWS, the water industry, and the Drinking Water Program led to all required PWS in California completing a VA and updating their ERP.

All PWS submitted their VA directly to USEPA as it contained sensitive security information about their vulnerability that should not be available to the general public. PWS submitted their ERP directly to the Drinking Water Program leaving out any sensitive information regarding their water system.

The Bioterrorism Act requirement for PWS to do a VA and update their ERP was a one-time requirement. Many of these VAs are now ten or more years old and should be updated. Many PWS have made infrastructure and security improvements based on the initial VA, but a water system must continually look, prioritize, and plan for all the vulnerabilities within that water system. ERPs are also continually changing and must be updated on a regular basis.

New methodology has been developed and refined on doing VAs. The current water system guidance for doing VAs is the American National Standards Institute/American Water Works Association (ANSI/AWWA) J100-10: Risk and Resilience Management for Water and Wastewater Utilities. This assessment supports the all-hazards principles set forth in national homeland security doctrine Presidential Policy Directives (PPD-8 and PPD-21), while sustaining the objectives of the Bioterrorism Act. All PWS in California should update their VA under ANSI/AWWA J100-10.

Water system critical infrastructure has been in place before 9/11. The dams, reservoirs, aqueducts, canals, levees, water treatment plants, wells, springs, surface water intakes, pumping stations, tanks, distribution systems, and service connections are still there and vulnerable. The Bioterrorism Act helped classify them as critical infrastructures, helped water systems to prioritize them, and provided more security to protect them. The Bay-Delta provides drinking water supplies to over 22 million people in the state, and is considered one of the most critical infrastructures in the nation. A major disaster of the Bay-Delta could have a financial impact greater than Hurricane Katrina.

The Bioterrorism Act also helped point out several key areas that were lacking by PWS and laid out the enormous task of how to protect all the critical infrastructures. There are approximately 7,650 PWS in California, with over 16,000 groundwater sources and over 1,000 surface water sources. This does not account for the number of distribution reservoirs, water treatment plants, pumping stations, and millions of service connections.

Based on the VAs, reviews by USEPA, and the CDC, the greatest risk for water systems is in the distribution system, not in the sources or aqueducts as previously thought.

Water drawn from water sources and aqueducts is treated prior to being distributed to customers, so there is a barrier to catch anything before being distributed to consumers. There is also the dilution effect of large bodies of surface waters, rivers from water flowing in, and of large aqueducts. An exception may be smaller water systems with only one well source.

After 9/11 many medium and large PWS installed security measures at these water treatment plants and other vulnerable sites to where they are now relatively secure. These security improvements led to national guidance for water security improvements such as the Water Infrastructure Security Enhancements, ANSI/ASCE/EWRI 56-10 and 57-10.

California passed Proposition 50: "Water Quality, Supply and Safe Drinking Water Projects, Coastal Wetlands Purchase and Protection Act," that provided $50 million in bond funding for security projects. The priority list for projects had over $2.4 billion in requests for funding of security projects from only ten percent of systems.

The American Water Works Association Research Foundation (AWWARF) researched terrorism acts on drinking water systems worldwide. The research report, "Actual and Threatened Security Events at Water Utilities" (Author: American Water Works Association Research Foundation (AWWARF) 2003, Prepared by O'Brien & Gere Engineers, Inc.) found 20 cases of deliberate contamination of water supplies worldwide. The report also describes 36 threatened events/disrupted plots to contaminate drinking water.

The Drinking Water Program Homeland Security staff track incidents and investigate with local law enforcement any suspected incidents. All water related security incidents are tracked by the Water Information Sharing and Analysis Center (ISAC). The Water ISAC is funded by USEPA to track all security related issues for the water sector. A report to Congress, "Terrorism and Security Issues Facing the Water Infrastructure Sector," (Congressional Research Service, May 26, 2009, prepared by Claudia Copeland) expresses the continued concern for the security of the nation's water sector infrastructure from a terrorist attack or natural disaster.

CDC continues to work with USEPA and the U.S. Department of Homeland Security (DHS) on biological threats to water systems. CDC has three categories of biological agents of concern that are listed on their website: http://emergency.cdc.gov/agent/agentlist-category.asp. The CDC, USEPA, and DHS have also developed a more rapid method to test and recover biological agents from drinking water for emergency uses.

9.3. CYBER SECURITY

New technology has made the operations of water systems much easier, but it also has made vulnerabilities in water systems. Many of the larger systems have put in

Supervisory Control and Data Acquisition (SCADA) systems to help manage and control the water system from one main control center or from various locations through remote access. These systems can completely control a water system operation from turning on and off valves to controlling the complete treatment process.

Hackers have targeted many United States utilities in an attempt to disrupt them. Where power utilities had 82 reported cyber-attacks, the water sector had 29 attacks in 2012. (David Goldman, CNNMoney, January 9, 2013).

Water utilities that have or are considering adding SCADA systems should consider adopting secure practices on implementing these new technologies. One such guidance is the Roadmap to Secure Control Systems in the Water Sector, March 2008, Water Sector Coordinating Council Cyber Security Working Group, American Water Works Association, Department of Homeland Security. This document presents a strategic framework that considers the risks and vulnerabilities of water and wastewater utility process control systems, and identifies milestones for utilities in securing systems over the next ten years.

The ten key items to consider are:

1. Integrate protective concepts into organizational culture, leadership, and daily operations.

2. Identify and support protective program priorities, resources, and utility-specific measures.

3. Employ protocols for detection of contamination.

4. Assess risks and review vulnerability assessments (VAs).

5. Establish facility and information access control.

6. Incorporate resiliency concepts into physical infrastructure.

7. Prepare, test, and update emergency response and business continuity plans.

8. Develop partnerships with first responders, managers of critical interdependent infrastructure, other utilities, and response organizations.

9. Develop and implement internal and external communication strategies.

10. Monitor incidents and threat-level information.

USEPA also has available on their website Cyber Security 101 for Water Utilities to help them improve their cyber security.

9.4. EMERGENCY PREPAREDNESS

As noted earlier, the implementation of the Bioterrorism Act helped identify key water security areas that were lacking by PWS. These included lack of emergency response plans, public water system personnel that did not know the Standardized Emergency Management System (SEMS) or the Incident Command System (ICS), and having no security culture within the organization leading to complacency. SEMS is the standardized emergency management system used by all first responders in California and includes use of ICS. ICS is the standard management structure to manage a response to an emergency so that all responding agencies know the terms and structure of the response.

California PWS all complied with the Bioterrorism Act and completed an ERP only after a significant effort by the Drinking Water Program to assist PWS to comply with the Bioterrorism Act. Guidelines were provided to all PWS in California. Prior to that requirement and effort, many PWS did not have a plan. However, an ERP needs to be updated as contacts change and lessons are learned from exercises or actual events. Many water systems have updated their plans, but many have not.

SEMS is California's version of the National Incident Management System (NIMS). NIMS was implemented by HSPD 5 in 2004 and is based on SEMS and ICS. NIMS is the national emergency management system that all federal agencies use and all states are expected to use on a national response. Many PWS do not know how to respond under SEMS or NIMS or how to use ICS. PWS are still getting trained in using SEMS and ICS, but there are still many systems that need training and ongoing exercises with other first responders to be fully able to respond in an emergency.

The overall security culture for PWS needs to be encouraged and promoted. The AWWA has developed standard ANSI/AWWA G430-09: Security Practices for Operations and Management to encourage its member agencies to cultivate a culture of security and to plan for all hazards emergencies. Professional associations, USEPA, Federal Emergency Management Agency (FEMA), and the State Water Board also feel that PWS should plan for an all hazards response and recovery to an emergency that leads to a resilient public water system.

To promote all hazards preparedness with PWS, their partners, and their stakeholders, USEPA Water Security Grant funds were used and established several training classes for PWS. This helps them to better achieve the ability to respond, recover, and become resilient. The ability to use USEPA Water Security Grant funding for innovative training for PWS proved helpful when additional funding was made available by USEPA to assist PWS. The additional funds were secured and a contract with California Specialized Training Institute was modified to develop and conduct a Water Sector Emergency Operations Center (EOC) Specific Position class. The Water Sector EOC class was based on standard operations guidance from a Joint Water Task Force, emergency water system personnel that worked in EOCs during emergencies.

The Drinking Water Program has also worked with the California Water/Wastewater Agency Response Network, CALWARN. This is a water sector mutual aid/assistance network. CALWARN was one of the first Water/Wastewater Agency Response Network, (WARN) networks in the country. After Hurricane Katrina, USEPA and the AWWA promoted mutual aid networks as one of the best ways for water and wastewater systems to help each other during disasters. Several California water agencies sent crews and aid to New Orleans after Katrina.

In 2005, there were only two WARN agencies in the United States, California and Florida. Currently, there are over 50 WARN agencies within the United States with Mississippi the only state still not under a WARN agreement. There are even WARN agencies being established outside the United States.

The CALWARN concept is really the only alternative for many small systems in California. If a major disaster occurred in California many small water systems may not get any aid or assistance from first responders or from any federal/state agency for some time.

In California, there are only about 250 systems that are CALWARN members. Many larger water systems would assist the smaller water systems if they were members of CALWARN during a major disaster, but many systems have not taken advantage of this resource. Membership in CALWARN and use of mutual aid/assistance is clearly an area to improve since it is the only resource available for many of the systems in California during a major disaster and it does not cost anything to be a member.

Similar to CALWARN for drinking water laboratories is the California Mutual Aid Laboratory Network (CAMAL Net). CAMAL Net was formed after 9/11 after an event on the California State Water Project. The event was not an actual confirmed event, but caused a concern for the determination of an unknown chemical in water. In response to trying to find an unknown contaminant in water, work was carried out in conjunction with water sector laboratories to develop five analytical methods to detect unknown contaminants. USEPA is now promoting the Water Lab Alliance which is very similar to CAMAL Net, but on a national basis. Due to the promotion of the Water Lab Alliance CAMAL Net participation has dropped off. However, there is still uncertainty of how water systems in California will access and use the Water Lab Alliance.

There are numerous other collaborations with PWS in California such as the Emergency Response Network Inland Empire (ERNIE) and the Bay Area Security Information Collaborative (BASIC). BASIC has developed several documents that have been used by the industry. The first was the original color coded threat conditions for water systems. BASIC also helped revise and get approved the “Multi-Agency Response Guidance for Emergency Drinking Water Procurement and Distribution,” 2nd Edition, August 2007. This document helps water systems with the recovery phase of the emergency when there is no water or there is a shortage.

BASIC also helped produce the “Crisis Emergency Risk Communication (CERC) Toolkit for Local Community Water Systems in California.” The CERC Toolkit is based on the CDC CERC Toolkit for Bioterrorism incidents. The CERC Toolkit for community water systems is designed to assist them in dealing with emergency events before they happen. Many of the questions that come from the media and public already have answers. For those that do not, there is a proven method on how to deal with them through message mapping. This helps PWS with the response phase of the emergency event.

The Drinking Water Program has worked with several PWS on protecting the distribution systems, and several water systems have been working on distribution system detection systems. The San Francisco PUC, the public water system that serves San Francisco, is one system that is part of USEPA’s Water Security Initiative. And The Drinking Water Program has worked with SFPUC on disease surveillance that made SFPUC a good candidate for the Water Security Initiative.

Disasters such as floods or a major earthquake will impact water quality to almost every consumer in the region impacted by that disaster. Recent studies by USGS anticipate a major earthquake to strike in Northern California, 67 percent chance in the next 30 years; in Southern California, 70 percent chance in the next 30 years; or a major Atmospheric River Storm (ARCStorm) that will produce flooding throughout California. Any one of these events will significantly impact water supply and quality. FEMA has produced and is updating two catastrophic earthquake plans, one for Southern California and one for Northern California. Both plans anticipate that water systems in the region will run out of water after an earthquake due to water lines breaking, loss of power to pumps, and other factors.

A PWS impacted by this event will be out of service for some period of time. The PWS will have difficulty in obtaining the resources to repair damages and to return to normal operational service. All PWS in an impacted disaster zone will be requesting the same resources as other utilities such as portable generators, backhoes, and service crews. PWS will also be requesting water infrastructure resources such as pipe repair clamps, new water mains, and disinfectants. These resources are just-in-time delivery meaning there are not a lot of supplies in inventory making these resources scarce during a disaster. The only readily available resource for a PWS will be from mutual aid partners.

9.5. THE STATE WATER BOARD DRINKING WATER PROGRAM EMERGENCY RESPONSE

The California State Emergency Plan establishes the State Water Board Drinking Water Program, as the agency responsible for ensuring the safety of all public water supplies and after a disaster to evaluate public water systems to restore the provision of safe drinking water. The Drinking Water Program staff has been trained on SEMS and ICS and will report to the water system emergency operations center (EOC), operational area

EOC, the regional EOC, the state operations center as an agency representative or technical specialist.

The State Water Board response has already been incorporated into the two largest catastrophic disaster planning initiatives in California, the expected Southern California Earthquake and the next San Francisco Bay Area Earthquake. The Southern California Catastrophic Earthquake Response Plan, 2010, and the San Francisco Bay Area Earthquake Readiness Response: Concept of Operations Plan, Interim, September 23, 2008 are two planning documents that incorporate the State Water Board Drinking Water Program emergency response to ensure the drinking water is safe and assist public water systems to return to normal operations.

In a disaster the local public health officer has broad powers to protect public health and will generally order that a Boil Water Notice (BWN) be issued for any area in a disaster zone as a precaution if there is no information on the condition of the water system in that area. Once a BWN or even a Do Not Drink notice has been issued, the State Water Board is the only regulatory agency that can lift the notice when it determines the water is safe to drink.

Drinking Water Program staff work with the local health officer before an unsafe notice is issued. Policy guidance has been issued to help health officers, emergency response personnel and PWS know the complex issues of issuing an unsafe water notice (Unsafe Water Notice Guidance, 3/9/2011). Once issued, the Drinking Water Program staff work with all PWS that are impacted to get them back into normal operations.

In some cases, the larger water systems will issue the BWN on their own after advising the local Drinking Water Program staff of their decision. (This occurred after the Northridge earthquake of 1994). Drinking Water Program staff then work with the water system to resolve any problems and to return the system to normal operations and lift the BWN.

9.6. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

As we have seen from the implementation of the Bioterrorism Act and from Drinking Water Program inspections, many PWS are not keeping their emergency response plan up-to-date. Until it is mandated that a PWS update its ERP, there will be many PWS that do not have an up-to-date ERP. A PWS should update its plan at least every five years.

California typical first responders, fire, Hazmat, and police are all trained in SEMS. These California first responders are well known and respected for their use of SEMS and ICS during an emergency. California SEMS was the basis for the federal government establishing NIMS for all states to use during an emergency or disaster.

Public water system personnel are now considered first responders. They have a critical infrastructure they are responsible for that impacts the health and safety of the general public. However, not all PWS operators in California are trained and qualified to use SEMS and ICS in an emergency. Many PWS personnel do not know how to work with their local emergency operations center nor with other first responders. All PWS personnel should be trained in SEMS and ICS.

CALWARN is the only mutual aid/mutual assistance organization that has been established to assist water and wastewater utilities statewide and possibly in neighboring states.

CALWARN volunteers helped water utilities impacted by the El Mayor Earthquake in Southern California get water sector resources needed to get water service returned to normal operations. Without CALWARN assistance the water utilities damaged by the earthquake would have taken much longer to recover.

Recommendations

9-1 As part of their Sanitary Survey, the State Water Board will encourage all PWS to update their ERP at least every five years.

9-2 As part of their Urban Water Management Plans, the State Water Board will encourage all PWS to provide ongoing training for water system staff on the Standardized Emergency Response System/Incident Command System. (SEMS/ICS). Smaller PWS should have their personnel trained in or be familiar with SEMS/ICS.

9-3 The State Water Board will encourage all PWS to plan for the next major disaster and become a member of CALWARN for the mutual aid/assistance that it offers.

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CHAPTER 10. IMPLEMENTATION PLAN

The Division of Drinking Water has been successful in ensuring that, at any given time, more than 98 percent of California's drinking water consumers served by PWS receive drinking water that meets federal and state drinking water standards. The remaining 2 percent of public water system consumers rely primarily on small public water systems that lack technical, managerial and financial capacity to deliver safe drinking water at affordable rates. The Drinking Water State Revolving Fund has since 1997 been instrumental in assisting small systems with capital improvements; however, costs for operation and maintenance are not eligible loan expenses.

Additionally, the Capacity Development Program and the Drinking Water State Revolving Fund, introduced in 1997, and the Small Water Systems Plan, introduced in 2012, have proven to be valuable initiatives to assist these systems to return to compliance.

The State Water Board is committed to actively pursuing initiatives to address the Human Right to Water, beginning with the state's residents who are served by PWS but who do not receive safe drinking water. Moving forward, the State Water Board identified 32 practical recommendations in 9 areas that would expand its efforts to bring a greater number of systems into compliance and contribute to realizing the Human Right to Water in California. Please refer to appendix 10 for a compendium of recommendations and the implementation timeline.

Drought

The Division of Drinking Water is actively working with the Division of Water Rights on drought related issues. Although current law requires public water systems (greater than 3,000 customers) to meter all customers by 2020 and establish rates based on the amount of water used, smaller water systems have no such requirements. This gap in existing legislation has led to a situation where a large number of systems do not meter the water use of their customers. Consequently, the systems lack the capacity to identify illegal connections and locate possible leaks, fail to collect needed revenue, and have no ability to monitor conservation efforts or establish rate structures that will encourage conservation. Additionally, an approved drinking water source is defined as either a surface water body or a groundwater well that supplies water for drinking purposes. Public water systems that depend on a single source are highly vulnerable to system outages, contamination plumes, drought depletion, and other challenges. Accordingly, the Waterworks Standards currently require new public water systems to have access to multiple sources. However, current law does not require existing public water systems to have access to multiple sources. This resulted in numerous instances where water systems faced dire emergency situations when their single source of water supply failed or was curtailed. Especially in light of the persisting severe drought, these situations will become more common. The State Water Board affirms its commitment to water conservation efforts through and beyond the drought, as well as best management practices that ensure the resiliency of systems in drought conditions.

8-1 The State Water Board recommends enactment of legislation to require that all PWS customers be metered, and that each customer be charged based on the amount of water used, be extended to all community water systems (i.e., include non-urban/small systems). Funding for this is available through both grants and loans.

3-3 The State Water Board will require, as appropriate, vulnerable water systems to 1) submit studies regarding the reliability of their existing sources of drinking water, and 2) take necessary actions to improve system reliability in accordance with the studies, as well as avoid or mitigate the impact of the loss of supply on the public health and safety, including the loss of supply due to prolonged or severe drought conditions. The cost of a reliability analysis is eligible for funding through DWSRF planning studies.

Affordable, Safe Drinking Water for Disadvantaged Communities

The Human Right to affordable, safe drinking water is not currently fulfilled in California. A large number of disadvantaged communities lack the technical, managerial and financial capacity to adequately and sustainably operate their public water systems at affordable rates. The State Water Board supports a portfolio of initiatives that will concurrently contribute to ensuring that disadvantaged communities have sustainable access to affordable, safe drinking water.

2-3 As resources allow, the State Water Board will coordinate with local county and city planning departments, LAFCOs, and LEHJs to identify: 1) areas currently developed without safe drinking water to determine where Community Services Districts could be created or where other actions could be taken, 2) areas where upgrades to housing are needed, and 3) areas where new development or issuance of new building permits should be postponed until safe water is demonstrated.

2-4 As resources allow, the State Water Board will coordinate with local county and city planning departments, LAFCOs, and LEHJs to identify those unincorporated areas within the county where a county-wide County Service Area (CSA) could be created to address drinking water needs particularly associated with water systems smaller than regulatory size. If communities/neighborhoods within the CSA wished to seek funding and/or consolidation, the LAFCO can then establish a specific zone of benefit for that area within which drinking water would be provided by a PWS. The CSA would then be eligible to apply for funding on behalf of the area. Alternatively, the PUC's role in defining the service areas of water utilities under its jurisdiction (including authorization of non-adjacent service area expansions and acquisitions of other water systems) may be part of the solution to this issue.

2-7 The State Water Board recommends enactment of legislation to implement a funding strategy that will ensure that the program is adequately and consistently funded. That strategy should address the need for funding of activities that provide greater oversight of and technical assistance to small PWS particularly those that serve disadvantaged communities.

2-8 Funding should be provided for infrastructure improvements to PWS particularly small PWS serving disadvantaged communities that are not meeting safe drinking water quality requirements. Sufficient funding for administration should be included.

4-3 The most critical recommendation in the State Water Board's 2013 Report to the Legislature, "Recommendations Addressing Nitrate in Groundwater" was that a new funding source be established to help ensure that all Californians, including those in disadvantaged communities, have access to safe drinking water, consistent with AB 685. A stable, long-term funding source should be provided for safe drinking water for small disadvantaged communities. Funding sources could include a point-of-sale fee on agricultural commodities, a fee on nitrogen fertilizing materials, a water use tax, or another funding source. The term was simply used for convenience and consistency. As noted in the Governor's Budget, the Administration, including the State Water Board, will work in concert with local governments, communities and dischargers on strategies to bring all systems into compliance, including governance, technical assistance, capital improvements, and ongoing operations and maintenance costs.

4-4 Where the State Water Board has identified responsible parties that have contaminated local groundwater used as a drinking water source and has caused violation of an MCL, the State Water Board will require those parties to cover the cost of mitigation including capital and treatment operation and maintenance costs. The Division of Drinking Water will coordinate with Regional Boards and the Office of Enforcement when issues are identified.

4-5 The State Water Board recommends enactment of legislation to identify a funding source to cover the costs of operating and maintaining treatment facilities in small, disadvantaged communities. Funds should be provided in a manner that safeguards public funds from potential fraud, waste, and abuse. Funding of operation costs should be time limited with the goal towards financial sustainability within a given period of time.

8-4 Options should be developed and evaluated for making drinking water affordable for all low income households, including evaluating the potential for establishing an appropriate water service subsidization program to low-income families and individuals served by a PWS that charges unaffordable rates. As a guiding human right principle, the cost of water should not pose a barrier to access.

8-6 As stated in the Governor's Budget,[2] "[a]n estimated 500 public water systems in disadvantaged communities rely on sources of drinking water that fall short of state and federal safe drinking water standards. Many of these systems are located in low-income communities, both urban and rural, that already pay high rates for the substandard tap water they receive. Although funding sources are available to assist communities with needed capital improvements, communities often lack the governance infrastructure, technical expertise and ability to pay for the ongoing operations and maintenance costs to treat the water to safe levels. Overcoming these problems requires innovative approaches. Accordingly, the Administration will work with local governments, communities and dischargers on strategies to bring these systems into compliance, including governance, technical assistance, capital improvements, and ongoing operations and maintenance costs." The State Water Board will work with stakeholders and the Legislature on this effort.

8-7 Funding should be provided to continue emergency grant funds to disadvantaged communities that have serious water quality problems.

[2] Page 6 of http://www.ebudget.ca.gov/2015-16/pdf/BudgetSummary/NaturalResources.pdf

Shared Solutions

In August 2012, the Governor's Drinking Water Stakeholder Group released a report that advocated for "shared solutions" as strategies that allow for increased economies of scale, as well as reducing unnecessary costs for small systems. The State Water Board affirms its support for shared solutions and promotes initiatives that would provide incentives for larger systems to alleviate financial burdens on smaller water systems.

3-1 The State Water Board will encourage large water systems, subject to compliance with such PUC requirements as may apply, to assist neighboring water systems in sampling and analysis, particularly when the small systems are out of compliance and when sampling of the small systems' source(s), including surface and groundwater, might provide information that would be of value to the larger system (e.g., presence of contaminants, movement of contaminants). Similar arrangements for water systems that utilize the same surface water source already exist.

4-2 The State Water Board will continue to promote consolidation of small water systems wherever feasible and appropriate. Consolidation is not limited to full or physical consolidation of drinking water treatment and delivery systems, and may include technical, managerial, financial or physical arrangements between water systems.

8-5 The State Water Board recommends enactment of legislation in support of consolidation where feasible and appropriate. Specifically, whenever: 1) a public water system lacking adequate TMF capacity applies for state funding to address compliance with drinking water standards or infrastructure or source reliability issues; 2) the applicant public water system is nearby a public water system with adequate TMF capacity that is willing to consolidate; and 3) consolidation is determined to be an appropriate and feasible solution, the applicant public water system should be required to consolidate with the compliant public water system in order to receive financial assistance. Legal barriers should also be addressed, such as potential expansion of the liability protection afforded by SB 1130 (2014). Financial assistance to facilitate consolidation should be made available through sources such as the DWSRF and/or the 2014 Water Bond. The State Water Board will use the Transition Advisory Group as a forum to address barriers to consolidation and receive recommendations on a potential legislative mandate for consolidation where appropriate.

Capacity Development

Many small public water systems serve water that does not meet standards due to their lack of technical, managerial, and financial (TMF) capacity. The Division of Drinking Water provides assistance to small water systems through its TMF assessment tools, sanitary surveys, trainings, and free technical help as part of its Capacity Development Program. Through a comprehensive assessment, it is determined whether the small

PWS has a reasonable possibility of attaining adequate TMF capacity. The State Water Board supports initiatives and concerted efforts that contribute to building the sustainable capacity of small PWS, and ensure the provision of safe, reliable drinking water to their customers at affordable rates.

4-1 As resources allow, the State Water Board will expand the goal of the Small Water System Plan to address the number of small water systems that have compliance problems, continue to track and report progress of these systems, and utilize the plan to prioritize technical assistance and financial assistance.

8-3 As part of its Capacity Development Program, the State Water Board will continue to encourage community water systems to adopt an assets management plan for infrastructure replacement, as part of their rate setting process.

2-1 The State Water Board will develop closer relationships with DHCD to resolve the conflicts between these agencies' requirements particularly as it relates to mobile home parks. The State Water Board will schedule a meeting with DHCD management by the second quarter of 2015 to develop a coordinated strategy to address water quality and water quantity in mobile home parks.

2-2 The State Water Board will identify the most efficient mechanism of working more closely with LAFCOs to help address technical, managerial, and financial issues with small agencies under their purview that operate a PWS.

2-5 The State Water Board will welcome the participation of investor-owned water systems, both large and small, in the efforts described in Recommendations 2-2 through 2-4, both as sources and recipients of technical, managerial, and financial assistance. Given the PUC's authority over service area expansions and system acquisitions by investor-owned water utilities, PUC participation in such efforts would also be beneficial.

3-2 The State Water Board will explore possible funding sources to facilitate operator education opportunities particularly for small water system operators.

Program Funding

For the past two fiscal years, the Safe Drinking Water Program fees have not generated sufficient revenue to support budgetary expenditures. The State Water Board supports a fee structure that allows good governance and enables the Division of Drinking Water to fulfill its mission without constraints.

2-7 The State Water Board recommends enactment of legislation to implement a funding strategy that will ensure that the program is adequately and consistently funded. That strategy should address the need for funding of activities that provide

greater oversight of and technical assistance to small PWS particularly those that serve disadvantaged communities.

Program Actions

Transferring the Drinking Water Program from the Department of Public Health to the State Water Board promotes safe drinking water through more integrated water quality management, from source to tap. The State Water Board is committed to bring comprehensive solutions to best address the drinking water needs of all Californians.

2-6 The State Water Board will continue to encourage new and existing board members of public water systems to complete a course on their duties to all public water systems and the members of the boards or other directing bodies that oversee their operation.

2-9 The State Water Board will report on the effectiveness of the LPA programs annually in the Water Board's Performance Report and will use this information to track progress and prioritize activities related to LPAs.

4-4 Where the State Water Board has identified responsible parties that have contaminated local groundwater used as a drinking water source and has caused violation of an MCL, the State Water Board will require those parties to cover the cost of mitigation including capital and treatment operation and maintenance costs. The Division of Drinking Water will coordinate with Regional Boards and the Office of Enforcement when issues are identified.

8-2 Proposition 218 has made it difficult for water systems of all sizes to increase their rates to address critical infrastructure issues. Consumers may not understand the costs associated with new treatment systems and otherwise supplying safe drinking water. The State Water Board will collaborate with the water utility industry, public interest groups, local non-profit organizations and other organizations to develop strategies to educate consumers on the factors that affect the cost of operating a water system. The State Water Board will develop fact sheets to communicate these issues to the public.

Transparency and Information Management

The State Water Board recognizes the critical importance and benefits of communication and shared information to the public it serves. SDWIS/STATE is only the beginning of a better information system. The needs and technology will grow much faster than the funding for and capability of DDW to meet those needs. There are still many improvements to be made while incorporating new regulations and new reporting requirements. Therefore, it is important to remember that information system funding and resources are needed to implement any new regulation or requirement and to make information available to the public and decision-makers.

5-1 As part of funding identified in recommendation 2-7, funding should include the resources necessary to maintain and expand the information management systems to implement the drinking water program efficiently and effectively and make such information available to the public.

Treatment and Analytical Methods

Efforts to determine the presence of waterborne microbial pathogenic agents in drinking water sources will continue to require more sophisticated analytical methods. As a result, there will be a continued reliance on monitoring for indicator organisms including coliform bacteria and Enterococci that require less expensive and easy to use methods. Treatment processes available to smaller water systems to achieve compliance with drinking water standards are generally expensive and technically challenging to maintain and operate. This lack of affordable treatment technologies available to small water systems will continue to be an impediment to the delivery of safe drinking water. The State Water Board is committed to supporting the research and development of affordable and effective treatment and analytical methods.

6-1 The State Water Board will coordinate research needs, including methods for testing for microbes using emerging technologies. Special attention should be drawn to emerging pathogens that survive in coliform free waters, as well as constituents of emerging concern.

6-2 The State Water Board will continue to stay abreast of and provide technical input on the development of field testing methods for regulated chemicals.

7-1 Funding should be provided for research and demonstration grants to develop new treatment processes or improve the cost efficiency of existing treatment processes for small water systems, including POU/POE devices.

7-2 The State Water Board recommends enactment of legislation to allow expanded use of point of use and point of entry treatment by public water systems.

Emergency Preparedness and Response

Based on the implementation of the Bioterrorism Act and from Drinking Water Program inspections, it is apparent that many PWS are not keeping their emergency response plan up-to-date. Yet, public water system personnel are now considered first responders. They have a critical infrastructure they are responsible for that impacts the health and safety of the general public. The State Water Board emphasizes the paramount importance of emergency response and preparedness for all public water systems, regardless of their size.

3-3 The State Water Board will require, as appropriate, vulnerable water systems to 1) submit studies regarding the reliability of their existing sources of drinking water, and 2) take necessary actions to improve system reliability in accordance with the studies, as well as avoid or mitigate the impact of the loss of supply on the public health and safety, including the loss of supply due to prolonged or severe drought conditions. The cost of a reliability analysis is eligible for funding through DWSRF planning studies.

5-2 The State Water Board will explore the best method for notifying PWS during emergencies, in alignment with their respective emergency response plans.

9-1 As part of their Sanitary Survey, the State Water Board will require that all PWS update their ERP at least every five years.

9-2 As part of their Urban Water Management Plans, the State Water Board will encourage all PWS to provide ongoing training for water system staff on the Standardized Emergency Response System/Incident Command System. (SEMS/ICS). Smaller PWS should have their personnel trained in or be familiar with SEMS/ICS.

9-3 The State Water Board will encourage all PWS to plan for the next major disaster and become a member of CALWARN for the mutual aid/assistance that it offers.

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APPENDICES

Appendix 1. Executive Summary from the Department's 1993 Report to the Legislature, "Drinking Water into the 21st Century: Safe Drinking Water Plan for California."

EXECUTIVE SUMMARY

BACKGROUND

California is a populous state which receives minimal rainfall. The supply, delivery, and regulation of drinking water is an important and sensitive issue. To date, the quality of California's drinking water has been good, and the state has been considered a leader in protecting water quality. But population growth, industrial expansion, agricultural intensification, and greater demand for existing water supplies are beginning to make drinking water protection more difficult. Improved laboratory detection capabilities and a better understanding of health risks have created an awareness that certain contaminants pose risks to the public health that were previously unknown or not well understood. This same awareness has also spawned a multitude of laws and regulations regarding drinking water.

This new understanding of the risks associated with drinking water combined with an acute awareness of the vulnerability of the California's water supplies brought about by several consecutive years of drought prompted the California Legislature to enact AB 21 (Chapter 823) in 1989. Among, other things, AB 21, directed the Department to undertake a comprehensive assessment of drinking water in California: its quality and safety, types of problems, overall health risks, current and projected costs, and current regulatory programs. From this assessment, the Department was directed to develop a plan containing specific recommendations to resolve any problems and improve the overall quality and safety of California's drinking water. This legislative assignment has been completed and is presented in this Executive Summary, a Summary of Conclusions and Recommendations, and the detailed Safe Drinking Water Plan report.

Drinking water is supplied to California residents through a myriad of governmental agencies, cities, districts, private utilities, mutual water companies, private businesses, and individually owned wells. There are over 10,000 public water suppliers (as defined by law) in the state serving water to approximately 29 million consumers. In addition, over 300,000 residents obtain their water from private individual wells. The water utilities range in size, from the minimum of 5 service connections, to more than 700,000 service connections. Less than 10percent of the public water systems in the state serve

collectively more than 95percent of the state's population. The remaining 90percent of the systems serve less than 5percent of the population. Approximately 70percent of the population obtains its drinking water from surface sources with the remainder relying on ground water supplies.

WATER QUALITY AND HEALTH RISKS

California's drinking water quality is generally of excellent quality. The combination of a low percentage of sources exceeding a MCL with a high rate of compliance by water systems meeting the drinking water standards indicates that the water being delivered is pure, wholesome, and potable. But, his is not to say that no significant contamination problems exist. These problems, however, tend to be regional and very specific and are discussed in detail in the report. In surface water, for example, the most common and most significant contaminants found are microbial pathogens followed by disinfection by-products. The most prevalent contaminant in ground water, according to the Department's sampling data, is nitrate, which exceeded the drinking water standard in 2.1percent of the sources. In 1.4percent of the wells the agricultural chemical 1,2-dibromo-3-chloropropane (DBCP) exceeded the drinking water standard for DBCP. Also found in ground water was trichloroethylene (an industrial chemical) that exceeded the standard in 0.9percent of the wells.

The detection of chemical contaminants in ground water sources has resulted in extensive media coverage which has heightened consumer concerns. In fact, it appears that the public perception of the degree of risk associated with drinking water contaminated with industrial or agricultural chemicals may be even higher than the actual risks as determined by scientific evidence to date. The risk associated with chlorinated surface water and some of the more recently discovered pathogens, for example, is far greater than the risk presented by chemicals in ground water, yet it receives little public attention or concern. Consumer confidence in public water supplies has appeared to deteriorate in recent years: 50percent of the water consumers in many urban areas in the state now use bottled water or home treatment devices. Much of this, according to surveys, is a result of taste or odor problems, and perceived health effects. It has been estimated that approximately one billion dollars are spent annually in California for bottled water.

The United States Environmental Protection Agency (USEPA) and the Department recently have adopted numerous new standards and requirements to ensure the safety of drinking water supplies. Additional requirements, including regulations governing surface water treatment, coliform monitoring, lead and copper, and additional contaminants, will go into effect within the next few years. California's standards are, in many cases, more stringent than those adopted by the USEPA. At the present time,

California is recognized as having the most stringent drinking water requirements in the country. The cost of complying with these new requirements is substantial and is estimated to be in excess of two billion dollars statewide to meet initial capital costs for treatment and other improvements. These costs will have a greater impact on smaller water systems.

THE COST OF WATER

According to a survey conducted for this report, the average monthly water bill paid by a California resident is currently $21.30 per month. This cost tends to increase as the size of the water system decreases with small system customers paying an average unit water rate that is 50percent higher than that paid by larger system customers. Complying with the new requirements is expected to add $6 to $55 per month, depending on system size, to the current statewide average water bill by the mid-1900s. In spite of these increased costs, water is an undervalued commodity and has not kept pace with cost increases experienced in other utilities such as energy. As a result, drinking water systems especially the smaller and mid-sized systems, and undercapitalized find it difficult to finance system improvements, maintenance, and infrastructure.

DRINKING WATER REGULATION

The regulation of drinking water in California has been successfully carried out, as demonstrated by the lack of documented illnesses caused by drinking water. Throughout the nation, there have been 250 outbreaks (61,000 cases of illness) of waterborne gastroenteritis outbreaks during the past decade. None of these occurred in California community water systems.

Despite success, the drinking water regulatory program can, and should be, improved. For example, the regulation of drinking water is fragmented between state and local governments. The state regulates public water systems serving more than 200 service connections whereas counties regulate systems serving fewer than 200 connections. This arrangement, which worked reasonably well in years past, has created difficulties in implementing the new requirements. These implementation problems, which relate to adequate resources, accountability, and consistency, have recently led to a threat of primacy withdrawal by the USEPA unless the state laws were changed. AB 2158, enacted in 1990, partially addressed the fragmentation problem between the state and local governments, but further coordination is still needed.

As the report clearly points out, many of the problems regarding compliance with standards, lack of resources, large cost impacts, and risk to consumers relate to the more than 9,000 small water systems that serve less than 200 service connections.

Less than 50percent of these small systems meet state drinking water standards and requirements. The situation for small water systems will become much worse as the new requirements are implemented. Nearly one million persons, consisting primarily of workers, school children, and individual residents, are served by these small systems on a daily basis. Given the high rate of noncompliance, these persons, and as the millions of visitors using these systems, are subject to risks of waterborne illness from microbial contaminants.

PROBLEMS AND SOLUTIONS

Many of the smaller water systems in California will be unable to comply with state and federal requirements due to lack of financial resources. Their inability to finance ongoing maintenance and capital improvements is a testament to the lack of adequate planning and financial requirements for public water systems. The fact remains, however, that they are in existence and present what is perhaps the most difficult drinking water problem that needs to be addressed. The report outlines a comprehensive strategy and a series of legislative recommendations to attempt to cope with the problems associated with the small systems. The strategy will help to eliminate the proliferation of new nonviable water systems. This strategy includes recommendations for better planning at the regional or local level, consolidation of existing systems, criteria for creation of new systems, and the provision for technical and financial assistance.

Looking to the future, the Department's assessment indicates a lack of coordinated planning for water supply at the local level. The state Department of Water Resources has done a good job of water supply planning on a statewide basis particularly in regards to storage and interbasin transfer. The current deficiency, however, is that adequate consideration has not been given to protecting our water resources from quality degradation associated with certain land uses. Comprehensive planning to ensure reliable drinking water supplies has not taken place on a local or regional level. This is an area which, in the opinion of the Department, is in need of legislative direction.

In summary, California has had a good track record in regulating and managing its drinking water. Improvements, however, must be made for California to cope with its burgeoning population and dwindling water supplies. In order to continue to promote the health of its citizens, California must direct attention toward the following issues:

- Greater integration of water supply and water quality planning and regulatory activities at the state level.
- Recognition of the need to address water supply and drinking water quality in land use planning.

- The need for coordinated long-range water supply planning at the local and regional level.
- Better master planning for the future by water utilities.
- Addressing the problems of small water systems including the lack of financial and technical resources.
- Developing greater reliability and improved protection of the sources of domestic water supply.
- Improving our knowledge of contaminants and their effect on human health.
- Improving consumer knowledge and understanding of drinking water quality issues.

Specific and more detailed recommendations to address these issues are described in the Summary of Conclusions and Recommendations. Detailed background discussion of the programs, problems, and issues associated with the drinking water program, as well as bases and justifications for the conclusions and recommendations are presented in the main report entitled, "Drinking Water into the 21st Century: Safe Drinking Water Plan for California."

Appendix 2. Definition of a Public Water System (H&SC Section 116275(h) - (k))

(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.

(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 that 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.

(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.

Appendix 3. Drinking Water Standards for Contaminants

This appendix provides a listing of relevant state statutes and Federal and State MCLs for inorganic contaminants, radiological contaminants, organic contaminants and disinfection byproducts. Treatment techniques for two chemicals are also included.

Inorganic Contaminants (22 CCR Section 64431)

Contaminant	U.S. EPA		California	
	MCL (mg/L)	**Date**[a]	**MCL** (mg/L)	**Effective Date**
Aluminum	0.05 to 0.2[b]	1/91	1 0.2[b]	2/25/89 9/8/94
Antimony	0.006	7/92	0.006	9/8/94
Arsenic	0.05 0.010	eff: 6/24/77 eff: 1/23/06	0.05 0.010	77 11/28/08
Asbestos	7 MFL[c]	1/91	7 MFL[c]	9/8/94
Barium	1 2	eff: 6/24/77 1/91	1	77
Beryllium	0.004	7/92	0.004	9/8/94
Cadmium	0.010 0.005	eff: 6/24/77 1/91	0.010 0.005	77 9/8/94
Chromium, Total	0.05 0.1	eff: 6/24/77 1/91	0.05	77
Chromium, Hexavalent	-	-	0.010	7/1/2014
Copper	1.3[d]	6/91	1[b] 1.3[d]	77 12/11/95
Cyanide	0.2	7/92	0.2 0.15	9/8/94 6/12/03
Fluoride	4 2[b]	4/86 4/86	2	4/98
Lead	0.05[e] 0.015[d]	eff: 6/24/77 6/91	0.05 [e] 0.015[d]	77 12/11/95
Mercury	0.002	eff: 6/24/77	0.002	77

Nickel		Remanded	0.1	9/8/94
Nitrate	(as N) 10	eff: 6/24/77	(as N03) 45	77
Nitrite (as N)	1	1/91	1	9/8/94
Total Nitrate/Nitrite (as N)	10	1/91	10	9/8/94
Perchlorate	-	-	0.006	10/18/07
Selenium	0.01 0.05	eff: 6/24/77 1/91	0.01 0.05	77 9/8/94
Thallium	0.002	7/92	0.002	9/8/94

a. “eff.” indicates the date the MCL took effect; any other date provided indicates when USEPA established (i.e., published) the MCL.
b. Secondary MCL.
c. MFL = million fibers per liter, with fiber length > 10 microns.
d. Regulatory Action Level; if system exceeds, it must take certain actions such as additional monitoring, corrosion control studies and treatment, and for lead, a public education program; replaces MCL.
e. The MCL for lead was rescinded with the adoption of the regulatory action level described in footnote d.

Radionuclides (22 CCR Sections 64442 and 64443)

Contaminant	**US EPA**		**California**	
	MCL (mg/L	**Date**	**MCL** (mg/L)	**Effective Date**
Uranium	30 ug/L	12/7/00	20 pCi/L 20 pCi/L	1/1/89 6/11/06
Combined Radium - 226+228	5 pCi/L	eff: 6/24/77	5 pCi/L 5 pCi/L	77 6/11/06
Gross Alpha particle activity (excluding radon & uranium)	15 pCi/L	eff: 6/24/77	15 pCi/L 15 pCi/L	77 6/11/06
Gross Beta particle activity	4 millirem/yr	eff: 6/24/77	50 pCi/L[f] 4 millirem/yr	77 6/11/06
Strontium-90	8 pCi/L	eff: 6/24/77 now covered by Gross beta	8 pCi/L[f] 8 pCi/L[f]	77 6/11/06
Tritium	20,000 pCi/L	eff: 6/24/77 now covered by Gross beta	20,000 pCi/L[f] 20,000 pCi/L[f]	77 6/11/06

a. “eff.” indicates the date the MCL took effect; any other date provided indicates when USEPA established (i.e., published) the MCL.

f. Gross beta MCL is 4 millirem/year annual dose equivalent to the total body or any internal organ; Sr-90 MCL = 4 millirem/year to bone marrow; tritium MCL = 4 millirem/year to total body

Organic Contaminants (22 CCR Section 64444) - Volatile Organic Chemicals (VOCs)

Contaminant	US EPA		California	
	MCL (mg/L	**Date**	**MCL** (mg/L)	**Effective Date**
Benzene	0.005	6/87	0.001	2/25/89
Carbon Tetrachloride	0.005	6/87	0.0005	4/4/89
1,2-Dichlorobenzene	0.6	1/91	0.6	9/8/94
1,4-Dichlorobenzene	0.075	6/87	0.005	4/4/89
1,1-Dichloroethane	-	-	0.005	6/24/90
1,2-Dichloroethane	0.005	6/87	0.0005	4/4/89
1,1-Dichloroethylene	0.007	6/87	0.006	2/25/89
cis-1,2-Dichloroethylene	0.07	1/91	0.006	9/8/94
trans-1,2-Dichloroethylene	0.1	1/91	0.01	9/8/94
Dichloromethane	0.005	7/92	0.005	9/8/94
1,3-Dichloropropene	-	-	0.0005	2/25/89
1,2-Dichloropropane	0.005	1/91	0.005	6/24/90
Ethylbenzene	0.7	1/91	0.68 0.7 0.3	2/25/89 9/8/94 6/12/03
Methyl-tert-butyl ether (MTBE)	-	-	0.005[b] 0.013	1/7/99 5/17/00
Monochlorobenzene	0.1	1/91	0.03 0.07	2/25/89 9/8/94
Styrene	0.1	1/91	0.1	9/8/94
1,1,2,2-Tetrachloroethane		-	0.001	2/25/89
Tetrachloroethylene	0.005	1/91	0.005	5/89

Toluene	1	1/91	0.15	9/8/94
1,2,4 Trichlorobenzene	0.07	7/92	0.07 0.005	9/8/94 6/12/03
1,1,1-Trichloroethane	0.200	6/87	0.200	2/25/89
1,1,2-Trichloroethane	0.005	7/92	0.032 0.005	4/4/89 9/8/94
Trichloroethylene	0.005	6/87	0.005	2/25/89
Trichlorofluoromethane	-	-	0.15	6/24/90
1,1,2-Trichloro-1,2,2-Trifluoroethane	-	-	1.2	6/24/90
Vinyl chloride	0.002	6/87	0.0005	4/4/89
Xylenes	10	1/91	1.750	2/25/89
a. “eff.” indicates the date the MCL took effect; any other date provided indicates when USEPA established (i.e., published) the MCL. b. Secondary MCL.				

Organic Contaminants (22 CCR Section 64444) - Non-Volatile Synthetic Organic Chemicals (SOCs)

Contaminant	**US EPA**		**California**	
	MCL (mg/L	**Date**	**MCL** (mg/L)	**Effective Date**
Alachlor	0.002	1/91	0.002	9/8/94
Atrazine	0.003	1/91	0.003 0.001	4/5/89 6/12/03
Bentazon		-	0.018	4/4/89
Benzo(a) Pyrene	0.0002	7/92	0.0002	9/8/94
Carbofuran	0.04	1/91	0.018	6/24/90
Chlordane	0.002	1/91	0.0001	6/24/90
Dalapon	0.2	7/92	0.2	9/8/94
Dibromochloropropane	0.0002	1/91	0.0001	7/26/89

			0.0002	5/3/91
Di(2-ethylhexyl)adipate	0.4	7/92	0.4	9/8/94
Di(2-ethylhexyl)phthalate	0.006	7/92	0.004	6/24/90
2,4-D	0.1 0.07	eff: 6/24/77 1/91	0.1 0.07	77 9/8/94
Dinoseb	0.007	7/92	0.007	9/8/94
Diquat	0.02	7/92	0.02	9/8/94
Endothall	0.1	7/92	0.1	9/8/94
Endrin	0.0002 0.002	eff: 6/24/77 7/92	0.0002 0.002	77 9/8/94
Ethylene Dibromide	0.00005	1/91	0.00002 0.00005	2/25/89 9/8/94
Glyphosate	0.7	7/92	0.7	6/24/90
Heptachlor	0.0004	1/91	0.00001	6/24/90
Heptachlor Epoxide	0.0002	1/91	0.00001	6/24/90
Hexachlorobenzene	0.001	7/92	0.001	9/8/94
Hexachlorocyclopentadiene	0.05	7/92	0.05	9/8/94
Lindane	0.004 0.0002	eff: 6/24/77 1/91	0.004 0.0002	77 9/8/94
Methoxychlor	0.1 0.04	eff: 6/24/77 1/91	0.1 0.04 0.03	77 9/8/94 6/12/03
Molinate	-	-	0.02	4/4/89
Oxamyl	0.2	7/92	0.2 0.05	9/8/94 6/12/03
Pentachlorophenol	0.001	1/91	0.001	9/8/94
Picloram	0.5	7/92	0.5	9/8/94
Polychlorinated Biphenyls	0.0005	1/91	0.0005	9/8/94
Simazine	0.004	7/92	0.010 0.004	4/4/89 9/8/94

Thiobencarb	-	-	0.07 0.001[b]	4/4/89 4/4/89
Toxaphene	0.005 0.003	eff: 6/24/77 1/91	0.005 0.003	77 9/8/94
2,3,7,8-TCDD (Dioxin)	$3x10^{-8}$	7/92	$3x10^{-8}$	9/8/94
2,4,5-TP (Silvex)	0.01 0.05	eff:6/24/77 1/91	0.01 0.05	77 9/8/94

a. “eff.” indicates the date the MCL took effect; any other date provided indicates when USEPA established (i.e., published) the MCL.
b. Secondary MCL.

Disinfection Byproducts (22 CCR Section 64533)

Contaminant	**US EPA**		**California**	
	MCL (mg/L	**Date**	**MCL** (mg/L)	**Effective Date**
Total Trihalomethanes	0.100 0.080	11/29/79 eff: 11/29/83 eff:1/1/02 [g]	0.100 0.080	3/14/83 6/17/06
Haloacetic acids (five)	0.060	eff: 1/1/02 [g]	0.060	6/17/06
Bromate	0.010	eff: 1/1/02 [g]	0.010	6/17/06
Chlorite	1.0	eff: 1/1/02 [g]	1.0	6/17/06

a. “eff.” indicates the date the MCL took effect; any other date provided indicates when USEPA established (i.e., published) the MCL.
g. Effective for surface water systems serving more than 10,000 people; effective for all others 1/1/04.

Treatment Techniques (22 CCR Section 64448)

A public water system which uses acrylamide and/or epichlorohydrin in drinking water treatment shall certify annually in writing to the Department that the combination of dose and monomer does not exceed the following levels:

Contaminant	**US EPA**		**California**	
	MCL (mg/L	**Date**	**MCL** (mg/L)	**Effective Date**
Acrylamide	TT[h]	1/91	TT[h]	9/8/94
Epichlorohydrin	TT[h]	1/91	TT[h]	9/8/94
h. TT = treatment technique, because an MCL is not feasible.				

Appendix 4. - Unregulated Chemicals for which Monitoring is Required (UCMRs).
A 2001 regulation required public water systems to monitor for these UCMRs beginning. The requirement for monitoring was repealed in 2007.

Inorganic chemicals

- Boron -- naturally occurring chemical; an advisory notification level was established in the 1990s.
- Chromium, hexavalent -- has industrial uses, but is also naturally occurring. It had been regulated under the Total Chromium maximum contaminant level (MCL), but a hexavalent chromium MCL became effective on July 1, 2014
- Perchlorate -- used as a solid rocket propellant, it is primarily of concern as a contaminant from aerospace , munitions, and fireworks manufacturing. A perchlorate notification level was established in 1997, and its MCL was adopted, effective October 2007.
- Vanadium -- naturally occurring chemical, an advisory notification level was established in 2000.

Organic chemicals

- Dichlorodifluromethane – a refrigerant and aerosol spray propellant, a notification level was established in the mid-1990s.
- Ethyl tertiary butyl ether – ETBE and several other oxygenates were included as UCMRs as a result of concerns about methyl tertiary butyl ether (MTBE)* contamination, mostly from leaking underground gasoline storage tanks.There were few, if any, findings.
- Tertiary amyl methyl ether – see ETBE.
- Tertiary butyl alcohol – see ETBE.
- 1,2,3-Trichloropropane – found in agricultural and industrial areas; a notification level was eastablished in 1999, and a PHG was completed by OEHHA in 2009, and the State Water Board plans to propose an MCL, likely in 2014.

*MTBE had previously been a UCMR, but in 1999 a 13-ug/L secondary MCLwas adopted to address taste and odor issues, and in 2000 a 6-ug/L MCL (to address possible cancer risks, based on laboratory animal studies). A notification level, first established in 1991, had been in place prior to the MCL.

Appendix 5. Chemicals with State Water Board Notification Levels

Information about Notification Levels is available at:
http://www.CDPH.ca.gov/certlic/drinkingwater/Pages/notificationlevels.aspx

Chemical	Notification Level (milligrams per liter)
Boron	1
n-Butylbenzene	0.26
sec-Butylbenzene	0.26
tert-Butylbenzene	0.26
Carbon disulfide	0.16
Chlorate	0.8
2-Chlorotoluene	0.14
4-Chlorotoluene	0.14
Diazinon	0.0012
Dichlorodifluoromethane (Freon 12)	1
1,4-Dioxane	0.001
Ethylene glycol	14
Formaldehyde	0.1
HMX	0.35
Isopropylbenzene	0.77
Manganese	0.5
Methyl isobutyl ketone (MIBK)	0.12
Naphthalene	0.017
N-Nitrosodiethyamine (NDEA)	0.00001
N-Nitrosodimethylamine (NDMA)	0.00001
N-Nitrosodi-n-propylamine (NDPA)	0.00001
Propachlor**	0.09
n-Propylbenzene	0.26
RDX	0.0003
Tertiary butyl alcohol (TBA)	0.012
1,2,3-Trichloropropane (1,2,3-TCP)	0.000005
1,2,4-Trimethylbenzene	0.33
1,3,5-Trimethylbenzene	0.33
2,4,6-Trinitrotoluene (TNT)	0.001
Vanadium	0.05

Appendix 6. Recent Regulations for Public Drinking Water Systems

- Listed below are recently adopted drinking water regulations. All regulations, as well as drinking water related statutes, are available at: http://www.CDPH.ca.gov/certlic/drinkingwater/Pages/lawbook.aspx. Long Term 1 and 2 Enhanced Surface Water Treatment Rules (CDPH-09-014) -- effective July 1, 2013.
- Disinfectant Residual, Disinfection Byproducts, and Disinfection Byproduct Precursors (CDPH-09-004) -- effective June 21, 2012.
- Point of Entry Treatment (CDPH-10-011E) -- effective September 22, 2011.
- Ground Water Rule (CDPH-09-007) - effective August 18, 2011.
- Point of Use Treatment (CDPH-10-009E) -- effective December 21, 2010.
- Revision of Safe Drinking Water State Revolving Fund (CDPH-06-009) -- effective April 2, 2009.
- Revision of the Arsenic MCL (CDPH-04-017) -- effective November 28, 2008.
- Water Works Standards (R-14-03) - effective March 9, 2008.
- Interim Enhanced Surface Water Treatment Rule (R-20-01) -- effective January 12, 2008
- Primary Maximum Contaminant Level for Perchlorate (R-16-04) -- effective October 18, 2007.
- Secondary Maximum Contaminant Levels (R-21-03) -- effective September 27, 2006.
- Public Notification Requirements for Drinking Water Violations (R-59-01) effective September 1, 2006.
- Disinfectants and Disinfection Byproducts (R-62-00) -- effective June 17, 2006.
- Radionuclide Drinking Water Regulations (R-12-02) -- effective June 11, 2006.

Appendix 7. Summary of Funding Programs for FY 2011-2012 and 2012-2013

SDWSRF Funding Program FY 2011-2012						
WS Name	**WS Number**	**County**	**Disadvantaged**	**Small Water System**	**Total SRF Funding**	**FA Executed**
Planning Funding						
City of Montague	4710007-002P	Siskiyou	✓	✓	$500,000	11/30/2011
Leggett Valley School	2300785-001P	Mendocino	✓	✓	$11,650	6/8/2012
Nicasio School District	2100582-001P	Marin	✓	✓	$205,000	10/27/2011
Redwood Terrace	4100510-002P	San Mateo		✓	$22,050	6/8/2012
Modesto Pacific, LLC	5000080-001P	Stanislaus	✓	✓	$40,000	10/27/2011
Santa Nella Water District	2410018-001P	Merced	✓	✓	$415,000	10/27/2011
Ducor CSD	5400542-003P	Tulare	✓	✓	$111,080	1/5/2012
Pershing High School	1000207-001P	Fresno	✓	✓	$220,400	1/23/2012
Huron	1010044-001P	Fresno	✓	✓	$500,000	5/3/2012
Madera#6	2000550-001P	Madera	✓	✓	$400,000	3/30/2012
Greenfield County WD	1510024-001P	Kern	✓	✓	$472,635	6/18/2012
White Fence Farms MWC	1900523-001P	Los Angeles		✓	$40,425	6/8/2012
			Total Planning Funding		**$2,938,240**	

SDWSRF Funding Program FY 2011-2012						
WS Name	**WS Number**	**County**	**Disadvantaged**	**Small Water System**	**Total SRF Funding**	**FA Executed**
Construction Funding						
Midway Heights CWD	3110041-002C	Placer		✓	$559,000	11/30/2011
Tahoe City PUD	3110010-003C	Placer	✓	✓	$1,300,000	2/23/2012
Placer CWA-Bowman	3110005-002C	Placer			$7,801,000	6/18/2012
Trinity	5310003-001C	Trinity	✓	✓	$743,880	6/29/2012
Bolinas Public Utility District	2110005-003C	Marin		✓	$365,000	8/29/2011
Willits, City of	2310004-001C	Mendocino	✓	✓	$5,779,623	12/21/2011
Clearwater MWC	1700546-003C	Lake		✓	$184,000	2/8/2012
TUD - Crystal Falls	5510010-005C	Tuolumne		✓	$1,184,704	2/23/2012
Lanare	1000053-005C	Fresno	✓	✓	$313,188	3/20/2012
Stockton East	3910006-003C	San Joaquin	✓		$15,000,000	5/18/2012
Lamont	1510012-007C	Kern	✓		$2,585,333	6/29/2012
Maywood Mutual WC	1910084-003C	Los Angeles	✓	✓	$2,450,000	11/1/2011
LADWP	1910067-033C	Los Angeles	✓		$127,235,853	6/30/2012
LADWP	1910067-034C	Los Angeles	✓		$64,769,179	6/30/2012
Olivenhain MWD	3710029-006C	San Diego			$17,812,998	2/23/2012
Julian CSD	3700909-003C	San Diego		✓	$125,000	5/10/2012
San Diego	3710020-064C	San Diego			$5,977,779	6/18/2012
San Diego	3710020-065C	San Diego			$11,571,398	6/18/2012

Total Const. Funding	$265,757,935

SDWSRF Funding Program FY 2011-2012 *(Summary by type of FA)*		
Funding Agreement Type	**Total FA's**	**Total Amount**
Planning Funding Agreements Executed	12	$2,938,240
Construction Funding Agreements Executed	18	$265,757,935
Grand Total	**30**	**$268,696,175**

SDWSRF Funding Program FY 2011-2012 *(Summary of Disadvantaged projects funded)*		
Funding Agreement Type	**Total FA's**	**Total Amount**
Planning Funding Agreements Executed	10	$2,875,765
Construction Funding Agreements Executed	9	$220,177,056
Grand Total	**19**	**$223,052,821**

SDWSRF Funding Program FY 2011-2012 *(Summary of Small Water projects funded)*		
Funding Agreement Type	**Total FA's**	**Total Amount**
Planning Funding Agreements Executed	12	$2,875,765
Construction Funding Agreements Executed	10	$13,004,395
Grand Total	**22**	**$15,880,160**

Prop 50 Funding Program FY 2011-2012						
WS Name	**WS Number**	**County**	**Disadvantaged**	**Small Water System**	**Total P50 Funding**	**FA Executed**
Construction Funding						
Sacramento Suburban WD	P50-3410001-015	Sacramento			$485,500	1/20/2012
Tahoe City PUD - Lake Forest	P50-3110032-071	Placer	✓	✓	$2,000,000	2/23/2012
City of Trinidad	P50-1210018-115	Humboldt		✓	$120,115	7/6/2011
Clear Water MWC	P50-1700546-110	Lake		✓	$86,000	4/7/2012
TUD Sawmill	P50-5510013-142	Tuolumne			$449,534	2/29/2012
Park Water Company	P50-1910161-021	Los Angeles	✓		$2,591,154	8/11/2011
Golden State Water Company	P50-1910155-048	Los Angeles	✓		$183,285	3/20/2012

Senior Canyon MWC	P50-5601117-069/108	Ventura		✓	$485,490	1/14/2012
Palomino Estates WC	P50-1206002-111	Humboldt		✓	$51,000	5/9/2012
			Total Construction Funding		**$6,452,078**	

Prop 50 Funding Program FY 2011-2012 *(Summary - overall funding agreements executed)*			
Funding Agreement Type		**Total FA's**	**Total Amount**
Construction Funding Agreements Executed		9	$6,425,078
	Grand Total	**9**	**$6,425,078**

Prop 50 Funding Program FY 2011-2012 *(Summary - Disadvantaged projects funded)*			
Funding Agreement Type		**Total FA's**	**Total Amount**
Construction Funding Agreements Executed		3	$4,774,439
	Grand Total	**3**	**$4,774,439**

Prop 50 Funding Program FY 2011-2012 *(Summary - Small Water projects funded)*			
Funding Agreement Type		**Total FA's**	**Total Amount**
Construction Funding Agreements Executed		5	$2,742,605
	Grand Total	**5**	**$2,742,605**

Prop 84 Funding Program FY 2011-2012						
WS Name	**WS Number**	**County**	**Disadvantaged**	**Small Water System**	**Total P84 Funding**	**FA Executed**
Planning Funding - Section 75022						
Hanford, City of	1610003-004	Kings	✓	✓	$500,000	7/6/11
LSID - Tonyville	5410007-003	Tulare	✓	✓	$257,500	9/23/11
Arnold Park (O'Bannon's MHP)	3500526-001	San Benito	✓	✓	$250,000	12/15/11
Son Shine Properties	1500588-001	Kern	✓	✓	$465,240	1/23/12
Foothill MWC	4300630-003	Santa Clara	✓	✓	$231,280	1/23/12
Pershing High School	1000207-003	Fresno	☐	✓	$275,500	1/23/12

Ducor CSD	5400542-005	Tulare	✓	✓	$27,770	1/6/12
Beverly Grand Mutual Water Co.	5400651-001	Tulare	✓	✓	$113,000	1/14/12
Kernvale Mutual Water Co	1500364-001	Kern	✓	✓	$73,000	3/8/12
County Water Company	3302093-501	Riverside	✓	✓	$494,300	3/13/12
Pauma Valley Mutual Water Co.	3700934-001	San Diego	✓	✓	$483,800	3/20/12
CMD No. 6 Lake Shore Park	2000550-002	Madera	✓	✓	$100,000	3/30/12
East Niles CSD	1510006-801	Kern	✓	✓	$469,051	4/19/12
CMD No. 7 Marina View Heights	2000551-003	Madera	✓	✓	$500,000	4/24/12
Iverson and Jacks Apartments LLC	2701068-002	Monterey	✓	✓	$144,870	5/21/12
City of McFarland - P2	1510013-002	Kern	✓	✓	$182,000	5/24/12
Hillview WC - Raymond	2010012-001	Madera	✓	✓	$500,000	5/30/12
Valley Ford Water Association	4900568-001	Sonoma	✓	✓	$485,000	6/7/12
CMD No. 42 Still Meadows	2000737-002	Madera	✓	✓	$278,000	6/26/12
Santa Rosa, City of	4910009-801	Sonoma	✓	✓	$500,000	6/29/12
			Total Planning Funding		**$6,330,311**	

Prop 84 Funding Program FY 2011-2012						
WS Name	**WS Number**	**County**	**Disadvantaged**	**Small Water System**	**Total P84 Funding**	**FA Executed**
Construction Funding - Section 75022						
Rancho De Sonoma	4900845-001	Sonoma	✓	✓	$1,082,538	9/13/11
MCHA Los Banos Center	2400108-001	Merced	✓	✓	$1,058,412	10/4/11
Cutler PUD	5410001-001	Tulare	✓	✓	$2,931,300	12/2/11
Sunbird MHP/Coachella Valley WD	3301755-001	Riverside	✓	✓	$497,000	12/6/11
Diamond Park MWC	3000663-003	Orange	✓	✓	$1,121,727	2/16/12
Catalina Street Pump Owners Assoc.	3000662-003	Orange	☐	✓	$441,651	2/16/12
Coleville School	2600570-002	Mono	✓	✓	$729,169	3/30/12
San Benancio School WS	2701227-003	Monterey	✓	✓	$198,174	6/20/12
			Total Const.		**$8,059,971**	

Funding	

Prop 84 Funding Program FY 2011-2012						
WS Name	WS Number	County	Disadvantaged	Small Water System	Total P84 Funding	FA Executed
Construction Funding - Section 75025						
N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Total Const. Funding		**$0**	

Prop 84 Funding Program FY 2011-2012						
WS Name	WS Number	County	Disadvantaged	Small Water System	Total P84 Funding	FA Executed
Emergency Funding - Section 75021						
North Gualala Water Company- A2	2310007-001	Mendocino	N/A	✓	$169,688	1/23/2012
Durham Ferry	3901424-001	San Joaquin	N/A	✓	$100,000	7/7/2011
Krista Mutual Water Company	1500475-001	Kern	N/A	✓	$47,000	10/11/2011
Seville Water Company	5400550-001	Tulare	N/A	✓	$50,000	12/19/2011
Athal Mutual Water Company	1500289-001	Kern	N/A	✓	$47,458	1/23/2012
			Total Emerg. Funding		**$414,146**	

Prop 84 Funding Program FY 2011-2012 (Summary)		
Funding Agreement Type	Total FA's	Total Amount
Planning Funding Agreements Executed	20	$6,330,311
Construction Funding Agreements Executed	8	$8,059,971
Emergency Funding & Oral Agreements Executed	5	$414,146
Grand Total	**33**	**$14,804,428**

Prop 84 Funding Program FY 2011-2012 *(Summary - Disadvantaged projects funded)*		
Funding Agreement Type	Total FA's	Total Amount

Planning Funding Agreements Executed	19	$6,054,811
Construction Funding Agreements Executed	7	$8,059,971
Grand Total	**26**	**$14,114,782**

Prop 84 Funding Program FY 2011-2012 *(Summary - Small Water projects funded)*		
Funding Agreement Type	**Total FA's**	**Total Amount**
Planning Funding Agreements Executed	20	$6,330,311
Construction Funding Agreements Executed	8	$8,059,971
Emergency Funding & Oral Agreements Executed	5	$414,146
Grand Total	**33**	**$14,804,428**

FY 2012-2013

SDWSRF Funding Program FY 2012-2013						
WS Name	**WS Number**	**County**	**Disadvantaged**	**Small Water System**	**Total SRF Funding**	**FA Executed**
Planning Funding						
Plum Valley School	5200506-001P	Tehama	✓	✓	13,000	8/7/12
Kettleman City	1610009-005P2	Kings	✓	✓	274,324	8/28/12
Anza MWC	3301180-001P	Riverside	✓	✓	267,600	9/26/12
Jackson Valley Irrigation District	0300037-002P	Amador	✓	✓	500,000	11/16/12
Lewiston Valley WC	5301002-001P	Trinity	✓	✓	360,000	11/14/12
Rosamond CSD	1510018-007P	Kern	✓		500,000	5/21/13
Madera #1	2000544-001P	Madera	✓	✓	130,000	5/24/13
City of Firebaugh (Las Deltas MWC)	1000054-002P	Fresno	✓	✓	438,000	5/3/13
Allensworth	5400544-001P	Tulare	✓	✓	390,000	4/29/13
Madera #33	2000554-002P	Madera	✓	✓	322,000	5/16/13
Rancho Estates MWC	3700936-001P	San Diego	✓	✓	500,000	6/14/13

Camp Nelson	5410022-001P	Tulare	✓	✓	139,000	6/11/2013
FCSA #30 and #32	1000019-002P 1000359-003P	Fresno	✓	✓	725,000	5/20/13
Donner PUD	2910016-002P	Nevada	✓	✓	172,903	6/26/2013
Panoche	1000345-002P	Fresno	✓	✓	385,000	6/26/2013
Tipton	5410014-003P	Tulare	✓	✓	29,000	6/26/2013
Tooleville	5400567-001P	Tulare	✓	✓	454,380	6/26/2013
LADWP (Planning)	1910067-010P	Los Angeles	✓		500,000	6/26/2013
LADWP (Planning)	1910067-011P	Los Angeles	✓		500,000	6/26/2013
LADWP (Planning)	1910067-009P	Los Angeles	✓		500,000	6/26/2013
			Total Planning Funding		**$7,100,207**	

SDWSRF Funding Program FY 2012-2013						
WS Name	**WS Number**	**County**	**Disadvantaged**	**Small Water System**	**Total SRF Funding**	**FA Executed**
Construction Funding						
Lake County-Spring Valley	1710018-004C	Lake	✓	✓	1,809,760	9/12/12
Montara WSD	4110010-022C	San Mateo		✓	2,920,000	11/14/12
Rainbow MWD	3710016-004C	San Diego			7,924,076	11/16/12
Rainbow MWD	3710016-008C	San Diego			10,303,804	11/16/12
Baseline Gardens	3610007-007C	San Bernardino	✓	✓	3,000,000	2/25/13
City of Fresno A-1	1010007-026C	Fresno			11,405,432	11/21/2012
Midway Height A-1	3110041-002C	Placer		✓	333,400	12/20/2012
North of the River	1510041-007C	Kern	✓	✓	498,212	12/12/12

City of Montague	4710007-002C	Siskiyou	✓	✓	3,851,572	4/26/13
Garberville SD	1210008-006C	Humboldt	✓	✓	4,060,478	5/10/13
Kit Carson	1600014-001C2	Kings	✓	✓	1,993,000	6/14/13
Sequoia Union USD	5400709-001C	Tulare	✓	✓	277,457	5/3/2013
Springville PUD	5410011-004C	Tulare	✓	✓	1,706,600	6/26/2013
Heritage Ranch CSD	4010012-003C	San Luis Obispo		✓	714,000	6/14/13
City of Delano A-2	1510005-001C	Kern	✓		3,000,000	6/26/2013
LADWP	1910067-031C	Los Angeles	✓		102,281,674	6/26/2013
LADWP	1910067-022C	Los Angeles	✓		100,972,990	6/26/2013
Trinity Center MWC A-2	5310003-001C	Trinity	✓		$1,086,445	3/28/2013
			Total Const. Funding		**$258,138,900**	

SDWSRF Funding Program FY 2012-2013 ***(Summary by type of FA)***

Funding Agreement Type	Total FA's	Total Amount
Planning Funding Agreements Executed	20	$7,100,207
Construction Funding Agreements Executed	18	$258,138,900
Grand Total	**38**	**$265,239,107**

SDWSRF Funding Program FY 2012-2013 ***(Summary of Disadvantaged projects funded)***

Funding Agreement Type	Total FA's	Total Amount
Planning Funding Agreements Executed	20	$7,100,207
Construction Funding Agreements Executed	12	$224,538,188
Grand Total	**32**	**$231,638,395**

SDWSRF Funding Program SFY 2012-2013 ***(Summary of Small Water projects funded)***

Funding Agreement Type	Total FA's	Total Amount
Planning Funding Agreements Executed	16	$5,100,207
Construction Funding Agreements Executed	11	$21,164,479
Grand Total	**27**	**$26,264,686**

SDWSRF Summary of Executed Funding Agreements - *Loan vs Grant*				
Water System Name	**Project No.**	**FA Loan Amount**	**FA Grant Amount**	**FA Total Funding Assistance**
Plum Valley School	5200506-001P	$0	$13,000	$13,000
Kettleman City	1610009-005P2	$0	$274,324	$274,324
Anza MWC	3301180-001P	$0	$267,600	$267,600
Lake County-Spring Valley	1710018-004C	$0	$1,809,760	$1,809,760
Jackson Valley Irrigation District	0300037-002P	$0	$500,000	$500,000
Lewiston Valley WC	5301002-001P	$0	$360,000	$360,000
Montara WSD	4110010-022C	$2,920,000	$0	$2,920,000
Rainbow MWD	3710016-004C	$7,924,076	$0	$7,924,076
Rainbow MWD	3710016-008C	$10,303,804	$0	$10,303,804
Baseline Gardens	3610007-007C	$0	$3,000,000	$3,000,000
City of Fresno A-1	1010007-026C	$11,405,432	$0	$11,405,432
Midway Height A-1	3110041-002C	$333,400	$0	$333,400
North of the River	1510041-007C	$99,642	$398,570	$498,212
City of Montague	4710007-002C	$851,572	$3,000,000	$3,851,572
Rosamond CSD	1510018-007P	$0	$500,000	$500,000
Madera #1	2000544-001P	$26,000	$104,000	$130,000
City of Firebaugh (Las Deltas MWC)	1000054-002P	$0	$438,000	$438,000
Allensworth	5400544-001P	$0	$390,000	$390,000
Garberville SD	1210008-006C	$1,060,478	$3,000,000	$4,060,478
Madera #33	2000554-002P	$0	$322,000	$322,000
Rancho Estates MWC	3700936-001P	$0	$500,000	$500,000
Camp Nelson	5410022-001P	$139,000	$0	$139,000
Kit Carson	1600014-001C2	$0	$1,993,000	$1,993,000
FCSA #30 and #32	1000019-002P/1000359-003P	$0	$725,000	$725,000
Donner PUD	2910016-002P	$34,581	$138,322	$172,903
Panoche	1000345-002P	$0	$385,000	$385,000
Sequoia Union USD	5400709-001C	$0	$277,457	$277,457
Springville PUD	5410011-004C	$341,320	$1,365,280	$1,706,600
Heritage Ranch CSD	4010012-003C	$714,000	$0	$714,000
Tipton	5410014-003P	$0	$29,000	$29,000
Tooleville	5400567-001P	$0	$454,380	$454,380
City of Delano A-2	1510005-001C		$3,000,000	$3,000,000
LADWP	1910067-031C	$102,281,674	$0	$102,281,674
LADWP	1910067-022C	$100,972,990	$0	$100,972,990
LADWP (Planning)	1910067-010P	$500,000	$0	$500,000
LADWP (Planning)	1910067-011P	$500,000	$0	$500,000

LADWP (Planning)	1910067-009P	$500,000	$0	$500,000
Trinity Center MWC A-2	5310003-001C	$0	$1,086,445	$1,086,445
	Totals	**$240,907,969**	**$24,331,138**	**$265,239,107**

Prop 50 Funding Program FY 2012-2013						
WS Name	**WS Number**	**County**	**Disadvantaged**	**Small Water System**	**Total P50 Funding**	**FA Executed**
Construction Funding						
Hat Creek Water Company, LLC	P50-4500022-118	Shasta	✓	✓	$814,047	08-22-12
Trinity Center MWC	P50-5310003-144	Trinity	✓	✓	$2,000,000	09-21-12
Mountain Gate CSD	P50-4510002-106	Shasta		✓	$776,590	10-10-12
Mountain Gate CSD	P50-4510002-175	Shasta		✓	$1,723,479	10-10-12
Estero MWC	P50-2100519-139	Marin		✓	$53,000	10-24-12
San Francisco Zen Center	P50-2100565-134	Marin		✓	$126,000	11-21-12
LADWP	P50-1910067-086	Los Angeles	✓		$10,000,000	11-27-12
Rush Creek MWC	P50-5301017-224	Trinity		✓	$860,835	12-03-12
City of Riverside	P50-3310031-084	Riverside			$4,609,500	01-16-13
Rancho Chaparral MWC	P50-2701278-081	Monterey		✓	$607,007	02-15-13
City of Trinidad	P50-1210018-136	Humboldt	✓	✓	$1,796,931	04-10-13
Golden State Water Company	P50-1910223-090	Los Angeles	✓		$4,705,000	04-10-13
Las Cumbres MWC	P50-4400631-072	Santa Cruz		✓	$1,253,000	04-10-13
Myers Flat MWC	P50-1200538-163	Humboldt	✓	✓	$2,000,000	04-10-13
North Kaweah MWC	P50-5400506-145	Tulare		✓	$1,990,000	04-11-13
City of Montague	P50-4710007-128	Siskiyou	✓	✓	$2,000,000	04-25-13
Irvine Ranch Water District	P50-3010092-192	Orange			$2,264,475	05-01-13
Santa Margarita Water District	P50-3010101-012	Orange			$10,000,000	05-01-13
Hillview Water Company	P50-2010007-006	Madera	✓	✓	$1,998,600	05-17-13
Inland Empire Utilities Agency*	P50-3610075-085	San Bernardino	✓		$52,005,716	05-20-13
Rubidoux CSD	P50-3310044-206	Riverside	✓		$3,089,616	05-22-13
Clear Water MWC	P50-1700546-222	Lake		✓	$175,739	06-06-13
Tranquility Irrigation District	P50-1010030-254	Fresno	✓	✓	$1,988,125	06-18-13

Total Funding	**$106,837,660**

NOTE: Inland Empire Utilities Agency is partially disadvantaged. $20,000,000 of total project cost.

Prop 50 Funding Program SFY 2012-2013 *(Summary - overall funding agreements executed)*		
Funding Agreement Type	**Total FA's**	**Total Amount**
Construction Funding Agreements Executed	**23**	**$106,837,660**
Grand Total	**23**	**$106,837,660**

Prop 50 Funding Program SFY 2012-2013 *(Summary - Disadvantaged projects funded)*		
Funding Agreement Type	**Total FA's**	**Total Amount**
Construction Funding Agreements Executed	**11**	**$82,398,035**
Grand Total	**11**	**$82,398,035**

Prop 50 Funding Program SFY 2012-2013 *(Summary - Small Water projects funded)*		
Funding Agreement Type	**Total FA's**	**Total Amount**
Construction Funding Agreements Executed	**16**	**$20,163,353**
Grand Total	**16**	**$20,163,353**

Prop 84 Funding Program SFY 2012-2013						
WS Name	**WS Number**	**County**	**Disadvantaged**	**Small Water System**	**Total P84 Funding**	**FA Executed**
Planning Funding - Section 75022						
Arvin CSD	P84C-1510001-001P2	Kern	✓		$323,823	07-12-12
Pixley PUD	P84C-5410009-009P	Tulare	✓	✓	$500,000	08-14-12
Kettleman City CSD	P84C-1610009-010P	Kings	✓	✓	$500,000	08-28-12
Salyer MWC	P84C-5304501-004P	Trinity	✓	✓	$135,000	08-31-12
CSA #70 W-4	P84C-3600196-501P	San Bernardino	✓	✓	$379,800	09-06-12
Yosemite USD	P84C-2000567-003P	Madera	✓	✓	$450,000	09-06-12
Latrobe School District	P84C-0900210-004P	El Dorado	✓	✓	$396,700	09-14-12
Fourth Street Water Co., Inc.	P84C-1500449-002P	Kern	✓	✓	$410,000	09-21-12
Quail Valley Water District	P84C-1502724-001P	Kern		✓	$498,532	10-01-12
Rand Communities Water District	P84C-1510016-004P	Kern	✓	✓	$435,000	10-01-12

Tokay Park Water Company	P84C-3400172-004P	Sacramento	✓	✓	$270,000	10-11-12
Reef-Sunset USD	P84C-1600048-002P	Kings	✓	✓	$121,100	10-26-12
East Orosi CSD	P84C-5401003-003P	Tulare	✓	✓	$472,584	11-16-12
Sierra Linda MWC	P84C-2000506-001P2	Madera	✓	✓	$299,255	11-16-12
County of Tulare	P84C-5400550-007P	Tulare	✓	✓	$691,000	11-28-12
Gratton School District	P84C-5000273-002P	Stanislaus	✓	✓	$373,500	11-28-12
Manteca USD	P84C-3901169-002P	San Joaquin	✓	✓	$480,000	11-28-12
Washington USD	P84C-1000221-001P	Fresno	✓	✓	$499,862	12-03-12
Hardwick Water Company	P84C-1600507-002P	Kings	✓	✓	$391,220	12-28-12
Lanare CSD	P84C-1000053-006P	Fresno	✓	✓	$500,000	12-28-12
Sutter County WWD No. 1	P84C-5100107-002P	Sutter	✓	✓	$500,000	12-28-12
Washington USD	P84C-2701221-002P2	Monterey	✓	✓	$100,753	12-28-12
Vaughn Water Company Inc.	P84C-1510029-801P	Kern		✓	$958,200	02-27-13
Zonneveld Dairy	P84C-1000369-002P	Fresno	✓	✓	$472,000	04-17-13
Century MHP	P84C-3900579-002P	San Joaquin	✓	✓	$373,500	05-21-13
Rosamond CSD	P84C-1510018-801P	Kern	✓	✓	$999,898	05-21-13
Lakeview Ranchos MWC	P84C-1500525-001P	Kern	✓	✓	$467,500	06-11-13
Long Canyon Water Company	P84C-1500578-002P	Kern	✓	✓	$496,116	06-11-13
Pinon Pines MWC	P84C-1510054-001P2	Kern	✓	✓	$227,927	06-18-13
Caliente USD	P84C-1502607-003P	Kern	✓	✓	$427,930	06-20-13
Apple Avenue Water System #3	P84C-2701036-001P	Monterey	✓	✓	$67,000	06-26-13
El Adobe POA, Inc.	P84C-1500493-001P	Kern	✓	✓	$499,821	06-26-13
Sanger USD	P84C-1000112-001P2	Fresno	✓	✓	$299,192	06-26-13
Yuba City USD	P84C-5100149-002P	Sutter	✓	✓	$268,510	06-26-13
			Total Planning Funding		**$14,285,723**	

Prop 84 Funding Program SFY 2012-2013						
WS Name	**WS Number**	**County**	**Disadvantaged**	**Small Water System**	**Total P84 Funding**	**FA Executed**
Construction Funding - Section 75022						
Lewiston Valley Water Company	P84C-5301002-001C	Trinity	✓	✓	$1,386,000	10-12-12
Tranquility Irrigation District	P84C-1010030-002C	Fresno		✓	$4,508,100	11-05-12
City of Gridley	P84C-0400058-002C	Butte		✓	$429,412	01-10-13
Cuyama CSD	P84C-4210009-002C	Santa Barbara	✓	✓	$830,611	02-07-13
Baseline Gardens MWC	P84C-3610007-006C	San Bernardino	✓	✓	$3,475,835	02-25-13
Caruthers CSD	P84C-1010039-009C	Fresno		✓	$4,660,041	03-22-13
LSID (El Rancho)	P84C-5410052-001C	Tulare	✓	✓	$1,041,000	04-10-13
Oildale MWC	P84C-1500373-001C	Kern		✓	$1,899,570	04-22-13
North Edwards Water District	P84C-1510052-003C	Kern	✓	✓	$4,900,000	05-01-13
Aerial Acres Water System	P84C-1500405-001C	Kern	✓	✓	$2,004,490	05-21-13
			Total Const. Funding		**$25,135,059**	

Prop 84 Funding Program SFY 2012-2013						
WS Name	**WS Number**	**County**	**Disadvantaged**	**Small Water System**	**Total P84 Funding**	**FA Executed**
Construction Funding - Section 75025						
City of El Monte	P84G-1910038-803C	Los Angeles	✓		$1,500,000	08-09-12
Joshua Basin Water District	P84G-3610025-801C	San Bernardino	✓		$3,210,000	09-06-12
San Gabriel Valley Water Company	P84G-1910039-802C	Los Angeles			$1,302,612	10-11-12
Valley County Water District	P84G-1910009-801C	Los Angeles			$847,020	11-28-12
			Total Const. Funding		**$6,859,632**	

Prop 84 Funding Program SFY 2012-2013				
WS Name	**WS Number**	**County**	**Total P84 Funding**	**FA Executed**
Emergency Funding - Section 75021				
Saint Anthony Trailer Park	P84E-3301380-001	Riverside	$250,000	07-24-12
Tokay Park Water Company	P84E-3400172-001	Sacramento	$9,097	08-06-12
Teviston CSD	P84E-5400641-001	Tulare	$10,922	09-18-12
West Goshen MWC	P84E-5400957-002	Tulare	$9,726	11-06-12
Eastern MWD	P84E-3310009-001	Riverside	$1,205	11-19-12
Howell's Lakeside Marina	P84E-5200007-001	Tehama	$5,863	11-19-12
Lewiston CSD	P84E-5301002-001	Trinity	$5,480	12-03-12
Strathmore PUD	P84E-5410012-001	Tulare	$34,350	01-16-13
City of Orange Cove	P84E-1010023-001	Fresno	$250,000	02-15-13
Kettleman City CSD	P84E-1610009-001	Kings	$50,000	02-27-13
Kettleman City Elementary School	P84E-1600048-001	Kings	$8,000	02-27-13
Ocotillo MWC	P84E-1300513-001	Imperial	$250,000	04-09-13
Eastern MWD	P84E-3310009-002	Riverside	$8,004	05-02-13
West Goshen MWC	P84E-5400957-003	Tulare	$30,729	05-24-13
Monterey Park Tract CSD	P84E-5000389-001	Stanislaus	$47,676	06-04-13
City of San Joaquin	P84E-1010034-001	Fresno	$75,000	06-11-13
Lewiston Valley Water Company	P84E-5301002-002	Trinity	$27,000	06-11-13
Hardwick Water Company	P84E-1600507-001	Kings	$15,427	06-12-13
Linda Vista Farms	P84E-1000445-001	Fresno	$29,000	06-26-13
Iverson & Jacks Apartments, LLC	P84E-2701068-001	Monterey	$25,200	06-28-13
		Total Emerg. Funding	**$1,142,679**	

Prop 84 Funding Program SFY 2012-2013 (Summary)			
Funding Agreement Type		**Total FA's**	**Total Amount**
Planning Funding Agreements Executed		34	$14,285,723
Construction Funding Agreements Executed		14	$31,994,691
Emergency Funding & Oral Agreements Executed		20	$1,142,679
	Grand Total	**68**	**$47,423,093**

Prop 84 Funding Program SFY 2012-2013 *(Summary - Disadvantaged projects funded)*			
Funding Agreement Type		**Total FA's**	**Total Amount**
Planning Funding Agreements Executed		32	$12,828,991
Construction Funding Agreements Executed		8	$18,347,936
	Grand Total	**40**	**$31,176,927**

Prop 84 Funding Program SFY 2012-2013 *(Summary - Small Water projects funded)*			
Funding Agreement Type		**Total FA's**	**Total Amount**
Planning Funding Agreements Executed		33	$13,961,900
Construction Funding Agreements Executed		10	$25,135,059
	Grand Total	**43**	**$39,096,959**

Appendix 8. List of Treatment Technologies Used or Tested by California Water Systems

List of Treatment Technologies for Disinfection, Filtration, Inorganic Contaminants, Volatile organic Contaminants, Synthetic Organic Contaminants, and Radionuclides

1,2,3-TCP TREATMENT										
Name of System	System No.	Name of Treatment Facility	System Location	Capacity, gpm	Treatment Processes	Date of Permit or Startup	Status	Treatment Effectiveness	Capital Costs	O&M Costs
Glendale	1910043	Glendale OU	Glendale	5250	AS with GAC	July 2000	online	good		
Burbank	1910179	Burbank Operable Unit	Burbank	9000	AS with GAC		operational; modifications being conducted	good		
City of Oceanside	3710014	Mission Basin Desalting Facility	Oceanside	4424	GAC	March 2009	online	good		
Valley County WD	1910009	Lante TP	Baldwin Park	7800	AS with GAC	June 2007	online	good		
Shafter, City of	1510019	Well 14	Shafter	2100	AS with GAC	January 2010	online	good		
Bakersfield, City of	1510031	L210	Bakersfield	950	AS with GAC	March 2010	online	good		

PERCHLORATE TREATMENT

Name of System	System No.	Name of Treatment Facility	System Location	Capacity, gpm	Treatment Processes	Type of Resin used in Ion Ex	Date of Permit or Startup	Status	Treatment Effectiveness	Capital Costs	O&M Costs
Lincoln Avenue WC	1910063	Ion Exchange Treatment Plant	Altadena	2,000 gpm with 2,400 maximum	Add an ion exchange treatment system for the removal of perchlorate in groundwater from Wells 3 and 5	Amberlite PWA2 by Rohm & Haas	July 2004	Permit Amendment completed	IX can treat 1.7 MG/ft^3 PW2 resin, with perchlorate as high as 20 ug/L. Compliance with the drinking water standard requirement	Leasing from USFilter: $9500/month Plus $159/acre-feet	1,084,124/per year
La Puente CVWD	1910060	La Puente Treatment Plant	Baldwin Park	2500	Ion Separation Exchange Process (ISEP)	CalRes 2000 by Calgon Carbon	February 2001	In-use	99.2percent	$2.8MM	$1.6 MM
Monterey Park City of	1910092	Delta Treatment Plant	Monterey Park		Calgon Carbon Fix Bed Ion Exchange with	CalRes 2103 and 2104 by Calgon Carbon	2004	problems encountered; not in operation	evaluation		
Southern California Water Company - [illegible]	1910223	South San Gabriel Trmt Plnt	San Gabriel		Layne Environmental Fix Bed Ion Exchange with	Amberlite PWA555 by Rohm & Haas		operational - monitoring evaluation	good		
SCWC - San Dimas	1910142	Highway Plant	San Dimas		Basin Water Fix Bed Ion Exchange with disposable resin	Purolite A520-E	evaluation	under evaluation	evaluation		
Valley County Water District	1910009	Arrow/Lante Treatment Facility	Baldwin Park	7800	Ion Separation Exchange Process (ISEP)	Calgon Calres 2000 SBA Type 1	evaluation	under evaluation	evaluation		
California Domestic Water Company	1910199	Perchlorate Removal Facility	Whittier	5000	Fixed Bed Ion Exchange with CalRes 2101 resin	CalRes 2101	July 2002	In-use	<14 to <4 ppb		125/ac-ft
City of Redlands	3610037	Rees Well IX	Redlands	1,100	Basin Water IX Replaceble Resin. Use SIR-100-HP	SIR-100-HP by Resin Tech	August 2004	Active			
City of Colton	3610014	Wells 15, 17 & 24 IX	Colton	2,000	US Filter HP 1220 DW IX. Anion exchange resin	DOWEX 1 by Dow Chemical or USF A-284-NSF by US Filter	September 2003	Active	10 to <4 ppb		
City of Rialto	3610038	Chino 1 well IX	Rialto	1,800	Basin Water IX. Use Standard Type 1 strong base anion	Purolite A-850FL	June 2004	Active			
City of Rialto	3610038	Chino 2 Well IX	Rialto	2,000	US Filter HP 1220 DW IX. Anion exchange resin	DOWEX 1 by Dow Chemical or USF A-284-NSF by US Filter	September 2003	Active			
San Gabriel Valley WC	3610041	Well F-17B and Well F-17C IX	Fontana	5,000	US Filter HP 1220 DW IX. Anion exchange resin	Amberlite PWA2 by Rohm & Haas	January 2004	Start-up			

PERCHLORATE TREATMENT

Name of System	System No.	Name of Treatment Facility	System Location	Capacity, gpm	Treatment Processes	Type of Resin used in Ion Ex	Date of Permit or Startup	Status	Treatment Effectiveness	Capital Costs	O&M Costs
West Valley WD	3610004	Well 18A	Rialto	2,400	US Filter HP 1220 DW IX. Used USF A-284-NSF	Amberlite PWA2 by Rohm & Haas	May 2003	Active			
West Valley WD	3610004	Well 42	Rialto	2,000	Calgon Carbon Corporation. Anion	CalRes 2100 by Calgon Carbon	May 2003	Active			
Ca. Water Service Co.-East LA	1910036	Well 10-03		800	Basin Water Ion Exchange Replaceable Resin	SIR-100-HP by Resin Tech		Under const.	<4 ppb	Unknown	Unknown
Castaic Lake Water Agency	1910048			2,400	Proposed Opt I - Ion Exchange (Cal Resin	CalRes 2100 by Calgon Carbon or USF 9710		Proposed	to <4 ppb	3.7 Millions	0.94 M/yr
Castaic Lake Water Agency	1910048			2,400	Proposed Opt II - Fixed Bed Bioreactor	NA		Proposed	to <4 ppb	9.3 Millions	0.16 M/yr
Morgan Hill, City of	4310006	Tennant Well (never used)		800	US Filter Anion Exchange, Purolite	Purolite A530-E	Never used	Inactive	<10 to <4 ppb	Unknown	
Morgan Hill, City of	4310006	Nordstrom Well (seasonal)		1000	US Filter Anion Exchange, Purolite	Purolite A530-E	August 2003	Inactive	to <4 ppb	Unknown	
Pasadena, City of	1910124			~3,800	Proposed Opt I - Calgon ISEP	Not yet selected (maybe Rohm and Haas PWA2)		Proposed			
Pasadena, City of	1910124			~3,801	Proposed Opt II - Fluidized Bed Bioreactor	NA		Proposed			
Pomona, City of	1910126			10,000	Ion Exchange (for NO3 removal)	Sybron ASB2		Operational	to <4 ppb	Unknown	
Redlands, City of	3610037	Texas St.			Organic Polymer/Monomer Tailored GAC	NA		Start-up			
Rialto, City of	3610038				USFilter Anion Exchange, Dow	DOWEX 1 by Dow Chemical	November 2003	Operational			
Riverside, City of	3310031	Tippecanoe Regional Plant		5000	Calgon Anion Exchange	Calgon CalRes 2103	November 2002	Operational	~30 to <4 ppb	Unknown	
Riverside, City of	3310031	Sunnyside Regional Plant		6000	Calgon Anion Exchange	Calgon Calres 2101	October 2002	Operational	~60 to <4 ppb	Unknown	
Riverside, City of	3310031	Gage 46-1 Plant		3600	Calgon Anion Exchange	Calgon Calres 2103	November 2002	Operational		Unknown	

PERCHLORATE TREATMENT

Name of System	System No.	Name of Treatment Facility	System Location	Capacity, gpm	Treatment Processes	Type of Resin used in Ion Ex	Date of Permit or Startup	Status	Treatment Effectiveness	Capital Costs	O&M Costs
Riverside, City of	3310031	Gage 66-1 Plant		2400	Calgon Anion Exchange	Calgon Calres 2103	September 2005	Start-up		Unknown	
San Gabriel WQA		Big Dalton Well		4.3	Calgon ISEP continuous anion exchange and	CalRes 2000	January 2004	Completed	18-76 to <4 ppb		
San Martin County Water District	4300542	Camping World Well		2000	USFilter Anion Exchange, Rohm & Haas	Amberlite PWA555 by Rohm & Haas	December 2003	Operational	7=> <4 ppb	Unknown	
So. Ca. Water Co., So. San Gabriel	1910223	South San Gabriel Well 1		750	Rohm & Haas Amberlite PWA 555 regenior HC	Amberlite PWA555 by Rohm & Haas	November 2003	offline, pump failed	no data available to date	229,390	160/AF
West San Martin Water Works	4300543	New Colony Well		300	USFilter Anion Exchange, Rohm & Haas	Amberlite PWA555 by Rohm & Haas	September 2003	Operational	7=> <4 ppb	Unknown	
West San Martin Water Works	4300543	County Building Well		500	USFilter Anion Exchange, Rohm & Haas	Amberlite PWA555 by Rohm & Haas	September 2003	Operational	7=> <4 ppb	Unknown	

DBP TREATMENT										
Name of System	**System No.**	**Name of Treatment Facility**	**System Location**	**Capacity, gpm/MGD**	**Treatment Processes**	**Date of Permit or Startup**	**Status**	**Treatment Effectiveness**	**Capital Costs**	**O&M Costs**
MWD	1910087	Mills Treatment Plant	N/W of Lake Perris off of	160 MGD/ 220 MGD	Conventional treatment plant with	Ozone treatment on line	Permit amendment complete	Assures compliance with the Stage 1	$46,000,700	$40,500
Alameda County Water District	0110001	Mission San Jose WTP	Fremont	12.5 mgd	Koch Ultrafiltration	August 2004	Startup			
CLAWA Wholesale	3610114	Silverwood Lake WTP	Crestline	3,600	GAC	January 2002	Active			

CHROME 6 (HEXAVALEN CHROMIUM) TREATMENT										
Name of System	**System No.**	**Name of Treatment Facility**	**System Location**	**Capacity, gpm**	**Treatment Processes**	**Date of Permit or Startup**	**Status**	**Treatment Effectiveness**	**Capital Costs**	**O&M Costs**
Glendale	1910043	WBA	Glendale	425	IX	December 2009	online	good		
Glendale	1910043	RCF	Glendale	100	Reduction, coagulation, filtration	December 2009	online	good		

1,4-Dioxane TREATMENT										
Name of System	**System No.**	**Name of Treatment Facility**	**System Location**	**Capacity, gpm**	**Treatment Processes**	**Date of Permit or Startup**	**Status**	**Treatment Effectiveness**	**Capital Costs**	**O&M Costs**
San Gabriel Valley Water Company	1910039	Drier Water Treatment Facility	Baldwin Park	7500	Trojan Low Pressure UV with Hydrogen Peroxide	evaluation	97-005 evaluation	evaluation		
Valley County Water District	1910009	Arrow/Lante Treatment Facility	Baldwin Park	7,800	Trojan Low Pressure UV with Hydrogen Peroxide	evaluation	97-005 evaluation	evaluation		

NDMA TREATMENT

Name of System	System No.	Name of Treatment Facility	System Location	Capacity, gpm	Treatment Processes	Date of Permit or Startup	Status	Treatment Effectiveness	Capital Costs	O&M Costs
California Domestic	1910199	Rayox	Bassett	5000	Rayox UV Sept 2001		online	good		
San Gabriel Valley Water Company	1910039	Drier Treatment Facility	Baldwin Park	7500	Trojan Low Pressure UV	evaluation	97-005 process ongoing, evaluation	evaluation		
Valley County Water District	1910009	Arrow/Lante Treatment Facility	Baldwin Park	7800	Trojan Low Pressure UV	evaluation	97-005 process ongoing, evaluation	evaluation		

Uranium TREATMENT

Name of System	System No.	Name of Treatment Facility	System Location	Capacity, gpm	Treatment Processes	Type of Resin used in Ion Ex	Date of Permit or Startup	Status	Treatment Effectiveness	Capital Costs	O&M Costs
CWSC-Salinas	2710010	Well 28-01	Salinas	791	Strong base anion resin Type 1 Ion Exchange	ASB-1P-HP by Sybron	Letter of approval June 12, 2002	Active	Good		
Alpine WUA	3610002	Ion Exchange Plant for Uranium	Twin Peaks	25 gpm	Purolite(A-500 P) Type 1 Strong Base Anion	Purolite A-500P	September 1990	Active	Reliable and efficient		
Arrowbear Park CW	3610110	Uranium Removal Facility	Arrowbear Lake	250 gpm	IX Treatment constructed in 1988.The IX resin material specifically designed to exchange chloride ions	Purolite A-501P	April 1993	Active	Reliable and efficient		
Running Springs WD	3610062	Luring Canyon IX (for Luring Canyon Vertical well)	Running Springs	100	DOWEX IX (use DOWEX 21K resin in a chloride form to replace uranyl [illegible])	DOWEX 21K	Prior to 1999	Active			
		Harich IX (for Harich Wells 1, 2 & 3)	Running Springs		DOWEX IX (use DOWEX 21K resin in a chloride form to replace uranyl	DOWEX 21K	Prior to 1999	Currently inactive			

BTEX TREATMENT

Name of System	System No.	Name of Treatment Facility	System Location	Capacity, gpm	Treatment Processes	Date of Permit or Startup	Status	Treatment Effectiveness	Capital Costs	O&M Costs
Arrowhead Villas Mutual Service Company	3610093	None	Sky Forest	31.5 gpm	Counter Current, packed tower air stripping treatment plant	February 1990	Active.	Good		

MTBE TREATMENT

Name of System	System No.	Name of Treatment Facility	System Location	Capacity, gpm	Treatment Processes	Date of Permit or Startup	Status	Treatment Effectiveness	Capital Costs	O&M Costs
City of Santa Monica	1910146	Production Aquifer Remediation System	12054 Wilshire Blvd.	1100	GAC - MTBE up to 180 ug/L; TBA up to 50 ug/L	May 2002	Standby as of April 04 - Ground water tested ND for MTBE and TBA	Effective during Testing		
Arrowhead Villas Mutual Service Company	3610093	None	Sky Forest	31.5 gpm	Counter Current, packed tower air stripping treatment plant	February 1990	Active.	Good		
South Tahoe PUD	0910002		South Lake Tahoe		Advanced oxidation using ozone/hydrogen peroxide					

Nitrate/Nitrite TREATMENT

Name of System	System No.	Name of Treatment Facility	System Location	Capacity, gpm	Treatment Processes	Type of Resin used in Ion Ex	Date of Permit or Startup	Status	Treatment Effectiveness	Capital Costs	O&M Costs
SCWC - San Dimas	1910142	Columbia Plant	San Dimas		Nitrate treatment via Layne environmental with Rohm and Haas regenerable ion exchange resin using flat-head design vessel and fractal distribution.	Amberlite PWA555 by Rohm and Haas. Minimum flow restriction of 2.8 gpm/cft of resin	September 2004	operational	good		
SCWC - San Dimas	1910142	Highway Plant	San Dimas		Nitrate treatment via Basin Water modular regenerable ion exchange system with Purolite resin	Purolite A520-E	evaluation	evaluation			
Crescenta Valley Water	1910028	Glenwood Plant		1600	Ion exchange system	Purolite A400					
California Water Service Company-Salinas, CA	2710010	Well 15-01	Salinas		Nitrate Selective Ion exchange system	SIR-100 by ResinTech	July 2002				
California Water Service Company-Salinas, CA	2710010	Well 21-01	Salinas		Nitrate Selective Ion exchange system	Amberlite PWA555 by Rohm and Haas	June 2003				
California Water Service Company-Salinas, CA	2710010	Well 108-01	Salinas		Strong base anion resin Type 1 Ion exchange system	ASB-1P-HP by Sybron	August 2002				
Tierra Buena Tavern	5105004	NA	Source	15 gpm	Softening/Ion Exchange	Purolite A520E	December 2001	Active	from 75mg/L to 15-20mg/L	Unknown	Unknown
California Institution for Men	3610850	Nitrate IX for all wells	Chino	2,500	Purolite A-400 IX resin (chloride form)	Purolite A-400 IX (chloride form)	June 1905	Currently offline			

Nitrate/Nitrite TREATMENT

Name of System	System No.	Name of Treatment Facility	System Location	Capacity, gpm	Treatment Processes	Type of Resin used in Ion Ex	Date of Permit or Startup	Status	Treatment Effectiveness	Capital Costs	O&M Costs
Chino Basin Desalter Authority - Desalter No. 1	3610075	RO treatment plant	Mira Loma	4,639	Reverse Osmosis (RO) utilizes spiral thin-film composite polyamide membranes (CPA3 membranes was used prior to Nov 2001. ESPA2 membranes have been used since Nov 2001)	NA	April 2000	Active			
East Valley WD	3610064	Plant 132 IX treatment	San Bernardino	1,000	Basin Water IX. Use a strong base Type 1 anion exchange resin manufactured by Purolite (A-400E)	Purolite A-400E	November 2003	Active			
Hi-Desert WD	3610073	IX treatment facility (for Well 12E and 17E)	Yucca Valley	800	Process media: A-400E manufactured by Purolite Co.	Purolite A-400E	September 2002	Active			
GILARDI WATER SYSTEM	4901154	Reverse Osmosis Treatment Plant	Petaluma	10	Osmonics E2 RO	N/A	August 2009	Active			
Woodland, City of	5710006		Woodland		Well Packer with online nitrate analyzer	NA					

Treatment Type,, General Water System Information, Treatment Specifications, and Lessons Learned

	General System Information						Treatment Specifications			Lessons Learned
Treatment Type	**Syst. No.**	**Name of System**	**Name of Treatment Facility**	**Permit Date**	**Startup date**	**Status**	**Treatment Processes**	**Type of Media Used**	**Capacity (gpm)**	**Issues associated with the piloting, design, construction and/or operation of the arsenic treatment system**
AA	0600008	Colusa Co. WW#1 – Grimes	POU	Not permitted		Active	Activated alumina	NA	Unknown	
ADI	2610701	USMC Housing Coleville	Wells 1, 4 & 5 IX	July 2000			Media G2 manufactured by ADI International, Inc.	NA	90	
ATS	1800573	Richmond Elementary School	Well 2 Arsenic WTP	Not permitted	Demonstration Study performed from September 2005 until June 2007 as part of USEPA Arsenic Demonstration Project.	Active	Aquatic Treatment Systems (ATS) As/1200CS As Removal System 1) Soluble As(III) is changed to precipitate As(V) in 1 worker & 1 guard column, 2) Precipitate As(III) is removed in 1 worker & 2 guard columns; all columns are 10-inch Ø & 54-inch height	ATS A/P Complex 2002 oxidation media; ATS A/I Complex 2000 As adsorption media	12	Media is lasting as long as expected; contract with ATS includes return & replacement of media columns
Blending	3410017	California American Water Company - Parkway	Parksite Water Treatment Plant	September 2007	September 2007	Operational	Blending (4 wells)	N/A	1450	

CF Coag/ Filtration	1510017	Indian Wells Valley WD	to be determined	not yet permitted	to be determined	out to bid	coagulation/filtration with iron salt coagulant or adsorption	to be determined	to be determined	Previously had Basin Water IX treatment unit for testing; chlorination required for arsenic oxidation to As +5; de-chlorination required to limit NDMA formation; de-chlorination equipment proved problematic; plant removed from service and water system pilot tested different media. Water system will treat at least two wells and blend with other wells to meet MCL at all sources.
CF Coag/ Filtration	1510018	Rosamond CSD	Well 5 & Well 6	not yet permitted	to be determined	proposed	coagulation/filtration with iron salt coagulant	Lane Christenson LayneOx™ media (manganese dioxide)	to be determined	Water system purchased two package treatment facilities without pilot or bench scale testing and without applying for permit to do so; water system will apply for a permit before putting plant online. In place testing will be required before permitting the plant to deliver water to system.
CF Coag/ Filtration	1610004	City of Corcoran	Arsenic TP	Summer 06		Active	C/F	Greensand	18 MGD	
CF Coag/ Filtration	1610007	Home Garden		Not permitted	SRF project		C/F			
CF Coag/ Filtration	1910004	Golden State Water Company - Artesia	Centralia Plant	Jan 2006 (Centralia Wells 3&4) Sept 2007 (Centralia Well 6)	Jan 2006 (Centralia Wells 3& 4) Feb 2008 (Centralia Well 6)	Active	Chlorine oxidation and coagulation/filtration with ferric chloride addition followed by pressure filtration for arsenic, iron & manganese removal.	Anthracite & sand	2,850	Reliable and consistent system. Raw water arsenic levels are in the 20-30 ppb range. Ferric dosage is approx. 5 mg/L.

CF Coag/ Filtration	1910067	Los Angeles Department of Water and Power	Cottonwood Treatment Plant/Los Angeles Aqueduct Filtration Plant	May 2008	Mid-1990s	Active	Ferric chloride addition at Cottonwood, sedimentation in Haiwee Reservoir, followed by low dose ferric chloride addition and surface water treatment at direct filtration plant (LAAFP). Blending with State Water Project water prior to LAAFP provides additional treatment barrier.	N/A	600 MGD	Raw water arsenic levels are 25-30 ppb. LAAFP was not designed for As removal and this treatment is considered an interim measure. WS is investigating enhanced coagulation + sedimentation at LAAFP.
CF Coag/ Filtration	1910161	Park Water Company - Lynwood	Well 9D	Pilot Phase		Pilot phase	Coagulation/Filtration			Prop 50 funded project
CF Coag/ Filtration	3310012	Elsinore Valley MWD	Back Basin Groundwater Treatment Plant	Not yet permitted	August 2008	Pending approval	Coagulation/Filtration with pre-oxidation (sodium hypochlorite) and coagulation (ferric chloride)	30" anthracite, 18" sand	3500	Pilot testing conducted in 2005
CF Coag/ Filtration	3400229	Rio Cosumnes Correctional Center	Rio Cosumnes Correctional Center	Permit in progress	October 2007	Operational	Coprecipitation with Fe/Mn treatment using Filtronics similar set-up	Proprietary with Aluminum silica	300	
CF Coag/ Filtration	3410012	California American Water Company - Isleton	5th Street Water Treatment Plant	Permit in progress	October 2007	Operational	Coprecipitation with Mn treatment using ferric chloride and Nalcolyte 8105 polymer coagulant	Greensand Plus	736	
CF Coag/ Filtration	3410029	Sacramento County Water Agency - Laguna/ Vineyard	Lakeside WTP (WF-2)	Not permitted	August 2007	Operational	FeCl3 Iron Oxide Adsorption & Coprecipitation with pH adjustment (add'l HCl)	Greensand	4,500	
CF Coag/ Filtration	3410047	California American Water Company - Walnut Grove	Islandview Water Treatment Plant	Permit in progress	Pending	Pending - startup tests in July 2008	Coprecipitation with Mn treatment using Cat-floc 71264 polymer coagulant	Greensand Plus	300	
CF Coag/ Filtration	3410802	R.A. McGee Corr. Training Center	Water Plant	Not permitted	June 1905	Operational	FeCl3 Iron Oxide Adsorption & Coprecipitation	Hungerford & Terry Ferrosand (glauconite) over Anthracite	1,750	

CF Coag/ Filtration	3610004	West Valley WD	Zone 4-1 Arsenic Removal System (treat Well 2)	August 2007		Active	Coagulation/Filtration (C/F) (using ferric chloride for coagulation, and granular media Layne OX™ for filtration)	Granular media Layne OX for filtration	2,000	
CF Coag/ Filtration	3610052	Victor Valley WD (now Victorville WD)	El Evado (treat Wells 25, 28, 31, 34, 37, & 38)	April 2007		Active	(Corollo Engineers) Coagulation/Filtration (C/F) (using ferric chloride for coagulation, and granular media filtration) . It is followed by blending.	Granular media Layne OX for filtration	9,000	
CF Coag/ Filtration	3610052	Victor Valley WD (now Victorville WD)	Balsam (treat Wells 39 & 43)	April 2007		Active	(Corollo Engineers) Coagulation/Filtration (C/F) (using ferric chloride for coagulation, and granular media for filtration)	Granular media Layne OX for filtration	5,400	
CF Coag/ Filtration	3910005	City of Manteca	Well 14 Arsenic Treatment Plant	Not Yet	July 2009	Soon	Greensand Manganese system with coagulation filtration for arsenic	Greensand	900	Had manganese treatment and started adding ferric chloride for arsenic removal
CF Coag/ Filtration	3910023	Oakwood Lake Subdivision	Oakwood Lake Arsenic Treatment Plant	Nov. 2007	Nov. 2007	Operational	LayneOx pyrolucite iron, manganese, and arsenic coagulation filtration system	Pyrolucite	1000 nominal, 2000 max	No capacity for sludge in sewer, so sludge is settled in backwash tank and periodically hauled to appropriate landfill. Pilot test was a failure, but the process worked at a neighboring utility, so those results were used to predict performance.
CF Coag/ Filtration	4900786	Rancho Santa Rosa MHP	None	Piloting	March 2008	Active	Coprecipitation with Fe/Mn treatment using $FeCl_3$	Greensand	30	
CF Coag/ Filtration	5110001	City of Live Oak	Multiple Wells	Being Built	NA	Being Built	Coagulation/Filtration	Cl2 & FeCl3	Varies	3 well sites being equipped with treatment. Not yet operational.
DOW Adsorbsia	2410004	City of Livingston	Well Site No. 16	May 2010	August 2008	Active	Adsorption	DOW Adsorbsia GTO	1,200	The arsenic treatment system has produced water that meets the arsenic MCL since it was put online in August 2008.

Filtronics	1010005	City of Firebaugh	TP 1 & 2	Summer 07		Active	Filtronics media w/ferric chloride/rehab of existing iron/mang plant	Filtronics		
Filtronics	1510046	Lost Hills		Spring 07		Active	C/F	Filtronics		
Filtronics	2310011	Laytonville CWD	NA	Not yet permitted	January 2008	Operational, but effectively getting arsenic removal	Coprecipitation with Fe/Mn treatment using Filtronics similar set-up	Filtronics media, may need additional polishing media	450	Pilot study results have not been realized in full-scale operation. Had initial high pH water from filters for several months (pH>10) which caused carbonate ppt. and clogged distribution system. Difficulty with obtaining support from manufacturer.
Filtronics	4210009	Cuyama Community Services District	Arsenic Removal Plant	January 2006		Active	Filtronics Adsorption Media after ferric chloride treatment	Electromedia I	800	Undersized reclaim tank and sludge beds. Unable to process sludge properly, generating hazardous waste.
Filtronics	5410050	Alpaugh		Not permitted	SRF project		C/F	Filtronics	700	
GFO	3910701	Defense Logistics Agency-Sharpe Site	Sharpe Site Arsenic Treatment Plant	July 2006	May 2006	Operational	GFO Adsorptive Media	GFO	500	
Isolux	3500810	Whispering Pines Retirement Home	None	November 2006		Plant Operating	Isolux media adsorption	Zirconium Hydroxide-Disposable adsorptive media	10	
IX	1510029	Vaughn WC	Palm No. 2 Well		June 2007	Active	Ion Exchange			
IX	3310050	Coachella Valley Water District ID 17	7802 IXTP (Treats Wells 7802 and 7803)	9/25/2007	September 2007	Active	Basin Water Ion Exchange Treatment, strong base ion	ResinTech SBG1	2,000	
IX	3310063	Coachella Valley Water District ID 10	6806 IXTP (Treats Wells 6806 and 6807)	9/25/2007	September 2007	Active	Basin Water Ion Exchange Treatment, strong base ion	ResinTech SBG2	2,000	
IX	3310063	Coachella Valley Water District ID 10	7991 IXTP (Treats Wells 7991 and 7992)	10/5/2005	October 2005	Active	Basin Water Ion Exchange Treatment, strong base ion	ResinTech SBG3	2,000	
IX	3610010	Baldy Mesa CWD (former, now Victorville WD)	Avenal Centralized Arsenic treatment facility	June 2007		Active	Basin Water Ion Exchange Treatment System, using Resin Tech SBG-1, Type 1 strong base anion exchange resin.	Resin Tech SBG-1, Type 1 strong base anion exchange resin.	6,000	

IX	3610010	Baldy Mesa CWD (former, now Victorville WD)	La Mesa centralized arsenic treatment plant	Permit pending	planned Summer 2008	Pending	Basin Water Ion Exchange Treatment System, using Resin Tech SBG-1, Type 1 strong base anion exchange resin.	Resin Tech SBG-1, Type 1 strong base anion exchange resin.	2,000	
Kinetico	3910007	City of Ripon	Well 9 Arsenic Treatment Plant	Jan. 2008	Jan. 2008	Operational	Coagulation Filtration	Kinetico Macrolite	800 nominal, 8000 max.	Backwashed to municipal sewer.
Kinetico	4901232	La Crema Winery	None	June 2008	Full scale pilot started April 2007	Active	Sorptive media. Culligan HiFlo 55e softener, H_2O_2 injection	Kinetico UltrAsorb T titanium based media	100	
MetalEase	3410008	Elk Grove	Railroad WTP	September 2005	September 2005	Operational	Filtration	MetalEase MnO2 media	7,200	
MetalEase	3410008	Elk Grove	Hampton WTP	September 2005	September 2005	Operational	Filtration	MetalEase MnO2 media	1,000	
Pureflow	1910105	Paramount, City of	Well 13 Treatment Plant	February 2007	April 2007	Operational	Coprecipitation with Mn treatment using Pureflow	NA	3000	The City thought it took a long time for the whole piloting process - from initial set up to the final report. Also, the City noted that during start-up, it was a bit difficult to determine the correct chlorine dosage rate to obtain the desired chlorine residual at the plant effluent. Lastly, the Los Angeles County Sanitation District permit was a bit difficult to obtain (for the backwash tank to drain to the sewer).

Pureflow	1910149	Signal Hill, City of	Gundry reservoir Treatment facility	February 2003	February 2007	Operational	Coprecipitation with Fe/Mn treatment using Pureflow	NA	3000	Trying to adapt an old system to new treatment plant. During construction, certain surprises come up which weren't planned for - old as-builts incorrect. Adequate supply of backwash water and storage to place the backwash water important. City's budget was slashed for this project so smaller backwash tank was installed - they now have to cut backwash time and increase backwash frequencies. Pilot study - engineers come up with various testing protocols which took a long time. In addition, engineers requested a bunch of work to get done on last day.
Pureflow	2400075	El Nido Elementary School	Arsenic WTP	Not yet issued	September 2008	Operational	Pureflow C/F system using ferric chloride and chlorine	Pureflow	3.5	This system is under the regulatory jurisdiction of the Merced CHD. It is currently in the commissioning period and the treated water arsenic results have been ND. Mechanical problems with pumps and valves during startup. Poor response from manufacturer (it took a while to get a technician out to do work under warranty)
Pureflow	2610001	Mammoth CWD	Groundwater Treatment Plant 1 (treat Wells 6, 10, 15, & 18)	Permit update pending	Summer 2006 (for arsenic)	Active Permit for Fe and Mn. Pending for As	Coagulation/Filtration through three pressure filters (ferric chloride used as coagulant)	PM-200 media manufactured by Pureflow (manganese dioxide type media)	3,000	

Pureflow	2610001	Mammoth CWD	Groundwater Treatment Plant 2 (treat Wells 16, 17 & 20)	Permit update pending	Summer 2006 (for arsenic)	Active Permit for Fe and Mn. Pending for As	Coagulation/Filtration through two pressure filters (ferric chloride used as coagulant)	PM-200 media manufactured by Pureflow (manganese dioxide type media)	3,000	
Pureflow	3310025	City of Norco	Well 13 Filtration Plant	Not yet permitted	Full scale testing planned for early July 2008	Pending testing and approval	Coprecipitation with Fe/Mn treating using adsorptive/catalytic media filters (similar to Signal Hill system)	Pureflow PM-200 (pyrolusite)	2,000	Retrofit of an existing Pureflow filtration plant originally permitted for manganese removal with change of media to PM-200 and additional chemical pretreatment.
Pureflow	3410011	City of Galt	Industrial Well	April 2007	Offline until further study	Currently being	oxidation with chlorine and ferric chloride addition prior to filtration	Pureflow multimedia	1800	
Purolite ArsenX	1510026	Cal Water - Upper Bodfish System	Upper Bodfish Treatment Plant	not yet permitted	September 2007	online	Hybrid Ion Exchange	Purolite ArsenX media	250	ArsenX media also removes selenium, uranium, and antimony; Care needed to ensure that uranium does not build up too high in the ArsenX media. Treatment train also includes Greensand filtration for iron/manganese removal and activated alumina for fluoride removal. Water system given approval to use treatment plant pending issuance of final permit. Plant treats blend of two wells.
Purolite ArsenX	1510056	Cal Water - Lower Bodfish System	Lower Bodfish Treatment Plant	not yet permitted	November 2007	online	Hybrid Ion Exchange	Purolite ArsenX media	250	Treatment train also includes Greensand filtration for iron/manganese removal. Water system given approval to use treatment plant pending issuance of final permit. Plant treats blend of two or three wells.

Purolite ArsenX	4010007	Paso Robles Water Department	Sherwood Wells 9 & 11	July 2007		Used for summer peaking	MPT (Basin Water) Ion Exchange	Solmetex/Purolite ArsenX iron oxide base regenerable media	1000	Media capacity was approximately 30percent less than the pilot study demonstrated.
Purolite ArsenX	5100141	Meridian School	None	Temp. Only	May 2008	Active	Pre-filter & Post-GAC	Arsenx	10	Just recently started.
Purolite ArsenX	5100142	Nuestro School	None	May 2005	May 2005	Active	2 small units in series	Arsenx	5	Have not always followed permit conditions. As in raw water > 100 ppb
Purolite ArsenX	1500597	Grimmway Farms Frozen Foods	Buildings 2, 3, 4, 5 Point of Entry Treatment Units	Permit under preparation	April 2007	online	POE - Hybrid Ion Exchange with Possible offsite regeneration at Purolite facility in Philadelphia	Purolite ArsenX media	2 gpm each POE unit	After a brief pilot study, Grimmway Farms installed four point of entry treatment units. Each treatment unit has a 2-micron pre-filter. Units are working fine in terms of removal of arsenic. Raw well water is chlorinated. No chlorine residual detected in the effluent of units. Recent HPC sampling of the effluent shows high HPC ranging from 1600 to 2700 CFU/100 mL. Total coliform is negative in the effluent. Further investigation is underway.
RO/Activated Alumina	3310802	Chuckawalla Valley/Ironwood State Prison	RO/AA Plant	12/8/1995	11/1/1993	Active	Reverse Osmosis and Activated Alumina (parallel treatment)	N/A	3600	RO/AA system already in place to treat for TDS & Fluoride, incidentally removing arsenic to <MCL, but removal efficiency and reliability of existing treatment for removal of arsenic has not been confirmed yet.
RO/Activated Alumina	5102009	Church of Glad Tidings	POU	June 2004		Active	RO/Carbon block	NA	1	

Siemens GFH	1510703	China Lake NAWS	Well 25 RW	not yet permitted	2007	online	adsorption	U.S. Filter Granular Ferric Hydroxide (GFH)	150	Water system is providing bottled water until treatment data has been evaluated and the permit is issued.
Siemens GFH	1510703	China Lake NAWS	Well Sea Site 3	not yet permitted	2007	online	adsorption	U.S. Filter Granular Ferric Hydroxide (GFH)	25	Water system is providing bottled water until treatment data has been evaluated and the permit is issued.
Siemens GFH	1910195	Golden State Water Company - Hollydale	Century Plant	February 2006	February 2006	Active	Chlorine oxidation followed by two-stage filtration: pyrolusite for Mn removal then GFH for As removal.	Siemens GFH	600	Pilot plant was part of AwwaRF Project #2661 (Volume 2). This plant is operated much more intermittently than the Hawaiian & Massinger Plants and has only had one media change out so far. However, performance was similar to the GFO plants, with about 28,000 BV treated before change out occurred. WS is not pursuing any treatment changes at this site, despite the similarity in performance, because the frequency of change out (approximately annually) is much less burdensome.

Siemens GFH	2400172	Sandy Mush Detention Center			May 2008	Operational	Adsorption	Siemens GFH	200	This system is under the regulatory jurisdiction of the Merced CHD. Model predicted breakthrough at 9 months, but actual breakthrough occurred at 6 months. Vendor was not able to replace media expediently (took longer than 1 month). Treatment system had not been backwashed yet as of the date of breakthrough.
Sorb 33	1010028	Riverdale PUD	Well No. 2	Spring 07		Stand by	Adsorption	Bayoxide E-33	1,250	
Sorb 33	1510006	East Niles CSD	Well No. 21	Fall 07		Active	Adsorption	Bayoxide E-33	1,600	
Sorb 33	1805004	CDCR - High Desert State Prison	Arsenic WTP	05/01/2008 (Temporary)	Kennedy-Jenks performed 18-month Pilot Study; WTP Operational June 2008	Active	1) pH is lowered w/ carbonic acid (CO_2), 2) water is sent through filter beds, 3) pH is raised with sodium hydroxide (NaOH)	Severn Trent granulated iron media	2,222	Contract includes guarantee on number of bed volumes it will treat based on concentration of Arsenic in raw water

Sorb 33	1910004	Golden State Water Company - Artesia	Hawaiian Plant	March 2006	May 2006	Active	Chlorine oxidation followed by two-stage filtration: pyrolusite for Mn removal then GFO for As removal.	Severn Trent Bayoxide E33 (GFO)	600	Reliable removal of arsenic (raw water levels about 15-25 ppb); however, bed life has been much shorter than anticipated (change out typically occurs after 31,000 to 37,000 bed volumes; Severn Trent had predicted the media life would be 94,000 BV). WS tried using "pelletized" GFO, and bed life was even shorter (13,000 BV). Permit amendment included aggressive monitoring schedule to ensure media change out before arsenic MCL was exceeded at plant effluent. Spent media has not been hazardous thus far. WS submitted an excellent report on the first year of operation for this plant and the Massinger plant, which is being sent with this table. Report includes this statement: "The most valuable lesson that was learned from the first year of operation of the Hawaiian and Massinger plants was that pilot testing should have been performed at each site during the design phase." WS is currently considering options such as pH adjustment or retrofit to coag/filtration system to improve plant performance.

Sorb 33	1910004	Golden State Water Company - Artesia	Massinger Plant	March 2006	May 2006	Active	Chlorine oxidation followed by two-stage filtration: pyrolusite for Mn removal then GFO for As removal.	Severn Trent Bayoxide E33 (GFO)	600	This plant is almost identical to the Hawaiian Plant described above except that raw water As levels are higher (approx. 20-30 ppb) and media bed life has been correspondingly shorter (24,000-28,000 BV before change out; Severn Trent prediction was 58,000 BV; bed life with "pelletized" GFO was 15,000 BV). First year results and analysis are in report prepared by water system, which is being sent with this table.
Sorb 33	2910003	TDPUD Main System	Northside Well	Temp. Only	June 2008	Active	Severn Trent	Bayoxide	750	
Sorb 33	2910010	TDPUD Hirshdale	None	Temp. Only	August 2007	Active	Severn Trent/Also Fe & Mn Trt.	Bayoxide	30	
Sorb 33	3400106	East Walnut Grove	East Walnut Grove	Permit in progress	~spring 2006	Operational	Severn Trent adsorptive media	Disposable adsorptive media	300	5 year life media is being changed every year. CO2 used for pH adjusted-now exceeds LCR. New pilot underway for new media.
Sorb 33	3610013	City of Loma Linda	Wells MV3 and MV5	April 2006		Active	Adsorption using Bayoxide E33 (GFO)-SORB 33 Technology	Granular Ferric Oxide (Sorb 33) by Severn Trent	6,000	
Sorb 33	3610049	Twentynine Palms WD	Well 11 Treatment System	October 2007		Active	Adsorption using Bayoxide E33 (GFO)-SORB 33 Technology	Granular Ferric Oxide (Sorb 33) by Severn Trent	325	
Sorb 33	3910005	City of Manteca	Well 24 Arsenic Treatment Plant	Not Yet	Pending correction of nitrate exceedence	Not anticipated soon	Severn Trent BayOxide Sorb 33 GFO Adsorption	GFO	2000	Discovered that nitrates now also exceed the MCL.
Sorb 33	3910005	City of Manteca	Well 25 Arsenic Treatment Plant	Not Yet	Expect July 2009	Soon	Severn Trent BayOxide Sorb 33 GFO Adsorption	GFO	2500	

Appendix 9. Major State Drinking Water Legislation Enacted Since the Publication of the 1993 Plan

1994

Assembly Bill 2098 - Chapter 251, Statutes of 1994.

Substituted the term "Recommended Public Health Goal" for the term "Recommended Public Health Level" wherever it appears in the California Safe Drinking Water Act to eliminate confusion created by the latter.

Assembly Bill 2681 - Chapter 1040, Statutes of 1994.

Required DHS to grant variance from the primary drinking water standard for fluoride to any district upon request. Existing law only required DHS to grant variances for four specific drinking water agencies.

1995

Assembly Bill 733 - Chapter 660, Statutes of 1995.

1) Directed the DHS to adopt regulations that require the fluoridation of all public water systems that have at least 10,000 service connections.

2) Required those regulations include: a minimum and maximum permissible concentrations of fluoride; procedures for maintaining proper connections of fluoride, including equipment, testing, record-keeping and reporting; and a schedule for the fluoridation of individual public water systems based on the size of the system and the population being served.

3) Permitted a public water system schedule to fluoridate pursuant to the provisions of the bill to comply with the regulations adopted by the DHS at any time, but the requirement to comply may not be enforced until sufficient funding to pay the capital costs for the system is available from any source.

4) Required the DHS to seek all sources of funding for enforcement of the standards and capital cost requirements and permitted a public water system to collect a fee from its customers to recover the costs incurred in complying with the requirement to fluoridate.

5) Specified that DHS enforce the provisions unless authority is delegated under a local primary agreement.

6) Permitted the Attorney General, upon request of DHS, to institute mandamus proceedings, or other appropriate proceedings, in order to compel compliance with these provisions upon reticent owners or operators of public water systems.

Senate Bill 1172 - Chapter 673, Statutes of 1995.

1) Made various technical changes to definitions set forth in the California Safe Drinking Water Act (CSDWA), including adding a definition of human consumption and "resident."

2) Required the DHS to exempt from the act any noncommunity water system serving a transient population that provides restrooms for employees or the public provided:

(a) The water system is in compliance with either of the following:

(i) No water is served for public human consumption other than for hand washing; or

(ii) Approved bottled water is provided for consumption other than hand washing;

(b) The water provided for hand washing is bacteriologically safe. (Requires sampling at least once each calendar year and a report to the DHS); and

(c) The non-community water system is not a business regulated as a food facility.

3) Required public water systems to employ or utilize DHS-certified water treatment plant operators or operators-in-training.

4) Sets the fee for exempted noncommunity water systems at $100.

1996

Senate Bill 2727 - Chapter 875, Statutes of 1996

1) Authorized the enforcement agency implementing the California Uniform Retail Food Facilities Law (CURFFL) to monitor and enforce the potable drinking water standards as required in the CSDWA.

2) Defined "potable water" for the purposes of CURFFL as water that complies with the requirements for water from transient noncommunity water systems under the CSDWA.

3) Provided that potable water under the CSDWA applies to a food facility only if the human consumption at the food facility includes the drinking of water.

4) Defined a "nontransient noncommunity water system" as 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, and "transient noncommunity water system" as a noncommunity water system that does not regularly serve at least 25 of the same persons over six months per year.

5) Revised certain definitions in the CSDWA.

Assembly Bill 3483 – Chapter 197, Statutes of 1996.

Extended the then current public water system regulatory program from 1/1/1997 to 1/1/2002, and capped the DHS's fee authority under the program with respect to large water systems.

Senate Bill 1307 – Chapter 755, Statutes of 1996.

1) Changed the term "Recommended Public Health Goal" as it was used in the CSDWA to "Public Health Goal."

2) Declared that the primary purpose of the bill was to clarify that public health goals are a risk assessment construct and are not enforceable regulatory standards.

3) Reformatted and clarified the criteria the DHS is required to use when adopting public health goals and maximum contaminant levels for contaminants in drinking water supplies. Also establishes a schedule for adopting public health goals for contaminants for which maximum contaminant levels have already been adopted and requires they be reviewed every five years.

4) Requires that the State DHS prepare a CSDWA Plan every five years. (Under existing law, this was a one-time requirement that was completed in 1993.)

5) Repealed the existing requirement that an annual water quality report on the level of contaminants in water be sent to consumers and replaced it with a requirement that a "consumer confidence report" containing specified information be sent instead. The consumer confidence report will contain information that meets the requirements for that report recently enacted in the federal Safe Drinking Water Act Amendments of 1996.

6) Repealed the requirement that public water systems with more than 10,000 service connections evaluate the feasibility of reducing contaminants in their water supplies to the public health goal levels, and, if such reductions are feasible, take appropriate steps to implement reasonable measures to reduce contaminant levels as part of permit conditions.

7) Instead required large public water systems to prepare a report on contaminants in water supplies that exceed public health goal levels, the commercial technologies available to reduce the contaminant levels, what the estimated costs of reduction technologies are, and what action, if any, the public water systems intend to take to reduce contaminant levels.

Senate Bill 1851 – Chapter 874, Statutes of 1996.

1) Defined "potable water" under the CURFFL.

2) Defined "nontransient noncommunity water systems" and "transient noncommunity water systems" for the purposes of regulation under CSDWA.

3) Authorized local health departments to monitor and enforce potable drinking water standards included in the CSDWA as part of their regulation of the CURFFL.

4) Applies the CSDWA to food facilities only when facilities provide for human consumption of drinking water.

1997

Assembly Bill 592 – Chapter 814, Statutes of 1997.

1) Required DHS to establish a primary drinking water standard for MTBE which specifies maximum levels of

contaminants that, in the judgment of DHS may have an adverse effect on the health of persons, and a secondary quality drinking water standard for MTBE which specifies the maximum contaminant levels that, in the judgment of DHS, may adversely affect the odor or taste of the water.

2) Required the state board to conduct a pilot study on groundwater drinking well vulnerability using GIS mapping of site hydrology, drinking water well locations and location of underground tanks and pipelines.

3) Established an advisory committee to evaluate current management standards for underground storage tanks and pipelines.

4) Created the MTBE Emergency Action Account for funding cleanups or to provide alternative drinking water supplies in the case of contaminated wells; funded upon appropriation by the Legislature.

5) Created the "MTBE Voluntary Research Partnership" which allowed participation of state and local agencies, water purveyors and MTBE manufacturers and users in a

research partnership that will pursue treatment techniques for MTBE contamination; funding to be provided by participants.

6) Required the State Fire Marshal to develop a comprehensive database of pipeline information for utilization in emergency response, identification of vulnerable drinking water supplies, and adoption of pipeline safety measures, as specified.

7) Required each Regional Water Quality Control Board (regional board) to publish and distribute, on a quarterly basis, to all public water system operators, a list of MTBE discharges that occurred during the quarter.

8) Required the State Water Resources Board (state board) to create a GIS Mapping and Date Management Advisory Committee which will direct two pilot studies on drinking water vulnerability by mapping existing underground tanks, pipelines and drinking water wells in Santa Clara Valley and Santa Monica.

9) Allowed the state board to annually expend up to $5 million from a subaccount within the Underground Storage Tank (UST) Fund to reimburse costs up to $1 million incurred by owners and operators of public drinking water supply sources that have been contaminated by MTBE.

10) Required DHS to adopt a primary drinking water standard for MTBE on or before July 1, 1999, and to adopted a secondary drinking water standard on or before July 1, 1998. Authorized DHS to set primary drinking water standards for other oxygenates, as needed.

11) Required the Scientific Advisory Panel of the CA Drinking Water and Toxic Enforcement Act, on or before January 1, 1999 to recommend whether MTBE should be listed as a carcinogenic or reproductive toxin.

12) Required that a public water system shall have the same legal rights and remedies against a responsible party as a private landowner would have against such parties.

13) Specified that the bill would only become operative if SB 1189 was also enacted.

Assembly Bill 1460 – Chapter 524, Statutes of 1997.

1) Allowed recreational activity in which there is bodily contact with the water to continue in the Nacimiento Reservoir if the water is:

(a) Thoroughly treated before being used for domestic purposes; and

(b) Discharged, percolates into groundwater, and is subsequently treated or disinfected before domestic use.

2) Required any agency that removes water from the reservoir for domestic use to comply with any, or at a minimum, with one of three options with regard to the treatment of the removed water; and the water is subsequently treated in compliance with all DHS regulations.

3) Required that the water stored for domestic purposes that may be excepted from current law is removed from the reservoir by an agency for domestic purposes only in San Luis Obispo County and only in an amount for which that agency has a contractual right.

Senate Bill 373 - Chapter 274, Statutes of 1997

1) Authorized DHS to suspend, revoke, or refuse to grant or renew any operator or operator-in-training certificate to operate or supervise the operation of a water treatment plant, or to place on probation or reprimand a certificate holder upon any reasonable grounds, including submission of false/misleading information, willful/negligent acts, incompetence, fraud or failure to meet requirements for recertification.

2) Required DHS to provide certificate holders with a hearing before revoking a valid operator certificate.

3) Permitted the State Water Board to approve, for supervisors and operators of water recycling treatment plants, a water treatment plant operator of appropriate grade certified by the DHS in lieu of a wastewater treatment plant operator, provided that the State Water Board may refuse to approve or revoke its approval if the operator commits certain prohibited acts.

4) Required regional water quality control boards that enforce applicable water reclamation or water discharge requirements to notify DHS in writing if inspections determine possible grounds for not issuing or suspending or revoking a certificate of a certified operator who is operating or supervising the operation of a water recycling treatment plant.

Senate Bill 521 – Chapter 816, Statutes of 1997.

Provided that no water system, or its customers, is to be responsible for remediation or treatment costs of water contaminated by MTBE or a product containing MTBE.

Senate Bill 1189 – Chapter 815, Statutes of 1997

1) Required DHS to adopt a primary drinking water standard for MTBE on or before July 1, 1999, and to adopt a secondary drinking water standard on or before July 1, 1998.

2) Allowed the state board to annually expend up to $5 million from a subaccount within the Underground Storage Tank Fund to reimburse costs up to $1 million incurred by owners and operators of public drinking water supply sources that have been contaminated by MTBE.

Senate Bill 1307 – Chapter 734, Statutes of 1997

1) Under the CA SDWA, among other things:

(a) Specified the Act does not apply before August 1, 1998, to certain irrigation canal systems or in areas where the water service rendered by a person is primarily agricultural.

(b) Prohibited certain water districts in existence prior to May 8, 1994, that provide primarily agricultural services through a piped water system with only incidental residential or similar uses, from being considered a public water system if DHS makes certain determinations.

(c) Revised the findings DHS is required to make as a condition of exempting any public water system from the contaminant level and treatment technique requirements.

(d) Prohibited a public water system in existence on January 1, 1998, rather than January 1, 1991, from being granted a permit by DHS to operate a public water system unless the system is able to demonstrate adequate financial capability to deliver drinking water, and further requires the system to demonstrate adequate managerial and technical capability.

(e) Limited the requirement that the prevailing party be awarded litigation costs brought to enforce the Act to any civil action, rather than to any court action.

(f) Increased the daily civil penalty for failure to comply with an citation to order issued for violations or primary and secondary drinking water standards from $250 to $1,000.

2) Enacted the Safe Drinking Water State Revolving Fund (SDWSRF) Law of 1997, which, among other things:

(a) Authorized DHS to administer the SDWSRF, which would be established in the State Treasury and continuously appropriated to DHS to provide loans and grants to public water systems for infrastructure improvements.

(b) Set forth the eligibility, ranking, and funding of projects.

(c) Limited the amount of the Fund that may be awarded for grants and expended for administration.

(d) Required DHS, upon receipt of federal capitalization grant funds, to develop and implement a program to protect sources of drinking water.

3) Deleted provisions regulating the use and sale of solder containing more than certain amounts of lead and the use of lead pipe, and instead, prohibits any person from using any pipe, solder, or flux that is not lead free in the installation or repair of any public water system of any plumbing in a facility providing water for human consumption. These materials were also prohibited from being introduced into commerce or sold by any person in the business of selling plumbing supplies. DHS required to adopt building standards to implement the provisions.

4) Authorized the State Water Resources Control Board to develop and implement a ground water protection program as provided under the federal Safe Drinking Water Act and any federal acts that amend or supplement that Act.

Senate Bill 1312 – Chapter 437, Statutes of 1997

Prohibited the Department of Fish and Game from putting a poison in a drinking water supply to manage a fishery unless DHS determines it will not have an adverse impact on the quality of the drinking water supply. In making the determine, DHS must:

(1) Evaluate the short- and long-term health effects;

(2) Ensure that an alternative drinking water supply is supplied to users during the poisoning process; and

(3) Develop and implement a monitoring program to make sure the poison and its components are gone from the water after the process ends

Assembly Bill 921 – Chapter 295, Statutes of 1998.

Prohibited DHS from issuing or amending a permit for a public water system to use as a source of supply a reservoir that has been augmented with recycled wastewater, unless DHS:

(1) Performs an engineering evaluation and finds that the technology proposed to treat the recycled water will ensure that all applicable drinking water standards are met and that the water poses no significant threat to public health; and

(2) Holds at least three public hearings in the area where the recycled water is proposed to be used for drinking water.

1998

Senate Bill 2198 – Chapter 997 Statutes of 1998.

1) Shifts (annually) $5 million for the Underground Storage Tank (UST) Cleanup Fund and appropriated $5 million from the General Fund to DHS to provide the financial assistance to public water systems.

2) Allowed DHS to spend this money to make payments to public water systems for the costs of a) treating oxygenate-contaminated water, b) investigating possible sources of the contamination, c) acquiring alternative sources of drinking water, and d) pay for, up to $1 million annually, DHS research and development of cost-effective technologies to treat this contaminated water.

3) Required DHS to be reimbursed by a recipient public water system to the extent the system recovers its costs from parties responsible for the contamination. The public water systems are required to "aggressively pursue" cost recovery from these parties.

4) Prohibited the Air Resources Board (ARB) from adopting any regulation requiring any oxygenate to be added to motor vehicle fuel unless the regulation is subject to "multimedia rulemaking."

5) Exempted, from state regulation of USTs containing hazardous substances, unburied fuel delivery piping at marinas if daily inspections are conducted and recorded in an owner's log.

6) Required DHS to establish an 11-member Research Advisory Committee to review requests for research.

7) Required the committee members to be appointed by the director and to consist of:

(a) Four members representing public water systems;

(b) Four members representing entities paying into the UST Cleanup Trust Fund;

(c) One member representing environmental interest groups;

(d) One member representing consumer interest groups; and

(e) One member representing the department.

Senate Bill 2201 – Chapter 70, Statutes of 1998.

1) Prohibited recreational uses in the Modesto Reservoir where there is bodily contact with water unless certain conditions were met to further protect public health and safety.

2) Specifically, the bill required the Modesto Irrigation District file a report on the recreational uses and water treatment program at Modesto Reservoir with the Legislature, on or before January 1, 2002; and required the report to include:

(a) Estimated levels and types of recreational uses at the reservoir and levels of methyl tertiary butyl ether on a monthly basis;

(b) Summary of available monitoring in the Modesto Reservoir watershed for G*iardia* and C*ryptosporidium*;

(c) Sanitary survey of the watershed and water quality monitoring plan;

(d) Evaluation of recommendations relating to removal and inactivation of *Cryptosporidium* and G*iardia*;

(e) Annual reports provided to DHS;

(f) Evaluation of source water quality due to recreational activities on the Modesto Reservoir, including microbiological monitoring;

(g) Summary of activities between the district and county for operation of recreational uses and facilities in a manner that enhances water quality; and

(h) Reservoir management and operations plan; and (i) annual water quality reports to consumers.

3) This bill sunsetted January 1, 2004.

1999

Senate Bill 1107 – Chapter 755 Statutes of 1999.

1) Required DHS to certify operators in a manner that is consistent with the federal Safe Drinking Water Act (SDWA) and to make sure those persons who oversee public water system distribution possess a DHS-issued certificate, as well.

2) Specified the process for certification issuance, upgrading, suspension and revocation and allows the DHS to re-certify operators who are already certified under a grandfathering clause.

3) Required operators to take appropriate continuing education courses and authorizes the DHS to charge fees to cover its certification-related costs.

4) Created the Drinking Water Operator Certification (DWOC) Special Account into which certification fee revenue is deposited to cover the DHS' costs for administering the expanded certification program.

2001

Assembly Bill 61 – Chapter 619, Statutes of 2001.

Authorized DHS to appropriate money for the study, design, and construction of water systems based on specified grants and/or loans, including the participation of a not-for-profit water company.

Assembly Bill 430 – Chapter 171, Statutes of 2001.

Indefinitely extended provisions of the CA SDWC that requires DHS to administer provisions relating to the regulation of drinking water and public water systems; and assess fees on public water systems serving 1,000 or more service connections, depositing monies collected into the SDW Account Fund.

Senate Bill 351 – Chapter 602, Statutes of 2001.

Required DHS to adopt a primary drinking water standard for hexavalent chromium by January 1, 2004; and required a report on the progress of developing the standard to the Legislature by January 1, 2003.

Senate Bill 463 – Chapter 604, Statutes of 2001.

1) Made specific findings relating to state and federal standards for arsenic in public water supplies. The finding presented the case for why current standards are not protective of public health.

2) Required OEHHA to develop a public health goal (PHG) for arsenic in drinking water by December 31, 2002.

3) Directed the Secretary of Environmental Protection to also develop language, by December 31, 2002 to be included in consumer confidence reports (CCRs) on the health effects of ingesting arsenic in drinking water. After July 1, 2004, this language is to be included in CCRs that are sent to customers in water systems that measure arsenic in their finished water at levels of detection or PHGs, whichever is higher.

4) Required DHS to begin revising the process for revising the primary drinking water standard for arsenic by January 1, 2002, and directed DHS to adopt revised standards by June 30, 2004. In setting the new standard, DHS must consider emerging technologies that may cost-effectively reduce exposure to arsenic in drinking water.

Senate Bill 609 – Chapter 606, Statutes of 2001.

1) Authorized the board of supervisors of any county to contract up to 30 years with any state agency to finance any improvements relating to the provision of water service within a county service area that is established to provide water service.

2) Broadened the definition of "public agency" as it relates to eligibility for state and federal funds for water system project through a grant and loan program administered by DHS.

3) Authorized a district formed pursuant to the Public Utility District Act to contract with any state agency to finance any district improvements that are related to the provision of water for human consumption. Authorized that term of the contract to extend up to 30 years. Allowed these districts to exceed the cap on the amount of indebtedness specified in law when it contracts with any state agency to finance district improvements that are related to the provision of water for human consumption.

2002

Senate Bill 2481 – Chapter 999, Statutes of 2002.

1) Reestablished the Drinking Water Treatment and Research Fund ("drinking water fund") in the State Treasury for use by DHS to make payments to public water systems (PWSs) for the costs of treating contaminated groundwater and surface water for drinking water purposes, investigating the contamination and acquiring alternate water supplies. DHS also authorized to spend up to $1 million for research into treatment technologies and cover its administrative costs which cannot exceed 5percent.

2) Exempted PWSs from the requirement to aggressively pursue cost recovery of funds it receives from the drinking water fund under $1 million.

3) Required PWSs that detect an oxygenate at any level in its groundwater supply to notify the State Water Board and the Regional Water Boards. Either of the boards is required to determine whether to shirt down or curtail the use of the well within 30 days of receiving the notification.

Senate Bill 1093 – Chapter 968, Statutes of 2002.

Exempted Sly Park Reservoir in El Dorado County from the bodily contact prohibition in existing law and specifically allowed bodily contact with the water by any participant under certain conditions.

Senate Bill 1822 – Chapter 425, Statutes of 2002.

1) Defined public health goal (PHG) to be a goal established by the OEHHA pursuant to criteria specified by law.

2) Required OEHHA to adopt a PHG for perchlorate by January 1, 2003 using criteria established under the law.

3) Required DHS to adopt a primary drinking water standard for perchlorate by January 1, 2004 using criteria established under the law.

2003

Assembly Bill 181 – Chapter 167, Statutes of 2003.

1) Authorized public water systems to provide a notice of noncompliance that states specified requirements to

be recorded, and recording and proper indexing provides constructive notice of the requirements. Explicitly states that these notices do not constitute a title, defect, lien or encumbrance.

2) Required the public water system or water district to provide notice of the recordation to the record owners of the real property and to record a subsequent notice of compliance when the public water system or water district determines that the prescribed requirements have been met.

3) Required a water district subject to the provisions to annually publish a notice in a newspaper of general circulation describing any requirements and actions prescribed by the department to be taken by the water district and any record of compliance by the water district with these requirements and actions.

4) Specified the provisions shall not relieve a water district from complying with any other provisions of law.

Senate Bill 1074 – Chapter 742, Statutes of 2003.

1) Extended indefinitely the statutory authorization for recreational uses of the water in the Modesto Reservoir if certain conditions are satisfied.

2) Authorized DHS to require the Modesto Irrigation District (MID) to file a report, demonstrating that water quality will not be affected if there is a change in operation of its treatment facility or a change in the quantity of water to be treated at the facility.

2004

Assembly Bill 1934 – Chapter 374, Statutes of 2004.

1) Allowed recreational activity in which there is bodily contact with the water in Bear Lake Reservoir by any participant, under the following conditions:

(a) The reservoir water receives on-going complete water treatment, beginning no later than June 30, 2006;

(b) The Lake Alpine Water Company (Water Company) conducts a monitoring program for total coliform bacteria at the reservoir intake at a frequency to be determined by DHS; and,

(c) The reservoir is operated in compliance with DHS regulations.

2) Made the recreational use of the reservoir subject to additional conditions and restrictions adopted by the entity operating the water supply reservoir to further protect or enhance the public health and safety.

3) Required the Water Company to file a report with DHS and the Legislature no later than January 1, 2006, on the recreational uses of the reservoir and the water treatment program, that includes:

(a) Estimated levels and types of recreational uses at the reservoir on a monthly basis;

(b) The sanitary survey of the watershed and water quality monitoring plan;

(c) An evaluation of the impact on source water quality due to recreational activities on the reservoir, including any microbiological monitoring;

(d) The reservoir management plan and the operations plan; and,

(e) The annual water reports submitted to the consumers each year.

(f) Information on water quality.

4) Made a finding and declaration that a special law is necessary.

5) Limited the exemption by ending it on January 1, 2007.

Assembly Bill 2439 – Chapter 519, Statutes of 2004.

Exempted the Canyon Lake Reservoir within the Elsinore Valley Municipal Water District (Riverside County) until January 1, 2008, from the bodily contact prohibition in current law and specifically allowed bodily contact with the water by any participant under certain conditions.

Assembly Bill 2528 - Chapter 679, Statutes of 2004.

1) Deleted the requirement that a person operating PWS must notify the governing body of the local agency, in which its users of a drinking water supply reside, within 30 days of the closure of a well, or of discovery of a contaminant in a PWS drinking water well, exceeding the maximum contaminant level (MCL) or action level for drinking water.

2) Required, instead, that the operator of a wholesale or retail PWS provide a specified notice, within 30 days of when it is "first informed of a confirmed detection of a contaminant found in the drinking water delivered by a PWS for human consumption" that is in excess of a notice triggering level. The notice triggering levels are contamination that exceed:

(a) The MCL;

(b) A response level; or

(c) A notification level.

3) Defined a "retail water system" as PWS that supplies water directly to the end user. It also defines a "wholesale water system" as a PWS that supplies water to other PWSs for resale.

4) Directed an operator of a wholesale PWS to notify the wholesale PWSs governing body and the water systems that are directly supplied with that drinking water.

5) Directed an operator of a retail PWS to notify the retail water system's governing body and the governing body of the local agency in which users of the drinking water reside.

6) Required PWSs regulated by the Public Utilities Commission (PUC) to also notify PUC. PUC can order further action that is "not inconsistent with the standards and regulations of DHS to ensure a potable water supply.

7) Specified that the notification identify:

(a) The drinking water source;

(b) The origin of the contaminant if known;

(c) MCL, response level, or notification level;

(d) The concentration of the detected contaminant;

(e) The operational status of the drinking water source; and,

(f) A brief statement of health concerns.

8) Defined "notification level" as the non-regulatory concentration level of a contaminant in a drinking water source that DHS has determined, based on available scientific information, does not pose a significant health risk, but warrants notification of the governing body of the area in which the water is served.

9) Defined "response level" as the concentration of a contaminant in a drinking water source at which DHS recommends that additional steps, beyond notification of the governing body by the operator of the retail PWS, be taken to reduce public exposure to a contaminant that has yet to undergo or complete the standard setting process prescribed for the development of MCLs.

Senate Bill 96 – Chapter 727, Statutes of 2004.

1) Made findings and declarations related to the protection and maintenance of dental health through the fluoridation of drinking water and the intent of the Legislature to preempt initiatives that would prohibit or restrict the fluoridation of drinking water and decrease the burden of Medi-Cal and Denti-Cal on the state's limited funds.

2) Clarified that a PWS with at least 10,000 service connections and natural level of fluorides that is less than the minimum established by regulations is required to be fluoridated.

3) Required a PWS with at least 10,000 service connections to provide the Department of Health Services (DHS) with an estimate of the total capital costs to install fluoridation treatment at ten-year intervals, unless one has been installed.

4) Specified that the purpose of the schedule required for the fluoridation of PWSs and established under regulations is not to mandate the order in which PWSs receiving funding from private sources must fluoridate their water. Permits available funds to be offered to any system on the schedule.

5) Required estimates of the total capital and associated costs related to fluoridation treatments, as specified, provided by a PWS to DHS to be reasonable, as determined by DHS, and prohibits intangible or speculative costs. Requires a registered civil engineer recognized or employed by DHS who is familiar with the design, construction, operation and maintenance of fluoridation systems to determine whether costs are reasonable.

6) Defined "cost" as only those costs requiring an actual expenditure of funds or resources, and do not include costs that are intangible or speculative, including, but not limited to, opportunity or indemnification costs.

7) Exempted a PWS with multiple water sources, when funding is not received to fluoridate all sources, from maintaining required fluoride levels in areas receiving any

non-fluoridated water until funding is received to fluoridate the entire water system and the system is installed and operational.

8) Exempted a PWS from being required to fluoridate if:

(a) The PWS has been offered, pursuant to a binding contractual offer, the capital and associated funds necessary for fluoridation, as specified, and has completed the installation of a fluoridation system, however, in any given fiscal year funding is not available to the PWS sufficient to pay the noncapital operation and maintenance costs, as specified, from any outside source, as specified. Renders a PWS unqualified for an exemption for a particular year if a binding contractual offer to provide funds for 12 months, without regard to fiscal year, of noncapital operation and maintenance costs is received; and

(b) Funding provided by an outside source for capital and associated costs is depleted prior to completion of the installation of a fluoridation system, and funds sufficient to complete the installation have not been offered pursuant to a binding contractual offer to the PWS system by an outside source. Requires, in the event of a disagreement between a PWS and an outside funding source about the reasonableness of additional capital and associated costs, a registered civil engineer recognized or employed by DHS who is familiar with the design, construction, operation and maintenance of fluoridation systems to determine whether the costs are reasonable.

9) Required a PWS to fluoridate if funds are offered for that purpose.

2005

Senate Bill 197 – Chapter 252, Statutes of 2005.

1) Changed the date that ongoing water treatment must start at Sly Park Reservoir from June 30, 2005 to a date that is before swimming and other recreational activities were first formally allowed.

2) Specified that water treatment must comply with the USEPA's Long-Term 2 Enhanced Surface Water Treatment regulations.

3) Required the impact evaluation, a component of an existing requirement that the El Dorado Irrigation District report to DHS, to be prescribed by the department.

Senate Bill 979 – Chapter 139, Statutes of 2005.

1) Deleted the requirement, for the Bear Lake and Canyon Lake Reservoirs, that DHS consult with the entity

operating the reservoir at least 60 days prior to the effective date of any additional conditions or restrictions.

2) Deleted the January 1, 2006 date from Canyon Lake Reservoir to meet prescribed federal standards and revises other water treatment requirements for the reservoir.

2006

Assembly Bill 2367 – Chapter 347, Statutes of 2006.

Changed penalties for various legal violations: including changing second or subsequent violations of specified SDWA provisions from imprisonment in state prison for up to 24 months to imprisonment in the state prison for 16, 20, or 24 months.

2007

Assembly Bill 783 – Chapter 614, Statutes of 2007.

1) Defined "small community water system" as a community water system that serves no more than 3,300 service connections or a yearlong population of no more than 10,000 persons.

2) Defined "disadvantaged community" as the entire service area of a community water system, or a community within that service area, in which the median household income is less than 80percent of the statewide average.

3) Gave direction to CDPH to promote environmental justice goals in its programs to improve and expand small community water systems in four ways:

(a) Prioritized the funding of water projects in communities with below-average median household income;

(b) Promoted consolidation of small, public water systems when consolidation would improve the quality, reliability, or affordability of water to these communities;

(c) When small community water systems serve these communities, directs CDPH to provide funding for pre-construction studies on the feasibility of water system consolidation; and,

(d) When feasibility studies show that consolidation of small, public water systems will improve the quality, reliability, or affordability of water to these communities, prioritizes funding for projects that involve consolidation of those water systems.

4) Increases the maximum value of oral contracts entered into by CDPH which it has determined are necessary for the remedy or prevention of an emergency or imminent

threat to public health from water contamination or potential water contamination from $5,000 to $10,000.

Senate Bill 1029 – Chapter 725, Statutes of 2007.

Established timeframes by which regulations relating to maximum contaminant levels (MCLs) for primary and

secondary drinking water standards proposed by CDPH must be reviewed as part of the regulatory adoption process. For regulations pertaining to issues other than MCLs for primary or secondary drinking water standards, authorized CDPH to adopt specified federal rules and regulations in accordance with specified procedures.

Senate Bill 1046 – Chapter 253, Statutes of 2007.

Extended indefinitely by deleting the January 1, 2008, those provisions prescribing conditions for recreational use that include a prohibition on bodily contact unless water treatment conditions are met, for the Canyon Lake Reservoir in Riverside County.

2009

Assembly Bill 890 – Chapter 259, Statutes of 2009.

1) Required the public water systems serving the City of Maywood to conduct, publish, and distribute a study on the source of manganese in the water serving the City of Maywood and actions that can be taken to improve the water to a level consistent with surrounding communities.

2) Required the city council of Maywood to conduct a public hearing concerning the results of the study.

3) Required the public water systems to respond to comments from the hearing in writing.

4) Required the public water systems to notify the residents of the City of Maywood regarding contaminants in their water.

Assembly Bill 1438 – Chapter 531, Statutes of 2009.

1) Capped the maximum amount of a planning grant for each participating public water system's share of the costs of the planning, engineering studies, environmental documentation, and design of a single project at no more than $500,000.

2) Specified that unless CDPH approves an increase, the maximum amount of a construction grant award to each participating public water system for its share of the cost of the construction of a single project shall be no more than $3 million.

3) Authorized CDPH to approve an increase in the maximum amount for a construction grant award so that the maximum amount of the construction award does not exceed $10 million only if CDPH makes all of the following findings:

(a) A public water system that serves a disadvantaged community has a defined project need that exceeds the maximum grant amount of $3 million;

(b) The defined project has been bypassed in at least one funding cycled due to a lack funds;

(c) The defined project is eligible for funding pursuant to the program regulations; and,

(d) The defined project represents the highest public health risk among unfunded projects, as determined by the department according to its standard criteria.

Senate Bill 27X3 – Chapter 25, Statutes of 2009-10 Third Extraordinary Session.

1) Resolved any conflict between the federal American Recovery and Reinvestment Act (ARRA) and state law relating to CDPH expenditure of SDWSRF money, in favor of compliance with ARRA.

2) Increased the limit on CDPH grants for safe drinking water from the ARRA funds to $10 million per project.

3) Exempted ARRA-funded projects for urban water suppliers from certain planning and water management requirements specified in current state law.

4) Expanded the definition of financial assistance for the State Water Pollution Control Resolving Fund (Resolving Fund), to allow the State Water Resources Control Board to issue grants from ARRA funding.

5) Allowed loan forgiveness for Revolving Fund projects to the extent a loan is funded by ARRA funding.

6) Took effect immediately, as an urgency statute, to facilitate the State's access to ARRA funding.

Assembly Bill 5X4 – Chapter 5, Statutes of 2009-10 Fourth Extraordinary Session.

Increased public water system fees to cover state costs related to the administration of the Small Drinking Water Program. The increases raised $1.5 million for that purpose.

2010

Senate Bill 918 – Chapter 700, Statutes of 2010.

1) Required CDPH to adopt uniform water recycling criteria for indirect potable use for groundwater recharge, by December 31, 2013.

2) Required CDPH to adopt uniform water recycling criteria for surface water augmentation by December 31, 2016. The criteria for augmentation would be subject to review and approval by an expert panel on uniform water recycling criteria for indirect potable reuse through surface water augmentation convened by CDPH.

(a) Members of the panel must have specified expertise; including six members with following expertise:

(i) Toxicologist;

(ii) Engineer with at least three years of experience in wastewater treatment;

(iii) Engineer with at least three years experience in treatment of drinking water supplies and knowledge of drinking water standards;

(iv) Epidemiologist;

(v) Microbiologist; and

(vi) Chemist.

(b) Authorized CDPH to convene an advisory group or task force to develop uniform water recycling criteria for indirect potable reuse through surface water augmentation, including at least 9 representatives of water agencies, local governments, environmental, public health, environmental justice and business. Environmental, environmental justice, and non-governmental public health members may be compensated for travel expenses.

(c) Required the criteria for indirect potable reuse through surface water augmentation developed by DHS shall consider 10 specified sources of information on water reuse.

3) Required CDPH to investigate and then report to the Legislature on the feasibility of developing uniform water recycling criteria for direct potable reuse, by December 31, 2016. The investigation and report to the Legislature shall include a consideration of a 10 specific factors related to direct potable reuse.

2011

Assembly Bill 54 – Chapter 512, Statutes of 2011.

1) Specified in statute that a corporation organized for or engaged in the business of selling, distributing, supplying, or delivering water for domestic use shall be known as a mutual water company.

2) Required, no later than December 31, 2012, each mutual water company operating as a public water system to submit to the LAFCO a map depicting the approximate boundaries of the property that the company serves.

3) Stated that if the LAFCO requests information, in connection with the preparation of a municipal service review or spheres of influence, from a mutual water company, the corporation shall, within 45 days of the request, provide all reasonably available information and explain, in writing, why any requested information is not reasonably available.

4) Required a mutual water company that operates a public water system to maintain a financial reserve fund for repairs and placements to its water production, transmission, and distribution facilities equal to the reserve fund for these purposes required for a public water system or equal size.

5) Required each board member of a mutual water company operated as a public water system to, within six months of taking office, complete a two-hour course offered by a qualified trainer regarding the duties of board members of a mutual water company, duties of a corporate director to avoid financial conflicts of interest in contracts, and the duties of public water systems to provide clean drinking water that complies with the federal and state Safe Drinking Water Acts.

6) Defined the qualification requirements of a qualified trainer.

7) Required a mutual water company to be liable for the payment of any fines, penalties, expenses, and other amounts that may be imposed.

8) Authorized a mutual water company to levy an assessment in order to pay the fines, penalties, expenses, and other amounts so imposed and specified that if these exceed 5percent of the annual budget of the mutual water company, then the assessment must be imposed.

9) Required all improvements to public water systems operated by a mutual water company to be designed and constructed to comply with the applicable CA Water Works standards.

10) Gave LAFCO the power to review and approve or disapprove, at the LAFCO's discretion, the annexation of territory served by a mutual water company into the jurisdiction of a city, a public utility, or a special district that operates a public water system, with the consent of the respective public agency or public utility and mutual water company.

11) Specified that any annexation approved shall be subject to the state and federal constitutional prohibitions against the taking of private property without the payment of just compensation.

12) Gave LAFCO the power to request information, as part of a municipal service review, from identified public or private entities that provide wholesale or retail supply of drinking water, including mutual water companies and private utilities.

13) Provided that in conducting a municipal service review, the LAFCO may include a review of whether the agencies under review, including any public water system, are in compliance with the SDWA.

14) Stated that a public may satisfy any request for information as to compliance with the SDWA by the submission of the consumer confidence or water quality report prepared by the public water system.

15) Authorized the CDPH to issue a "letter of no prejudice" that allows an applicant for Safe Drinking Water Revolving Fund money to start clean drinking water project construction before final approval of funding without prejudicing CDPH's final decision on funding.

16) Allowed CDPH to impose an alternative penalty on a small public water system for violation of the Safe Drinking Water Act that would require completion of a project that brings the small public water system into compliance, instead of imposing monetary fines.

17) Made legislative findings regarding drinking water quality.

Assembly bill 938 – Chapter 514, Statutes of 2011.

Required a public water system's written public notice of a Tier 1 drinking water violation contain specified information in the appropriate language for watch group that speaks a language other than English or Spanish and that exceeds 1,000 residents or 10percent of the persons served by the public water system, whichever is less.

Assembly Bill 983 – Chapter 515, Statutes of 2011.

Authorized CDPH to take specified actions, when implementing the Safe Drinking Water State Revolving Fund, to improve access to financial assistance for projects serving small community water systems and disadvantaged communities.

Assembly Bill 1194 – Chapter 516, Statutes of 2011.

Made changes to the Calderon-Sher Safe Drinking Water Act to conform it to federal law.

Assembly Bill 1292 – Chapter 518, Statutes of 2011.

1) Authorized CDPH to contract with the I-Bank to issue taxable or tax-exempt revenue bonds for use as the 20percent state match for federal grant funds.

2) Authorizes bond proceeds to be deposited into the SDWSRF or to refund bonds previously issued, and to fund necessary reserves, capitalized interest, or issuances costs.

3) Required revenue bonds to be repaid from, and secured by, revenues in the SDWSRF, including loan repayments and interest earned on loans.

4) Required biennial CDPH reports on SDWSRF activities submitted after January 1, 2013 to include:

(a) Results of a federal survey of CA's public water infrastructure needs;

(b) Amount of funds available in the fund to finance those needs;

(c) Amount of all funding agreements executed since the last report;

(d) The fund utilization rate;

(e) Amount of unliquidated obligations; and

(f) The total dollar amount paid to funding recipients since the last report.

2013

Assembly Bill 115 - Chapter 630, Statutes of 2013.

Authorizes a legal entity to apply on behalf of one or more public water systems serving disadvantaged or severely disadvantaged communities if all of the following requirements are met:

(1) The legal entity has a signed agreement with each public water system for which it is applying for funding for a planning and feasibility study project that indicates that the

public water system agrees to the joint application and that the legal entity is acting on behalf of, and in place of, the public water system.

(2) The application is for 100 percent grant funding for a planning and feasibility project.

(3) The planning and feasibility study project includes a study of the feasibility of consolidation, which may include expansion of service to communities not currently served by a public water system.

(4) The applicant has demonstrated that the legal entity has the ability to complete the proposed planning project.

(5) At least one of the project participating public water systems has a primary drinking water standard violation and is on the project priority list.

(b) A “legal entity” means an entity that is duly formed and operating under the laws of this state.

Assembly Bill 118 - Chapter 631, Statutes of 2013.

Limits loans and grants from the Safe Drinking Water Revolving Fund for planning and preliminary engineering studies, project design, and construction costs to those incurred by community and not-for-profit noncommunity public water systems and specifies that a small community water system or nontransient noncommunity water system that is owned by a public agency or a private not-for-profit water company and is serving a severely disadvantaged community, is eligible to receive up to 100 percent of eligible project costs in the form of a grant, to the extent the system cannot afford a loan as determined by CDPH .

Authorizes an applicant, subject to specified conditions, to receive up to the full cost of a project in the form of a loan.

Assembly Bill 240 - Chapter 633, Statutes of 2013.

Enacts the Mutual Water Company Open Meeting Act, which applies to mutual water companies, and will permit an eligible person to attend a meeting of a mutual water company and to speak during the meeting..

Requires the board of the mutual water company that operates a public water system to adopt, in an open meeting, an annual budget on or before the start of each fiscal year.

Requires the board of a mutual water company that operates a public water system to contract with a certified public accountant or public accountant to conduct an annual review of the financial records and reports of the mutual water company.

Requires the board of directors of a mutual water company that operates a public water system to make specified documents available to an eligible person upon payment of fees covering the direct costs of duplication.

2014

Senate Bill 861 – Chapter 35, Statutes of 2014

Transfers the administration of the Drinking Water Program from the State Department of Public Health to the State Water Resources Control Board

Appendix 10. Implementation Plan

Area	Chapter	Recommendation	Metric for Success	Timeframe
Drought	**8-1**	The State Water Board recommends enactment of legislation to require that all PWS customers be metered, and that each customer be charged based on the amount of water used, be extended to all community water systems (i.e., include non-urban/small systems). Funding for this is available through both grants and loans.	Number of public water systems with meters as reported in their annual report.	Legislative action needed.
	3-3	The State Water Board will require, as appropriate, vulnerable water systems to 1) submit studies regarding the reliability of their existing sources of drinking water, and 2) take necessary actions to improve system reliability in accordance with the studies, as well as avoid or mitigate the impact of the loss of supply on the public health and safety, including the loss of supply due to prolonged or severe drought conditions. The cost of a reliability analysis is eligible for funding through DWSRF planning studies.		As needed based on information obtained through drought response surveys, sanitary surveys, annual reports, funding applications, and permits.
Affordable, Safe Drinking Water for Disadvantaged Communities	**2-3**	As resources allow, the State Water Board will coordinate with local county and city planning departments, LAFCOs, and LEHJs to identify: 1) areas currently developed without safe drinking water to determine where Community Services Districts could be created or where other actions could be taken, 2) areas where upgrades to housing are needed, and 3) areas where new development or issuance of new building permits should be postponed until safe water is demonstrated.		State Water Board staff will attend the CA Association of LAFCOs conference in September 2015.
	2-4	As resources allow, the State Water Board will coordinate with local county and city planning departments, LAFCOs, and LEHJs to identify those unincorporated areas within the county where a county-wide County Service Area (CSA) could be created to address drinking water needs particularly associated with water systems smaller than regulatory size. If communities/neighborhoods within the CSA wished to seek funding and/or consolidation, the LAFCO can then establish a specific zone of benefit for that area within which drinking water would be provided by a PWS. The CSA would then be eligible to apply for funding on behalf of the area. Alternatively, the PUC's role in defining the service areas of water utilities under its jurisdiction (including authorization of non-adjacent service area expansions and		State Water Board staff will attend the CA Association of LAFCOs conference in September 2015.

		acquisitions of other water systems) may be part of the solution to this issue.		
	2-7	The State Water Board recommends enactment of legislation to implement a funding strategy that will ensure that the program is adequately and consistently funded. That strategy should address the need for funding of activities that provide greater oversight of and technical assistance to small PWS particularly those that serve disadvantaged communities.	Number of projects issued funding agreements.	Proposition 1 was passed by voters in November 2014. DFA will develop grant guidelines in 2015 with funds beginning to be awarded in FY 2015-16.
	2-8	Funding should be provided for infrastructure improvements to PWS particularly small PWS serving disadvantaged communities that are not meeting safe drinking water quality requirements. Sufficient funding for administration should be included.		Proposition 1 was passed by voters in November 2014. DFA will develop grant guidelines in 2015 with funds beginning to be awarded in FY 2015-16.
	4-3	The most critical recommendation in the State Water Board's 2013 Report to the Legislature, "Recommendations Addressing Nitrate in Groundwater" was that a new funding source be established to help ensure that all Californians, including those in disadvantaged communities, have access to safe drinking water, consistent with AB 685. A stable, long-term funding source should be provided for safe drinking water for small disadvantaged communities. Funding sources could include a point-of-sale fee on agricultural commodities, a fee on nitrogen fertilizing materials, a water use tax, or another funding source. The term was simply used for convenience and consistency. As noted in the Governor's Budget, the Administration, including the State Water Board, will work in concert with local governments, communities and dischargers on strategies to bring all systems into compliance, including governance, technical assistance, capital improvements, and ongoing operations and maintenance costs.		Legislative action needed.
	4-4	Where the State Water Board has identified responsible parties that have contaminated local groundwater used as a drinking water source and has caused violation of an MCL, the State Water Board will require those parties to cover the cost of mitigation including capital and treatment operation and	DDW will work with Office of Enforcement to report to the Board on all relevant orders in the monthly	Ongoing.

		maintenance costs. The Division of Drinking Water will coordinate with Regional Boards and the Office of Enforcement when issues are identified.	Executive Director's report.	
	4-5	The State Water Board recommends enactment of legislation to identify a funding source to cover the costs of operating and maintaining treatment facilities in small, disadvantaged communities. Funds should be provided in a manner that safeguards public funds from potential fraud, waste, and abuse. Funding of operation costs should be time limited with the goal towards financial sustainability within a given period of time.		Legislative action needed.
	8-4	Options should be developed and evaluated for making drinking water affordable for all low income households, including evaluating the potential for establishing an appropriate water service subsidization program to low-income families and individuals served by a PWS that charges unaffordable rates. As a guiding human right principle, the cost of water should not pose a barrier to access.		Legislative action needed.
	8-6	As stated in the Governor's Budget, "[a]n estimated 500 public water systems in disadvantaged communities rely on sources of drinking water that fall short of state and federal safe drinking water standards. Many of these systems are located in low-income communities, both urban and rural, that already pay high rates for the substandard tap water they receive. Although funding sources are available to assist communities with needed capital improvements, communities often lack the governance infrastructure, technical expertise and ability to pay for the ongoing operations and maintenance costs to treat the water to safe levels. Overcoming these problems requires innovative approaches. Accordingly, the Administration will work with local governments, communities and dischargers on strategies to bring these systems into compliance, including governance, technical assistance, capital improvements, and ongoing operations and maintenance costs." The State Water Board will work with stakeholders and the Legislature on this effort.	Number of systems returned to compliance.	This concept is included in the Governor's January 2015 budget.
	8-7	Funding should be provided to continue emergency grant funds to disadvantaged communities that have serious water quality problems.		In FY 2015-16, the Cleanup and Abatement Account will be the source of emergency drought funding.

Shared Solutions	**3-1**	The State Water Board will encourage large water systems, subject to compliance with such PUC requirements as may apply, to assist neighboring water systems in sampling and analysis, particularly when the small systems are out of compliance and when sampling of the small systems' source(s), including surface and groundwater, might provide information that would be of value to the larger system (e.g., presence of contaminants, movement of contaminants). Similar arrangements for water systems that utilize the same surface water source already exist.		State Water Board staff will work with the CA-NV section of the AWWA to encourage partnerships.
	4-2	The State Water Board will continue to promote consolidation of small water systems wherever feasible and appropriate. Consolidation is not limited to full or physical consolidation of drinking water treatment and delivery systems, and may include technical, managerial, financial or physical arrangements between water systems.	State Water Board staff will report annually on numbers of consolidations achieved through the Water Boards' annual achievements report.	Issue will be a topic discussed during the DDW's annual management meeting, the annual local primacy agency meeting, and regular staff trainings.
	8-5	The State Water Board recommends enactment of legislation in support of consolidation where feasible and appropriate. Specifically, whenever: 1) a public water system lacking adequate TMF capacity applies for state funding to address compliance with drinking water standards or infrastructure or source reliability issues; 2) the applicant public water system is nearby a public water system with adequate TMF capacity that is willing to consolidate; and 3) consolidation is determined to be an appropriate and feasible solution, the applicant public water system should be required to consolidate with the compliant public water system in order to receive financial assistance. Legal barriers should also be addressed, such as potential expansion of the liability protection afforded by SB 1130 (2014). Financial assistance to facilitate consolidation should be made available through sources such as the DWSRF and/or the 2014 Water Bond. The State Water Board will use the Transition Advisory Group as a forum to address barriers to consolidation and receive recommendations on a potential legislative mandate for consolidation where appropriate.	DDW will report annually on numbers of consolidations achieved through the Water Boards' annual achievements report.	May require legislative action. Interaction with the TAG will continue until the last quarter of 2016 at which time DDW will evaluate the need to continue the TAG.
Capacity Development	**4-1**	As resources allow, the State Water Board will expand the goal of the Small Water System Plan to address the number of small water systems that have compliance problems, continue to track and report progress of these systems, and utilize the plan to prioritize technical assistance and financial assistance.	DDW will report on progress through the Water Boards' performance report.	Ongoing.

	8-3	As part of its Capacity Development Program, the State Water Board will continue to encourage community water systems to adopt an assets management plan for infrastructure replacement, as part of their rate setting process.		Ongoing. DDW will include TMF questions in sanitary surveys starting in 2016.
	2-1	The State Water Board will develop closer relationships with DHCD to resolve the conflicts between these agencies' requirements particularly as it relates to mobile home parks. The State Water Board will schedule a meeting with DHCD management by the second quarter of 2015 to develop a coordinated strategy to address water quality and water quantity in mobile home parks.	DDW will copy DHCD on all citations issued to mobile home park owners.	Second quarter of 2015.
	2-2	The State Water Board will identify the most efficient mechanism of working more closely with LAFCOs to help address technical, managerial, and financial issues with small agencies under their purview that operate a PWS.		State Water Board staff will attend the CA Association of LAFCOs conference in September 2015.
	2-5	The State Water Board will welcome the participation of investor-owned water systems, both large and small, in the efforts described in Recommendations 2-2 through 2-4, both as sources and recipients of technical, managerial, and financial assistance. Given the PUC's authority over service area expansions and system acquisitions by investor-owned water utilities, PUC participation in such efforts would also be beneficial.		DDW will schedule a meeting with the California Water Association to discuss next steps in the first half of 2015.
	3-2	The State Water Board will explore possible funding sources to facilitate operator education opportunities particularly for small water system operators.		DDW will participate in regular operator association conferences.
Program Funding	**2-7**	The State Water Board recommends enactment of legislation to implement a funding strategy that will ensure that the program is adequately and consistently funded. That strategy should address the need for funding of activities that provide greater oversight of and technical assistance to small PWS particularly those that serve disadvantaged communities.		DDW will propose necessary legislative action as necessary.
Program Actions	**2-6**	The State Water Board will continue to encourage new and existing board members of public water systems to complete a course on their duties to all public water systems and the members of the boards or other directing bodies that oversee their operation.		Ongoing. DDW will include TMF questions in sanitary surveys starting in 2016.

	2-9	The State Water Board will report on the effectiveness of the LPA programs annually in the Water Board's Performance Report and will use this information to track progress and prioritize activities related to LPAs.	LPAs meet the same performance goals as Districts.	DDW will report annually through the Water Boards' performance report.
	4-4	Where the State Water Board has identified responsible parties that have contaminated local groundwater used as a drinking water source and has caused violation of an MCL, the State Water Board will require those parties to cover the cost of mitigation including capital and treatment operation and maintenance costs. The Division of Drinking Water will coordinate with Regional Boards and the Office of Enforcement when issues are identified.	DDW will work with Office of Enforcement to report to the Board on all relevant orders in the monthly Executive Director's report.	Ongoing.
	8-2	Proposition 218 has made it difficult for water systems of all sizes to increase their rates to address critical infrastructure issues. Consumers may not understand the costs associated with new treatment systems and otherwise supplying safe drinking water. The State Water Board will collaborate with the water utility industry, public interest groups, local non-profit organizations and other organizations to develop strategies to educate consumers on the factors that affect the cost of operating a water system. The State Water Board will develop fact sheets to communicate these issues to the public.	Fact sheets disseminated to relevant groups throughout the state.	December 2015.
Transparency and Information Management	**5-1**	As part of funding identified in recommendation 2-7, funding should include the resources necessary to maintain and expand the information management systems to implement the drinking water program efficiently and effectively and make such information available to the public.		DDW will propose necessary legislative action as necessary.
Treatment and Analytical Methods	**6-1**	The State Water Board will coordinate research needs, including methods for testing for microbes using emerging technologies. Special attention should be drawn to emerging pathogens that survive in coliform free waters, as well as constituents of emerging concern.		DDW will support methods development through the contract with the DPH Drinking Water and Radiation Laboratory.
	6-2	The State Water Board will continue to stay abreast of and provide technical input on the development of field testing methods for regulated chemicals.		DDW will participate in advisory committees.
	7-1	Funding should be provided for research and demonstration grants to develop new treatment processes or improve the cost efficiency of existing treatment processes for small water systems, including POU/POE devices.		Funding is available through Proposition 1. DDW will participate in

				review of projects and advisory committees.
	7-2	The State Water Board recommends enactment of legislation to allow expanded use of point of use and point of entry treatment by public water systems.		Legislative action needed. DDW will issue regulations no later than 2016.
Emergency Preparedness and Response	**3-3**	The State Water Board will require, as appropriate, vulnerable water systems to 1) submit studies regarding the reliability of their existing sources of drinking water, and 2) take necessary actions to improve system reliability in accordance with the studies, as well as avoid or mitigate the impact of the loss of supply on the public health and safety, including the loss of supply due to prolonged or severe drought conditions. The cost of a reliability analysis is eligible for funding through DWSRF planning studies.		As needed based on information obtained through drought response surveys, sanitary surveys, annual reports, funding projects, and permits.
	5-2	The State Water Board will explore the best method for notifying PWS during emergencies, in alignment with their respective emergency response plans.		Ongoing.
	9-1	As part of their Sanitary Survey, the State Water Board will encourage all PWS to update their ERP at least every five years.		Ongoing.
	9-2	As part of their Urban Water Management Plans, the State Water Board will encourage all PWS to provide ongoing training for water system staff on the Standardized Emergency Response System/Incident Command System. (SEMS/ICS). Smaller PWS should have their personnel trained in or be familiar with SEMS/ICS.		Ongoing.
	9-3	The State Water Board will encourage all PWS to plan for the next major disaster and become a member of CALWARN for the mutual aid/assistance that it offers.		Ongoing.

Safe Drinking Water Plan for California

REPORT TO THE LEGISLATURE

CALIFORNIA
Water Boards
STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS