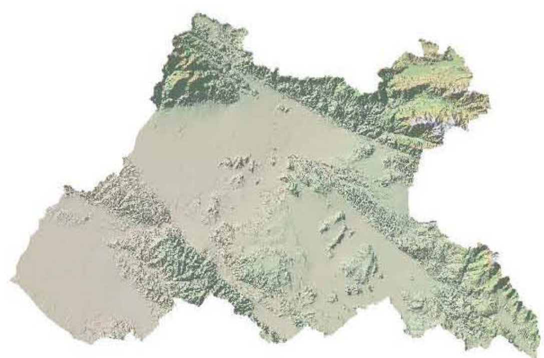
December 2006 Update

Regional Perchlorate Investigative Report

Santa Ana River Watershed Area, California



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SAWPA

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I. INTRODUCTION

In February 2004, the SAWPA Commission directed SAWPA staff to work with its member agencies and other local agencies in the watershed in examining the extent of perchlorate contamination in the Santa Ana Watershed (SAW) and to consider what future actions should be taken by SAWPA, possibly as part of a larger multi-agency task force, to address the water resource impacts of the contamination. Concern was expressed by the SAWPA Commission with the increasing reliance of local agencies on imported water to replace contaminated groundwater to meet potable water demands and the long term impacts to the regional Integrated Watershed Program goal of becoming less dependent on imported water supplies. Additional interests were expressed in having SAWPA serve as a unified voice of water supply agencies in the watershed to pursue federal funding to address the perchlorate contamination.

The SAWPA Planning Department met with representatives from all the SAWPA member agencies and the Santa Ana Regional Water Quality Control Board to determine the impacts of perchlorate in each of the agency jurisdictions. Contacts and data requests were also made with the State Department of Health Services, Metropolitan Water District of Southern California (MWD), various cities and multi-agency coalitions addressing perchlorate throughout the watershed. Coordination was conducted with a new MWD perchlorate task force that recently issued a data survey form that was sent to all MWD member agencies. Well contamination and plume location data was also requested to present an overview of the contamination in the watershed. This report constitutes the results of the brief investigation of the perchlorate contamination in the watershed, the current regulatory environment and suggested follow up actions by SAWPA.

II. BACKGROUND

Perchlorate is a white or colorless powder that most commonly originates as a contaminant in the environment when perchlorate salts (most commonly ammonium, potassium, magnesium, or sodium) dissolve in water. The resulting perchlorate ion consists of four atoms of chlorine and one atom of oxygen, and carries a negative charge. Highly resistant to bonding with other matter, perchlorate moves very freely within bodies of water and does not easily biodegrade. As a result, it can spread widely and remain in water supplies for decades (U.S. EPA, 2002).

Ammonium perchlorate and potassium perchlorate are used in the manufacture of solid propellant for rockets and missiles, and in the manufacture of fireworks. More than 90 percent of all the perchlorate manufactured, or roughly 20 million pounds per year is purchased by defense and aerospace industries.

Because solid rocket fuel has a shelf life and goes “flat” over time, it must be flushed from rocket motors periodically and replaced. High-pressure jets of water are typically used to wash out the fuel, creating large volumes of perchlorate contaminated waste water. Though perchlorate can be recovered from the solution and used again, the process has not been considered cost-effective (Jan 04 Report).

The defense and aerospace industries have disposed of large volumes of perchlorate in various states across the country since the 1950s. Many of these states have reported perchlorate contamination in their groundwater (Jan 04 Report).

Perchlorate salts are also used in a wide variety of commercial and industrial applications. They are used as a component of air bag inflators, and also in nuclear reactors and electronic tubes, as additives in lubricating oils, in tanning and finishing leather, as a mordant for fabrics and dyes, in electroplating, in aluminum refining, and in rubber manufacturing. Chemical fertilizer has been reported as a potential source of perchlorate contamination, but the U.S. EPA does not consider it to be an environmental hazard issue for agricultural applications based on new investigations (U.S. EPA, 2002).

Additionally, recent studies indicate that perchlorate may originate from natural sources and some types of fertilizers that contain Chilean Nitrates. In the 1880's, natural fertilizers were derived from deposits in the Atacama Desert of Northern Chile. Recent analysis of these, and others, depict the presence of perchlorate in fertilizer materials such as limestone. The presence of perchlorate in some minerals and other evaporate materials indicate that natural geochemical processes can produce perchlorate; however, pollution has not been to the extent as that of industrial contributors (geopubs.wr.usgs.gov/open-file/of03-314/0f03-314.pdf).

III. HEALTH EFFECTS OF PERCHLORATE (Jan 04 Report)

Perchlorate interferes with the proper functioning of the thyroid gland, which helps to regulate metabolism and growth. Specifically, perchlorate inhibits uptake of iodide to the thyroid, producing a decrease in thyroid hormone production. The human body does not metabolize perchlorate and data indicates that it does not accumulate in the body. Perchlorate is eliminated from the body fairly rapidly, with a half-life of only eight hours. Adverse health effects from perchlorate are considered acute, producing a strong or serious short-term effect.

Certain subpopulations, including pregnant women and their fetuses, and individuals with hypothyroid conditions (too little thyroid hormone) are thought to be at particular risk to repeated perchlorate exposure, even at low levels. During pregnancy a woman's endocrine system (which includes the thyroid gland) is placed under greater than normal strain. The proper functioning of a mother's thyroid gland is critical to both the health of the mother and the proper development of her fetus. This is particularly true during the first and second trimesters when the fetal thyroid is not yet developed and able to function on its own. Babies born to mothers with impaired thyroid functioning may exhibit changes in behavior, delayed development, and decreased learning capability.

At very high doses, perchlorate has caused thyroid tumors in laboratory rats. However, it is not certain whether similar effects would occur in humans. In fact, because of its known adverse effects, little perchlorate research has been conducted on humans. Most of what is known about the specific impacts of high doses on humans comes as a result of the treatment of patients with Graves' disease in the 1960s. Perchlorate's ability to reduce thyroid hormone production prompted its use as a treatment for the severe hyperthyroidism (too much thyroid hormone) associated with Graves' disease. Unfortunately, high doses of perchlorate produced moderate to severe, and occasionally fatal, side effects in some patients and the treatment was discontinued.

Only recently has attention begun to focus on the health effects of low-level perchlorate exposure. Given its propensity for blocking iodide uptake to the thyroid, these effects are thought to be similar to those caused by iodine deficiency. Because iodine deficiency in pregnant women has been linked to adverse neurological development and reduction of intelligence quotient (IQ) in their children, efforts are focused on establishing the level of perchlorate intake that will not increase the risk of these effects occurring. Prior to 1997, detection techniques did not allow scientists to identify perchlorate at very low concentrations. But laboratories can now reliably identify perchlorate at levels as low as 4 ppb, and the technology continues to improve. Consequently, our full understanding of health effects from low-level exposure to perchlorate is still emerging.

IV. PERCHLORATE PATHWAYS

Perchlorate enters the human body in one of several ways. It can be inhaled, absorbed through the skin or, more commonly, ingested by way of drinking water or certain foods. Inhalation and skin absorption are less efficient pathways than ingestion, and generally occur only under industrial circumstances in which perchlorate salts are present. More often, perchlorate from an industrial source comes into contact with water, rapidly dissolves, and, unless properly contained, enters a local water system where it may travel great distances to enter irrigation and drinking water sources. For example, large volumes of perchlorate produced at a manufacturing site southeast of Las Vegas seeped into the nearby Las Vegas Wash where the perchlorate migrated over three miles into Lake Mead, and from there to the lower Colorado River. The Colorado River provides drinking water to over 15 million residents of California, Nevada, Arizona, and Mexico, and irrigates much of the United States' winter lettuce supply. Colorado River water contains perchlorate concentrations well above the state's action level when it enters California.

While drinking water is probably the most common and best understood pathway for perchlorate to enter the human body, emerging research suggests that some food products may also carry perchlorate. A 2003 study conducted by the Environmental Working Group found perchlorate in excess of the California action level in lettuce samples taken from San Francisco Bay Area supermarkets. The winter lettuce tested was most likely grown in the regions of Southern California and Arizona irrigated by the waters of the Colorado River. This study raises concern that perchlorate can accumulate in plants, and perhaps through the food chain.

These findings were substantiated when the USDA confirmed federal tests found perchlorate in winter lettuce irrigated with Colorado River water. Canadian officials have expressed concern and are preparing to test lettuce and other crops imported from the rich agricultural regional straddling the California-Arizona border.

In addition, researchers from the Institute of Environmental and Human Health at Texas Tech University reported perchlorate was found in supermarket milk at levels exceeding the federal government's recommended levels for drinking water. Perchlorate levels in the milk ranged from 1.7 to 6.4 ppb – higher than the U.S. EPA's draft proposed safety standard of 1 ppb. Dr. Phil Smith of Texas Tech University has said that very preliminary research indicates that perchlorate seems to be more easily absorbed when it is in water and that perhaps perchlorate in food may not be as easily bioaccumulated.

However, more research is necessary to rule out any potential risks these possible pathways pose to humans.

V. STATE ACTIONS (Jan 04 Report)

Regulatory

On Friday March 12, 2004, the California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA) announced the publication of its Public Health Goal (PHG) for perchlorate. The PHG identifies 6 parts per billion as a level of perchlorate in drinking water that does not pose a significant human health risk. One caveat regarding the PHG is that OEHHA left open the option to further revise the PHG once the National Academy of Sciences (NAS) releases their report later this year.

On April 1, 2005, following review of the NAS report released in January 2005, OEHHA announced that the State's PHG for perchlorate in drinking water is consistent with the findings of a recent report on the chemical by the NAS. In light of the favorable NAS findings, OEHHA has determined that the PHG does not need to be revised.

The completion of this Public Health Goal is a first step in California's efforts to address the presence of perchlorate in the State's drinking water supplies. A PHG is not a regulatory requirement, and it is not a boundary between "safe" and "dangerous" levels of a chemical in drinking water. PHGs are health-protective goals for drinking water contaminants that regulators and suppliers should strive to achieve if it is feasible to do so. OEHHA develops PHGs for all regulated drinking water contaminants.

State law next requires the California Department of Health Services (DHS) to set a regulatory drinking water standard (the maximum contaminant level, or MCL) for perchlorate that is as close to the PHG as is economically and technically feasible. California should have an enforceable regulation on perchlorate sometime in 2004.

DHS has identified perchlorate as an "unregulated chemical requiring monitoring" (effective January 2001), and has instituted an "action level," requiring water systems to notify local government about detections of perchlorate above the action level. DHS originally established an action level of 18 ppb in 1997, revised that number downward to 4 ppb on January 18, 2002, and on March 2004, coinciding with the release of the PHG by OEHHA revised the action level to 6 ppb.

Funding

State funds to clean up perchlorate contamination have come from various sources:

$3 million State Water Resources Control Board – Cleanup and Abatement Account.

$3 million State Water Resources Control Board – Proposition 50 funds for water quality, drinking-water supply, safe drinking-water projects, and coastal wetlands purchase and protection.

AB 1747, a budget trailer bill authored by the Assembly Budget Committee in 2003, allows Proposition 50 bond funds to be used for grants for groundwater management and recharge projects. It instructs DHS to develop a program that places a priority on projects that reduce public and environmental exposure to contaminants that pose a significant health risk, including perchlorate

Recently, HR 4606, authorized $50 million, administered by the Secretary of the Interior through the Bureau of Reclamation, for groundwater remediation in areas covered by the Santa Ana Watershed Project Authority.

VI. FEDERAL ACTIONS

The EPA placed perchlorate on its contaminant candidate list in 1998. The following year, the EPA began requiring drinking water monitoring for perchlorate and, in 2002, issued a draft assessment of perchlorate. Titled *Perchlorate Environmental Contamination: Toxicological Review and Risk Characterization*, the report recommended a 1 ppb safety standard for perchlorate in drinking water – in other words, a level four times more restrictive than the current California action level. Though it has gone through extensive peer review, the EPA report has not yet been publicly released.

There is no national drinking water regulation for perchlorate, and it appears unlikely that there will be one anytime soon. On July 15, 2003, the U.S. EPA announced that it would not formulate safety standards for perchlorate or any of the other chemicals on its "contaminant candidate list." This means that perchlorate will not come up for review again for at least another three to five years, unless "emergency" procedures are followed to expedite the process.

In March 2003, the White House Office of Management and Budget referred perchlorate to the National Academy of Sciences (NAS) for six to 18 months of review. The EPA has banned public discussion of perchlorate by its employees until the NAS delivers its opinion. However, the federal EPA and DOD still widely differ in their assessments of what level of perchlorate is safe in drinking water. Based on this, the earliest that federal regulation of perchlorate could be expected is 2007.

To date, EPA has not yet issued a MCL for perchlorate.

VII. REMEDIATION TECHNOLOGIES

Because perchlorate spreads so readily, contaminates large volumes of water, and does not tend to biodegrade, it defies any traditional notion of "cleanup." In most cases, true cleanup is currently infeasible due to the limitations of technology, the immense volume of water contaminated, and the impracticality of pumping large bodies of groundwater dry simply to clean them. Instead, remediation at the wellhead is used to clean the water for human consumption.

It should be noted, however, that wellhead remediation does not generally address perchlorate contamination of ground or surface water sources used for irrigation or as drinking-water sources for livestock or wild animals.

Several technologies are available or under development to remediate perchlorate contaminated water, though some have been more thoroughly tested than others, Table 1. These technologies include chemical treatment, biological treatment, ion exchange (IX), reverse osmosis (RO) and nanofiltration (NF), electrodialysis reversal (EDR) and liquid granulated activated carbon (GAC). Generally speaking, there is no single preferred technology for perchlorate cleanup, although most pilot projects use either biological treatment or ion exchange. Each of the methods described below is relatively costly. The best methods are often determined by circumstances at the site and the proposed use of the water supply in question.

Table 1 - Treatment Technologies

Treatment Method	Process Alternative	Description
Chemical (reduction)	Various	- chemical process breaks perchlorate into oxygen and chloride - destroys perchlorate
Biological (reduction)	Fixed-Bed Fluidized-Bed Membrane Bioreactor	- microbes break perchlorate into oxygen and chloride - destroys perchlorate
Liquid Granulated Activated Carbon (adsorption)	Conventional Tailored	- perchlorate ion attaches to activated carbon particles
Ion Exchange (adsorption)	Conventional Throw Away	- perchlorate ion attaches to positively charged ion exchange resin
Membrane (separation)	Reverse Osmosis Nanofiltration	- uses a semi-permeable membrane to separate perchlorate ion from water
Electrical (separation)	Electrodialysis Reversal	- uses electrically charged semi-permeable membrane to separate perchlorate ion from water

Because of the technological limitations and costs of detection and cleanup, water containing low concentrations of perchlorate is often "blended" with uncontaminated water to reduce perchlorate concentrations below maximum acceptable levels. This process, for example, is employed in several areas in Southern California that are dependent on the Colorado River for their drinking water. Where perchlorate concentrations are higher, however, blending is not appropriate, and unless wellhead treatment is feasible, water sources must be shut down.

VIII. PERCHLORATE IMPACTS

CALIFORNIA (Jan 04 Report)

Widespread perchlorate pollution was discovered shortly after development in early 1997 of an improved detection method that is able to identify perchlorate at levels equivalent to a few grains of sand in an Olympic-sized swimming pool (parts per billion). Detection of high-level contamination at a former defense contractor site east of Sacramento in Rancho Cordova in 1997 brought wide public attention to perchlorate for the first time.

In February 1997, the California Department of Health Services (DHS) began sampling dozens of drinking water wells after perchlorate contamination was discovered in water supplies in eastern Sacramento County. In January 2001, DHS began requiring all community and non-transient non-community water systems that are vulnerable to perchlorate to sample their water supplies for perchlorate. Since that time, more than 1,100 of the state's approximately 4,400 water systems have reported the results of their monitoring efforts.

As of October 8, 2003, there were 335 drinking water sources in 10 California counties where perchlorate had been detected at or above the action-reporting level of 4 parts per billion (ppb). These detections did not include agricultural sources, monitoring wells, or private wells (which are not currently tested). The tested systems serve nearly 29 million Californians (or approximately 83 percent of the state population). Thus far, 85 systems across 10 counties have detected perchlorate in 335 active or standby drinking water wells.

A December 1, 2006, update of data reported to DHS revealed 276 drinking water sources in 77 systems across the State with detections of perchlorate at or above 4 ppb. Detections reported above the proposed MCL of 6 ppb were reported in 171 drinking water sources in 48 systems. A summary of this statewide data (DHS website http://www.dhs.ca.gov/ps/ddwem/chemicals/perchl/default.htm) is provided below in Table 1A.

The majority of California locations where perchlorate has been detected are associated with facilities that have manufactured or tested solid rocket fuels for the DOD or NASA. In a July 3, 2003, letter to Winston Hickox, then Secretary of the California Environmental Protection Agency (Cal EPA), U.S. Assistant Deputy Undersecretary of Defense for Environment John Woodley, Jr., provided a list of 37 DOD and defense contractor sites that had known perchlorate contamination. However, there are also a number of nonmilitary manufacturing sites that have contaminated groundwater.

Table 1A – December 2006 Statewide Summary of Perchlorate Detection

Active and Standby Sources with Perchlorate Detections (January 1, 2002-December 1, 2006) [a,b]					
	Detection at or above 4-µg/L DLR		Detection above 6-µg/L NL		
County	No. of Sources	No. of Systems	No. of Sources	No. of Systems	Peak Conc. (µg/L)
Los Angeles	111	31	71	21	100
Riverside	65	9	52	7	73
San Bernardino	57	16	37	12	88
Orange	19	9	4	3	10.6
Santa Clara	9	4	3	1	8
San Diego	5	3	1	1	7
Sacramento	4	2	1	1	95.9
Imperial	4	1	0	0	6
Tulare	1	1	1	1	24
Ventura	1	1	1	1	16
TOTAL	276	77	171	48	--

[a] Detections are from sources with two or more perchlorate detections at any concentration. Sources included have peak findings at or greater than the 4-µg/L DLR, or greater than the 6-µg/L notification level (*i.e.*, equal to or greater than 6.5 µg/L).

[b] Data are draft (they will change with subsequent updates). The following are not included in this table: pending, inactive, and destroyed or abandoned sources; monitoring wells; agricultural wells; and sources with peak detections below the DLR. All of those sources, however, are included here. Summary information on all sources since 1997, including detections reported below the DLR, are included in early findings and subsequent monitoring.

SANTA ANA RIVER WATERSHED

In the Santa Ana River Watershed, perchlorate has been identified by the Santa Ana Regional Water Quality Control Board (Regional Board) as a priority for groundwater resource protection. In the SAW, perchlorate contamination has been linked directly to past aerospace industry activities, which used ammonium perchlorate and potassium perchlorate in the manufacturing and testing of solid rocket propellants and can possibly be linked to the manufacturing of pyrotechnics and other products. Low levels of perchlorate have been detected in areas historically dominated by agriculture, leading to the speculation that chemical fertilizers imported from Chile in the early 1900's are a possible source of contamination. In addition, groundwater sources in the Santa Ana River Watershed have been contaminated in the past by the banking of water imported from the Colorado River.

The full extent of perchlorate contamination in the Santa Ana River Watershed is unknown, for the degree to which the problem has been characterized has been limited for numerous reasons. Recent data shows that perchlorate has been detected in over 170 municipal drinking water supply wells throughout the Santa Ana River Watershed and this number appears to be growing. Much of this data can be lumped into four distinct but roughly defined groundwater plumes (see Figure 1). In addition, there exist numerous contaminated sites outside of these plumes for which no source can readily be identified.

Additional Source Information for the Santa Ana Watershed:

Aerospace Industry and Fireworks Manufacturing
The source of the highest concentrations of perchlorate in the municipal supply wells in the Santa Ana Region have been found to be associated industrial point sources related with the aerospace industry and fireworks manufacturing. Perchlorate is formed through the dissolution of perchlorate salts, which are primarily used as an oxidizer in solid rocket fuel and other explosive mixtures, but have several other uses as well. The mass production of perchlorate salts began in Nevada around 1950, and is linked to a number of former industries in the Inland Empire area. Over 90 percent of all the perchlorate salts manufactured in the United States have been used in the manufacturing of solid rocket fuel by the Department of Defense or its contractors.

Colorado River
In 1997, perchlorate was found to be present in Colorado River water at concentrations up to 9 ppb. The source of the perchlorate was the perchlorate manufacturing facilities in Nevada adjacent to Las Vegas Wash, which flows into Lake Mead. The current efforts of these facilities, which have recently ceased operation and have relocated to Utah, are to remediate perchlorate pollution at their former facilities adjacent to Las Vegas Wash and decrease the flow of perchlorate to the Colorado River. The concentration of perchlorate in Colorado River water currently being delivered to Southern California is about 5 ppb.

Chilean Fertilizer
The only known naturally occurring source of perchlorate is in nitrate deposits in Chile. Prior to the 1920's, Chilean saltpeter (sodium nitrate) accounted for most of the world's supply of fixed nitrogen. Large quantities of sodium nitrate were exported throughout the world, including to the Unites States, and constituted the predominant source of nitrogen used in inorganic fertilizers. Perchlorate in sodium nitrate imported from Chile is believed to have been about 0.2%. A small amount of sodium nitrate is still imported from Chile into the United States, but currently represents an insignificant source of nitrogen in fertilizers. Sodium nitrate was a source of nitrogen that was historically used on citrus groves in the Santa Ana Region. Although sodium nitrate would have most likely been used in the Santa Ana Region primarily before the 1930's, the amount used, the locations it was applied, and the time periods it was applied is not known. The low concentration of perchlorate in Chilean nitrate is believed to be a possible source of perchlorate found in groundwater across the country; however, it has not yet been clearly determined to be a source anywhere that perchlorate is present in groundwater.

A summary of the December 1, 2006, DHS data for the Santa Ana River Watershed is provided below in Table 1B.

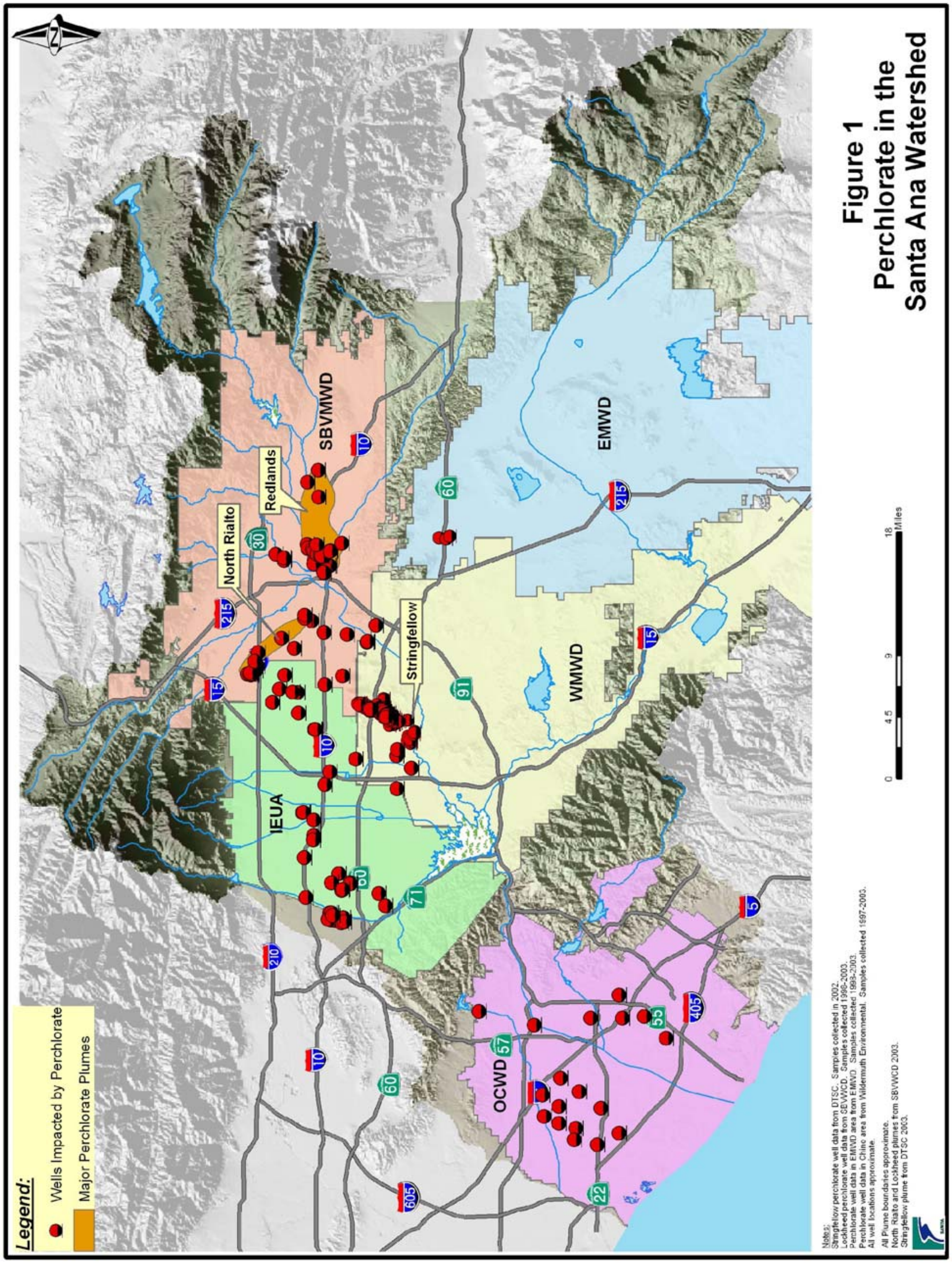

Figure 1
Perchlorate in the Santa Ana Watershed

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Table 1B – December 2006 Regional Summary of Perchlorate Detection

Active and Standby Sources with Perchlorate Detections (January 1, 2002-December 1, 2006) [a,b]				
System	**Number Detections**		**Detected Concentration**	
	Total	**abv 6-µg/L**	**Max**	**Avg**
Orange County				
City of Anaheim	17	1	6.3	4.8
City of Fullerton	6		5.1	4.4
City of Garden Grove	7		4.9	4.5
City of Santa Ana	2		4.4	4.3
City of Tustin	39	19	10.6	6.6
Crescent Water Association	7		5.9	4.9
Golden State Water Company - West Orange	24	4	7.9	5.2
Irvine Ranch Water District	3	1	6.1	5.9
Page Avenue Mutual Water Company	7	3	9.1	6.3
Orange County Summary	**112**	**28**	**10.6**	**5.5**
Riverside County				
City of Corona	178	80	13.0	6.4
Eastern Municipal Water District	22	8	12.0	7.4
City of Hemet	4		6.0	5.3
Jurupa Community Services District	7		4.7	4.3
Rancho California Water District	3	1	6.6	5.3
City of Riverside	1056	302	73.0	9.0
Rubidoux Community Services District	64	37	12.0	9.0
Western Municipal Water District - Arlington	161	34	11.0	5.6
Riverside County Summary	**1495**	**462**	**73.0**	**8.2**
San Bernardino County				
City of Chino	50	33	24.0	12.7
City of Chino Hills	2		4.4	4.3
City of Colton	28	5	10.0	4.1
City of Loma Linda	200	33	22.0	6.6
Cucamonga Valley Water District	12	3	9.0	5.4
East Valley water District	74	23	12.0	6.2
Inland Valley Development Agency - Norton	57	1	6.1	4.7
Loma Linda University	13	1	6.2	4.6
Monte Vista Water District	2		4.4	4.3
City of Ontario	30	5	8.1	5.4
Patton State Hospital	11	9	13.0	8.0
City of Redlands MUD	160	62	88.0	20.2
Reliant Energy (SoCal EDISON)	2		4.0	4.0
City of Rialto	140	55	25.0	7.8
City of San Bernardino	25	11	9.2	5.8
San Gabriel Valley Water Company - Fontana	335	87	24.0	12.9
West Valley Water District	327	27	10.0	4.2
San Bernardino County Summary	**1468**	**355**	**88.0**	**9.1**

Impacts to Regional Drinking Water Supplies

To review the issue in further detail, the impacts of perchlorate in the SAW have been identified and broken down by each of SAWPA's member agencies service areas.

SBVMWD

San Bernardino Valley Municipal Water District (SBVMWD) service area covers about 325 square miles in southwestern San Bernardino County, with a population of around 600,000. The District spans the eastern two-thirds of the San Bernardino Valley, the Crafton Hills, and a portion of the Yucaipa Valley, and includes the cities and communities of San Bernardino, Colton, Loma Linda, Redlands, Rialto, Bloomington, Highland, Grand Terrace, and Yucaipa.

The District's mission is to import water into its service area through participation in the California State Water Project and manage groundwater storage within its boundaries. The District's resources have not been directly impacted by perchlorate contamination; however many of the cities within its jurisdiction have significant contamination issues. A concern to SBVMWD is an increase in demand due to the loss of local groundwater resources to perchlorate contamination, which could adversely impact the Region's objective to become self-sufficient. Impacts to water resources within the Districts boundaries include the following:

City of Colton

Impact to Water Resources: Perchlorate has been detected in three of the City's drinking water wells at concentrations of 4 to 11 ppb. The contamination comes from multiple sources and is estimated to impact the production of 4,800 gallons per minute (gpm) of the city's potable groundwater supply.

Action: The City has taken a zero tolerance approach toward the issue of perchlorate and removed the contaminated wells from service. The City contracted out for the development of an appropriate treatment system. The technology selected was Ion Exchange (IX) using a throw away resin. In December 2003, two disposable resin IX treatment systems went on-line to treat the three contaminated wells. The total design capacity of the two systems is 4,800 gpm. The capital cost to construct the two systems was estimated at around $ 2 million. The City estimates that the O & M to operate the system, based upon a 90-day lifespan for the resin, will be $800,000 annually.

City of Loma Linda

Impact to Water Resources: Perchlorate has been detected in three of the City's drinking water wells. The source of perchlorate contamination has been identified as leakage from the Lockheed-Martin facility.

Action: Water from the contaminated well is currently blended while the City investigates alternative methods for treatment. The City is also in negotiations with Lockheed-Martin, considered to be the source of the contamination, concerning a settlement.

In 2006, perchlorate was detected in only a single well at levels ranging from non-detect to 7 ppb. Production from this well is currently blended with other sources. Three other wells with detectable levels of perchlorate have been removed from service and destroyed.

Water service has not been impacted, as the City has other wells and the capability to purchase additional drinking water from the City of San Bernardino. The City is currently in ongoing negotiations with Lockheed Martin, Inc., who has replaced impacted wells and assisted with other water quality issues that have surfaced as a result of the perchlorate contamination. The City plans to develop additional replacement wells equipped with appropriate perchlorate remediation technology to address future water needs.

City of Redlands

Impact to Water Resources: Perchlorate has been detected in seven of the City's drinking water wells at concentrations of 4 to 90 ppb. In 1997, perchlorate was detected in three drinking water wells, which supplied an 8-million gallon per day (MGD) Granular Activated Carbon (GAC) treatment facility (Texas St. Plant) previously installed by Lockheed-Martin to remove trichloroethylene (TCE). The levels detected in these wells ranged from 70 to 90 ppb. Perchlorate was also detected in four drinking water wells at intermediate levels of 4 to 8 ppb. These include the Orange Street, Church Street and Reese Street wells, which produce 8.5 MGD of potable water. Additionally, another six to ten non-potable water wells used for irrigation are contaminated by perchlorate. The source of perchlorate contamination has been identified as leakage from the Lockheed-Martin facility.

Action: The contaminated wells were taken off-line, but remain a potential potable water source to be used as necessary by the City. Lockheed-Martin paid the City $3.85 million to replace the three highly contaminated Texas Street wells with a new 8 MGD well field. These wells are available to the City only when used with the existing Granular Activated Carbon (GAC) system and under emergency conditions. The City is currently in negotiations with Lockheed-Martin concerning the other three drinking water wells and is investigating IX technology as a treatment option for these contaminated wells. These wells are generally only brought on-line in the summer to meet customer demand and will be used as necessary.

The City is currently teaming with Penn State University and CDM in the research of alternative treatment methods to upgrade the Texas Street Plant's existing GAC treatment process. The research with Penn State investigates an enhanced GAC process to treat perchlorate and TCE contamination in a cost effective manner. The research with CDM investigates the idea of a biological process to treat the perchlorate and TCE contamination. This method, however, is not likely to be developed by the City for the treatment of drinking water due to public perception issues with biological treatment.

There is currently no remedial action planned for the non-potable water wells. However, one of the wells is blended prior to discharge for irrigation.

City of Rialto

Impact to Water Resources: Perchlorate has been detected in five of the City's drinking water wells at concentrations of 4 to 74 ppb. The contamination comes from multiple sources and is estimated to impact the production of 9,600 gallons per minute (gpm) of the city's potable groundwater supply.

Action: The City has taken a zero tolerance approach toward the issue of perchlorate and removed the contaminated wells from service. The City then contracted out for the development of an appropriate treatment system. The technology selected was Ion Exchange (IX) using both disposable and regenerable resins. In September 2003, a single disposable resin IX treatment system went on-line. The total design capacity of this system is approximately 2,000 gpm. The capital cost to construct the system was estimated at around $1,000,000 with O& M to operate the system, estimated at another $500,000 annually. A second 2,000 gpm system using regenerable IX resin is scheduled to go on-line in March 2004, and a third system, of which the treatment process is unknown is anticipated to be completed in June 2004. No time line is currently available for the two remaining contaminated wells.

West Valley Water District

Impact to Water Resources: Perchlorate has been detected in four of the District's drinking water wells at concentrations of 3 to 8 ppb and in a fifth at 800 ppb. The source of this contamination is currently unknown.

Action: The District has removed the contaminated wells from service. The well registering perchlorate levels around 800 ppb was replaced. The District contracted out for the development of an appropriate treatment system. The technology selected was IX using a disposable resin. In or around June 2003, two disposable resin IX treatment systems went on-line to treat two of the contaminated wells. The total design capacity of each system is 2,000 gpm. The capital cost to construct the two systems was estimated around $1,200,000. The District estimates that the O & M to operate these systems will range around $600,000 annually. At this time, the two other contaminated wells remain off-line.

East Valley Water District

Impact to Water Resources: Perchlorate has been detected in eight of the District's drinking water wells at concentrations of 4 to 11 ppb. The source of this contamination is currently unknown.

Action: Currently, the District does not have the necessary infrastructure in place to deal with the contaminated wells. Two of the contaminated wells have been removed from service, while the other six wells remain on-line. As a treatment alternative, the District is involved in a design effort to develop an option for blending the water from contaminated wells. Preliminary costs for this project are estimated to be $250 to $300 per acre foot (AF). However, the District has taken the position to wait for the State to establish an MCL for perchlorate before taking any further remedial action. The District has taken a very proactive role in encouraging additional research and pilot scale testing of remedial technology for perchlorate contamination.

WMWD

Western Municipal Water District (WMWD) service area covers a 510 square mile area of western Riverside County and serves more than 17,000 retail and nine wholesale customers with water from both the Colorado River and the State Water Project. As a member agency of the Metropolitan Water District of Southern California (MWD), WMWD provides supplemental water to the cities of Corona, Norco, and Riverside and the water agencies of Box Springs, Lee Lake, Elsinore Valley, and Rancho California, as well as serving customers in the unincorporated areas of El Sobrante, Eagle Valley, Temescal Creek, Woodcrest, Lake Mathews, and March Air Reserve Base. WMWD also operates and maintains domestic and industrial wastewater collection and conveyance systems for retail and contract services customers in Lake Hills, March Air Reserve Base, Home Gardens, Corona, and Norco.

About one-quarter of the water that WMWD purchases from the MWD comes from the Colorado River Aqueduct and about three-quarters from the State Water Project, which transports water from Northern California via the California Aqueduct. WMWD also imports a very small quantity of water from the San Bernardino basin.

Although Western owns no wells for groundwater extraction, several of the cities to which it sells water have significant contamination issues. In addition, water imported from the Colorado River poses a potential perchlorate concern to cities within the District. WMWD's issue will be an increase in demand with the loss of local groundwater resources to perchlorate contamination, which could adversely impact the Region's objective to reduce water imports. Impacts to water resources within the District's boundaries include the following:

City of Corona

Impact to Water Resources: Perchlorate has been detected in eleven of the City's drinking water wells at concentrations of 4 to 14 ppb. The City also imports Colorado River water, which had detectable levels of perchlorate above California's Action Level of 6 ppb.

Action: Currently all contaminated water is blended with non-contaminated sources prior to being distributed to customers. Additionally, groundwater from three of the City's contaminated wells is treated using an existing reverse osmosis (RO) facility (Temescal Desalter). Imported Colorado River water is not banked and therefore is not a threat to the City's groundwater supply. This water is directly fed through two of the City's surface water treatment plants and then blended with groundwater and State Project water. The City has taken the position to wait for the State to establish an MCL for perchlorate before taking further action.

City of Riverside

Impact to Water Resources: Perchlorate has been detected in thirty-two of the City's drinking water wells at levels ranging from 5 to over 62 ppb. The source of perchlorate contamination has been identified as leakage from the Lockheed-Martin facility.

Action: Currently all contaminated water is blended with non-contaminated sources prior to being distributed to customers. The City and Lockheed-Martin are collaborating to develop IX technology to treat the contaminated wells. At present, the City has four disposable resin IX treatment facilities on-line or near completion. The first of these facilities went on-line in October 2002. The total design capacity of these systems is 18,000 gpm. The estimated lifespan of the resin used is approximately 60 days operating at a rate of 1,000 gpm. The overall engineering, capital and O & M costs to construct and operate these systems are estimated at approximately $550 per AF.

Stringfellow (DTSC website)

Impact to Water Resources: From 1956 until 1972, the 17-acre Stringfellow site was operated as a hazardous waste disposal facility. Over 34 million gallons of industrial waste, primarily from metal finishing, electroplating, and pesticide production were deposited in evaporation ponds. Over this time, liquid waste and contaminated materials including perchlorate dumped at the site have seeped into the local groundwater. This contamination has resulted in a plume nearly two miles wide extending all the way to the Santa Ana River.

Action: In addition to the remediation efforts by water purveyors, the California Department of Toxic Substances Control (DTSC) has been conducting a large-scale remedial effort at the Stringfellow site. In 1980, remediation efforts began with the construction of three groundwater extraction wells, a subsurface clay barrier structure, and an on-site surface water drainage system with gunite channels. All liquid wastes at the surface of the site were removed to a federally-approved hazardous waste disposal facility. With the exception of 1,000 cubic yards of DDT-contaminated soil, which were taken to a federally-approved facility, contaminated soils from the site were used to fill waste ponds. The surface was graded, covered with clean soil, and seeded.

In 1984, the State completed initial cleanup measures including fencing the site, maintaining the existing soil cap, controlling erosion, and disposing of the leachate extracted above and below the on-site clay barrier dam.

In 1988, the State and the EPA completed an investigation determining the type and extent of contamination in the canyon and community areas.

In 1990, the EPA selected a remedy that called for the installation of a groundwater extraction system in the community to treat contaminated groundwater that had migrated down gradient to the area, possibly followed by reinjection of the treated water. The potentially responsible parties installed an initial community wells extraction system and conducted field studies of soil vapor extraction in the on-site area, and paper studies of reinjection. However, more work was needed to hydraulically control the plume of contaminated groundwater. Further work was begun in September 1997, to install an additional extraction well in order to put the remaining portions of the plume under hydraulic control.

In 2003, DTSC contracted with Kleinfelder (geotechnical engineering firm) to conduct a full-scale Remedial Investigation/Feasibility Study (RI/FS) of the Glen Avon Community area below the Stringfellow site. This is a multi-functional study to Study and design measures for the ultimate remediation of contaminated groundwater resources in the Glen Avon Community Area, downgradient of the existing DTSC extraction system. SAWPA has been approached by DTSC to assist in future stakeholder involvement and water quality data collection for the SAR.

IEUA

Inland Empire Utilities Agency (IEUA) service area covers about 242 square miles in the southwestern corner of San Bernardino County, and provides regional wastewater service and imported water deliveries to eight contracting agencies. These include the City of Chino, City of Chino Hills, Cucamonga Valley Water District (CVWD), City of Fontana, City of Montclair, City of Ontario, City of Upland and Monte Vista Water District.

As a member agency of the Metropolitan Water District of Southern California (MWD), IEUA provides supplemental water, as well as regional wastewater treatment for both domestic and industrial clients and energy recovery/production facilities. In addition, the Agency has become a recycled water purveyor, biosolids/fertilizer treatment provider and continues as a leader in water supply salt management, for the purpose of protecting the regions vital groundwater supplies.

Impacts to the Agency's resources from perchlorate are not significant; however, several cities within its jurisdiction have significant contamination issues. A concern to IEUA is an increase in demand due to the loss of local groundwater resources to perchlorate contamination, which could adversely impact the Region's objective to become self-sufficient. Impacts to water resources within the District's boundaries include the following:

City of Chino

Impact to Water Resources: Perchlorate has been detected in six of the City's drinking water wells at concentrations of 5 to 17 ppb. The source of this contamination is currently unknown.

Action: Production from the City's contaminated wells is blended with imported water from MWD. Long term plans of the City include the development of Ion Exchange treatment to remove perchlorate, as well as, nitrates from these wells. The City has estimated capital costs of $15,000,000 to develop the necessary treatment facilities.

City of Ontario

Impact to Water Resources: Perchlorate has been detected in seven of the City's drinking water wells at concentrations of 4 to 12 ppb. The source of this contamination is currently unknown.

Action: Four of the contaminated wells, reporting values greater than 6 ppb, were removed from service by the City. The remaining wells, with detections reported in the range of 4 ppb or lower, remain in production. The City has plans to develop Ion Exchange treatment for their contaminated wells. The City has estimated capital costs of approximately $18,000,000 to develop the necessary treatment facilities.

Cucamonga Valley Water District

Impact to Water Resources: Perchlorate has been detected in six of the District's drinking water wells at concentrations of 3 to 9 ppb. The source of this contamination is currently unknown.

Action: Production from the District's perchlorate contaminated wells is already blended with other water sources, due to other contamination sources. The District anticipates no further treatment needs, assuming that the perchlorate levels do not increase significantly.

Fontana Water Company

Impact to Water Resources: Perchlorate has been detected in nine of the Fontana Union Water Company's drinking water wells at concentrations of 4 to 18 ppb. The source of this contamination is currently unknown.

Action: The contaminated wells were removed from service by Fontana Union Water Company. The Company contracted out for the development of an appropriate treatment system. The technology selected was Ion Exchange (IX) using a disposable resin. In February 2004, a single IX treatment system went on-line to treat two of the contaminated wells. The system is currently operating at 3,000 gpm, but has a total design capacity of 6,000 gpm. Currently, Fontana Union Water Company is continuing its efforts to develop IX treatment for five of the wells, which remain out of service.

In 2006, monitoring of drinking water wells across the basin detected perchlorate in only 7 wells (exceeding action notification threshold).

OCWD

Orange County Water District's (OCWD) service area covers more than 350 square miles, and includes Orange County's vast Groundwater Basin. The basin provides a water supply to more than 20 cities and water agencies, serving over two million people. The District owns 1,600 acres in and near the Santa Ana River in Anaheim and Orange, which it uses to capture flows and recharge the basin. The District also owns 2,400 acres above Prado Dam, which it uses for conservation and water quality improvement.

OCWD's mission is to manage and protect the vast groundwater basin in northern and central Orange County. The groundwater basin supplies approximately 75 percent of the water used by over two million residents in the District's service area. The remaining 25 percent is imported from the Colorado River and from Northern California through the Sacramento/San Joaquin Delta State Water Project by the Metropolitan Water District (MWD).

Direct source impacts to the Agency's resources are not significant, however, between 1950 and 1998 OCWD imported approximately three million acre-feet of Colorado River water for groundwater recharge. In addition, Colorado River water was used in many parts of the Basin for many years to irrigate agricultural land. Contamination from this water has shown up in a number of wells across the basin ranging from levels of 2.5 to 10.6 ppb. Wells with levels above the action level of 6 ppb are either being remediated by existing treatment or were taken out of service. A concern to OCWD is an increase in demand due to the loss of local groundwater resources to perchlorate contamination, which could adversely impact the Region's objective to become self-sufficient.

> In 2006, monitoring of drinking water wells across the basin detected perchlorate at levels ranging from non-detect (<2.5 ppb) to 13.4 ppb. Four of five wells with levels above the notification level of 6 ppb are either being remediated by existing treatment or were taken out of service.

EMWD

Eastern Municipal Water District (EMWD) service area covers about 555 square miles in Western Riverside County. The District serves six incorporated cities and unincorporated portions of western Riverside County. In addition to its role as a retail agency, the District also provides wholesale water to the following sub-agencies: Lake Hemet Municipal Water District, City of Hemet, City of San Jacinto, City of Perris, Nuevo Water Company, Elsinore Valley Municipal Water District and Rancho California Water District

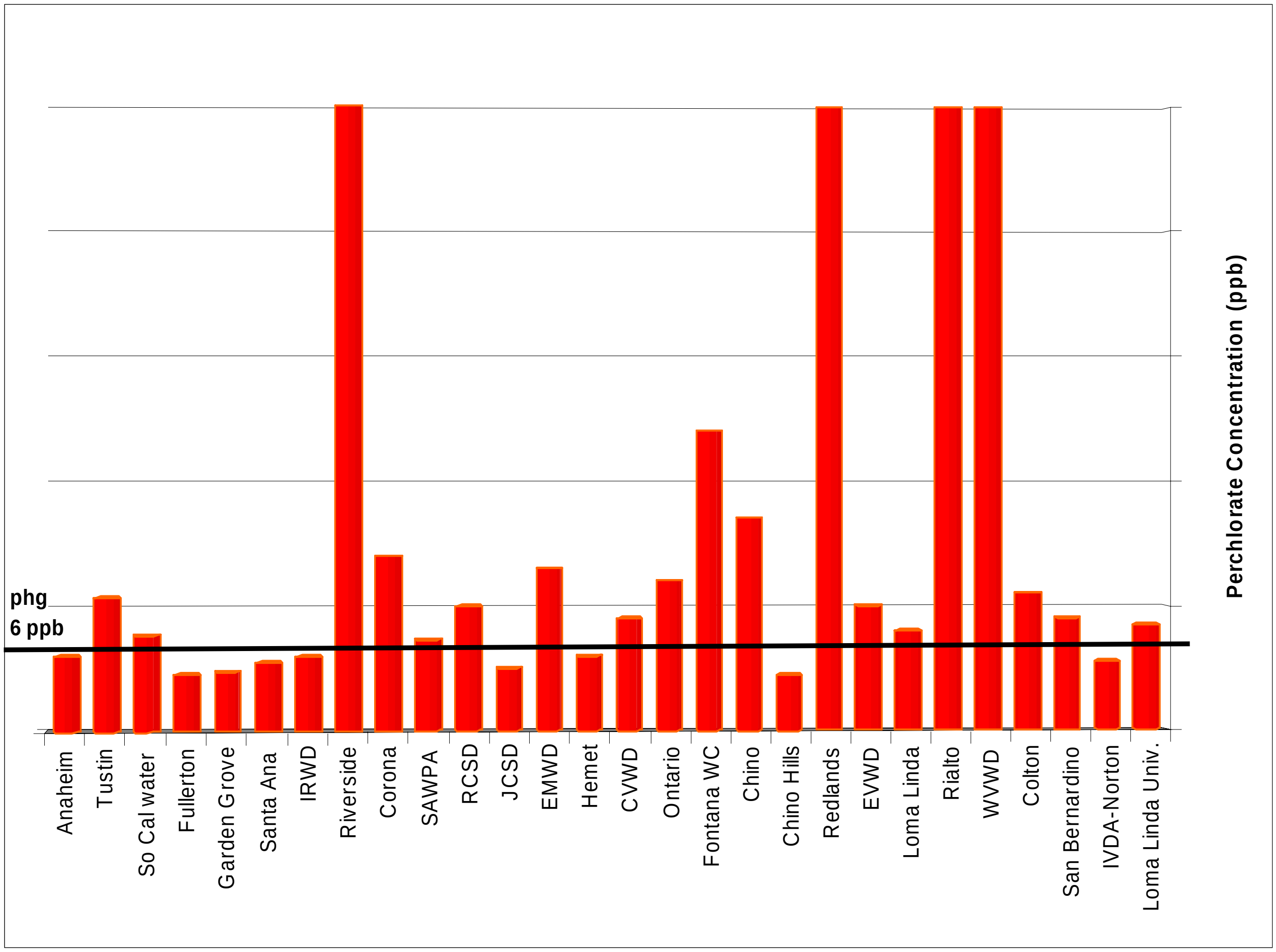
As a member agency of Metropolitan Water District, the District gained a supply of imported water from the Colorado River Aqueduct and, ultimately, water from northern California through the State Water Project. The District's initial mission was to deliver imported water to supplement local groundwater supplies. Over time, the District's role changed as additional agency responsibilities were added, including groundwater production and resource management, wastewater collection and treatment, and finally regional water recycling.

Impacts to the District's resources from perchlorate are not significant, with only about one percent of groundwater production contaminated by moderate levels of perchlorate. The source of this perchlorate is unknown, but is most likely attributed to past imported Colorado River water used for agricultural irrigation. A concern to EMWD is an increase in demand due to the loss of local groundwater resources to perchlorate contamination, which could adversely impact the Region's objective to become self-sufficient.

SUMMARY OF MAXIMUM PERCHLORATE CONCENTRATIONS

The maximum perchlorate concentration for each of the various cities and agencies is presented below in Figure 2.

Figure 2 - Measured Maximum Perchlorate Concentrations



Enforcement Actions by the Santa Ana Regional Water Quality Control Board

The Regional Board first became aware of the impacts of perchlorate on State and local water supplies and the health risks associated with the consumption of perchlorate in drinking water in 1997. Since 1997, perchlorate has been detected in about 175 municipal drinking water wells in San Bernardino, Riverside and Orange Counties. About 145 of these wells are in the Inland Empire, and the remainder in Orange County. About 50% of the municipal wells in the entire State that have detected perchlorate are in these three counties. Most of the detections throughout the State are in very low concentrations. Over 80% of the wells in the Inland Empire and Orange County with detectable levels of perchlorate are below 9 µg/l, and most of those are below 6 µg/l. All the wells are located in historical citrus areas; therefore, it is likely that most of these wells contain perchlorate from the historical use of Chilean nitrate. However, in the Redlands and Rialto areas, where the highest concentrations of perchlorate have been detected, industrial operations have been identified as the source. The California Regional Water Quality Control Board, Santa Ana Region, has been the lead agency addressing perchlorate problems in these two areas.

Redlands Plume

In 1997, the Regional Water Board adopted a cleanup and abatement order for Lockheed Martin for a perchlorate plume originating from Lockheed's former rocket motor and development facility in the Redlands area. The perchlorate has traveled about ten miles from the site and was detected in 45 municipal water supply wells belonging to five water purveyors. Lockheed has entered into water supply agreements with these parties, and has provided water replacement utilizing wellhead treatment, alternative water supplies, drilling new wells, and water supply system blending. To date, Lockheed has spent over $100 million on perchlorate and TCE investigation and cleanup in the Redlands area.

Rialto Plume

In 2002, four water purveyors in the Rialto area shut down wells containing perchlorate, ultimately ceasing or limiting the use of 22 wells. This created a potential water supply shortage situation. The Regional Water Board pursued various mechanisms to obtain money to assist the four water purveyors with funding for wellhead treatment. Approximately $10,135,000 has been provided to the water purveyors. Currently, 10 of the 22 impacted wells have wellhead treatment. These efforts, while significant, are far less than what will be needed to address the overall anticipated needs for cleanup of perchlorate in the Rialto area.

The Regional Water Board has issued investigation orders and cleanup and abatement orders to various parties. Nine parties have conducted soil or groundwater investigations. It is evident that there are two perchlorate groundwater plumes in the Rialto area, one originating from the 160-acre site, and one originating from the property owned by the County. The Regional Water Board issued a cleanup and abatement order to the County, with a requirement that the County provide water replacement for a City of Rialto well that was impacted by the County's plume. The County constructed an ion exchange system at the well, has spent over $6.5 million in investigations and cleanup, and will soon be installing more wells to completely contain its plume.

The Regional Water Board continues its efforts to address perchlorate in the Rialto area, and throughout the Region. In October 2006, Regional Water Board staff proposed an amended cleanup and abatement order for Pyro Spectaculars, a fireworks company, and Goodrich and Emhart/Black & Decker. This order would require providing replacement water to the water purveyors, reimbursement of past costs expended by the water purveyors, additional investigation to define the extent of the perchlorate plume, and developing and implementing a long term cleanup plan for the plume. A hearing on this order may occur as early as January 2007.

IX. EXISTING AGENCY COALITIONS ADDRESSING PERCHLORATE

In addition to the remediation efforts that are on-going in the SAW, a number of groups have organized to discuss and investigate perchlorate related issues in the watershed.

Chino Basin Watermaster Water Quality Committee –

- Organized through the Chino Basin Watermaster.
- Formed to examine water quality issues pertaining to groundwater (includes Perchlorate).
- Contact: John Rossi (909) 484-3888.

Santa Ana Regional Board Perchlorate Task Force –

- Organized through the Santa Ana Regional Water Quality Board in cooperation with EPA Region 9.
- Formed to investigate Potential Responsible Party's (RP) for Perchlorate contamination and conduct preliminary data collection and plume mapping in the Rialto-Colton Basin.
- Contact: Gerard Thibeault (909) 782-4130.

Inland Empire Perchlorate Task Force –

- Formed to negotiate a solution to the perchlorate contamination problems incurred by Fontana Water Co., and West Valley Water District.
- Contact: Attorney Barry Groveman of Musick, Peeler & Garrett LLP, (213) 629-7600.

The San Gabriel Perchlorate/NDMA/Emerging Contaminant Coordination Team (Perchlorate Workgroup) –

- Organized through the Main San Gabriel Basin Watermaster.
- Formed to examine various treatment technologies and issues pertaining to perchlorate.
- Contact: Mark Velazquez (626) 815-1300.

Mayor's Advisory Committee on Water Contamination (Perchlorate) –

- Formed to advise on perchlorate contamination issues.
- Contact: Charles W. Bader (909) 623-6020.

The Stringfellow Advisory Committee (SAC) –

- Organized by the Department of Toxic Substances Control focusing on Stringfellow site impacts.

- Formed to obtain community and local agency input and acceptance.
- Meets on the third Wednesday of January, March, May, July, September, and November at the DTSC Stringfellow Information Center, 9415 Mission Blvd., #D, Glen Avon.
- Contact Roger N. Paulson, PE (916) 255-6158 or Randy Sturgeon

  (916) 255-3649 at the Department of Toxic Substances Control, Site Mitigation/Stringfellow Branch, 8810 Cal Center Drive, Sacramento, CA 95626-3200.

X. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

As shown from SAWPA's regional perchlorate investigation, the impacts by perchlorate to the water resources in the Santa Ana River watershed are significant. It is estimated from the available data that over 170 production wells (see Table 2) are contaminated with perchlorate. Contamination levels within the watershed typically ranged from non-detect to 20 ppb, with a maximum of approximately 800 ppb. Approximately 387,000 AFY or 38% of the available groundwater production in the watershed is contaminated with perchlorate. This includes, at present, twenty-seven wells taken out of service and accounting for approximately 70,000 AFY of lost production

Perchlorate contamination has been detected throughout the watershed and the degree to which it impacts watershed agencies varies greatly across the watershed. In addition, the ability of agencies to remediate perchlorate contamination varies based upon the existing or available resources and infrastructure, as well as, the agencies ability to identify the contaminating source. Due to these issues agencies have taken different approaches in dealing with contamination some through installation of treatment processes, some by blending down to compliance, and some by taking no action until required to by regulators.

One of the main concerns with the increasing perchlorate contamination to groundwater supplies is the long-term impact on water resources in the watershed. The costs to remediate the contamination due to perchlorate are extraordinary and the loss of productive groundwater resources in the watershed imposes upon the region's goal of reducing water imports. It is estimated that over $25 million has been invested on capital improvements to remediate perchlorate in the watershed. These costs are compounded by the nearly $10 million in annual O&M costs estimated to be required for the lifetime of the contamination. In addition, it is estimated that approximately another $55 million in capital along with another $10 million annually in O&M costs are anticipated to be needed to treat the remaining contaminated wells. Overall, it is estimated that in addition to the nearly $80 million in capital costs, the long-term treatment of perchlorate will cost an additional $590 million in O&M over the lifetime of contamination. Of additional concern to watershed agencies is that few responsible parties have been identified or have stepped forward to address the issue.

Conclusions

From staff's survey of the issue, the following conclusions can be drawn:

1. **Perchlorate compliance is expected to be a major concern for the foreseeable future.** Despite the establishment of a State PHG and new action level of 6 ppb, higher than the previous interim State action level of 4 ppb, the majority of the cities and agencies in the watershed currently facing perchlorate in their drinking water supplies will continue to face problems with meeting these goals and will require costly cleanup and blending measures to achieve it. Approximately 35 cities and agencies are impacted in the watershed and the average concentration is 11.8 ppb. The only agencies which will find some relief in mitigation measures will likely be those who import Colorado River water, which is now achieving the compliance with average concentrations levels below 6 ppb.

2. **Outside control of data is a concern**. In any regional study approach, staff observed several reservations by agencies regarding the release of data. Several SAWPA member agencies and local agencies have expressed concern with the release of perchlorate well location and water quality data to any regional agency assigned to support all agencies impacted by perchlorate. By the release of well location and quality information to an outside regional agency such as SAWPA, some member agencies have expressed fears over the loss of data release control. An example of this potential problem was cited wherein a regional agency may be forced to release sensitive well information under the Freedom of Information Act to the press or other agency which may impact litigation cases with potential responsible parties (PRPs). Close coordination with the task force agencies would be necessary to avoid potential conflicts in this area.

   In the past, the California Department of Health Services provided well location data for all drinking water supply water quality data collected and reported to them. However, due to national security concerns, the well location is no longer accessible and staff would have to rely on the release of well location data from individual cities and agencies willing to share it.

3. **Liability issues will hinder perchlorate characterization efforts**. In conducting any major data collection effort particularly of well location and production data, the local agencies have encouraged the need to recognize the sensitivity of the perchlorate issue in the watershed. Since many of the cleanup efforts are linked to PRPs, the responsibility for the cleanup rests with these entities. Any suggestion that a regional effort is being undertaken to characterize the perchlorate contamination in the groundwater or suggest clean up options may be viewed by the PRPs as a substitute to their cleanup efforts or possibly a means of delaying their cleanup implementation.

4. **Characterization of perchlorate watershed-wide will be costly and time consuming**. Based on studies being undertaken by Wildermuth Environmental Inc. and other hydrogeologic consultants who are analyzing perchlorate plumes from PRPs or investigating potential PRPs, the historical data is sparse on what industries may have been involved, what perchlorate contaminants were uses, the

amount of the contamination and the direction of travel. Mitigation efforts are also expensive and time consuming as the contamination plumes cross multiple agencies and jurisdictions.

5. **Apportionment of outside funding must be based on need**. To support local agencies efforts to fund perchlorate remediation efforts, it is recommended that local agencies band together to secure state and federal funding. Some local agencies have expressed interest in having a regional agency represent their funding needs at the State and Federal level rather than approaching such sources in a competitive fashion. The regional agency could then serve as a neutral facilitator for such funding of regional needs. SAWPA has been identified as one such regional agency that could represent the perchlorate cleanup needs in the Santa Ana Watershed perchlorate cleanup needs; however, SAWPA has not been formally authorized to assume this role at this time. If approached to serve as the regional representative agency, all funding received should be apportioned out to the local agencies based on the strongest need for cleanup funding. This need would be based on those agencies that have lost the largest percentage of their potable water supplies due to groundwater contamination and are unable to obtain alternative water supplies. Thereafter other factors of need should be considered such as availability of local matching funding, impacts on rate structures, operation and maintenance costs, infrastructure needs to support water deliveries, etc. To resolve these issues, if and when funding is forwarded to a regional agency, the formation of a multi-agency task force is recommended to assist local agencies in defining a process of apportionment and to continue the lobbying support for outside funding in a regional approach. By joining together, a stronger voice of the water community in the Santa Ana Watershed regarding the problems and challenges of perchlorate will likely translate to a higher level of outside funding support success.

Table 2 – Summary: 2004 Regional Perchlorate Investigation Data

	Impacted Agency	Range of Perchlorate Detections (ug/L)	Number Impacted Wells	Impacted Production (AF/Yr)	Number Wells Taken Out of Service	Lost Production (AF/Yr)	Anticipated Wellhead Treatment Needs	Capital & Construct Costs ($)	Annual O&M Costs ($)
OCWD	Anaheim Public Utilities *	< 4.0 to 6.0	6	7,750	--	--	2	15,000,000	2,000,000
OCWD	City of Tustin **	6.3 to 10.7	8	13,000	NA	NA	NA	NA	NA
OCWD	Southern California Water Company - West Orange *	2.2 to 7.7	11	17,600	2	1,750	--	--	--
OCWD	City of Fullerton *	0.9 to 4.5	7	11,200	--	--	--	--	--
OCWD	City of Garden Grove *	3.2 to 4.8	12	19,200	--	--	--	--	--
OCWD	City of Santa Ana *	3.3 to 5.5	4	6,400	--	--	--	--	--
OCWD	Irvine Ranch Water District *	< 2.5 to 6.0	1	400	--	--	--	--	--
WMWD	City of Riverside Public Utilities Department *	5.0 to 62.0	32	120,100	--	--	--	NA*	NA*
WMWD	City of Corona ***	4.0 to 14.0	11	17,600	--	--	--	--	--
WMWD	Santa Ana Watershed Project Authority, Arlington Desalter *	5.3 to 7.3	5	6,450	--	--	--	--	--
WMWD	Rubidoux Community Sanitation District *	9.4 to 10.0	3	1,450	--	--	2	100,000	15,000
WMWD	Jurupa Community Sanitation District **	4.6 to 5.0	1	1,600	NA	NA	NA	NA	NA
EMWD	Eastern Municipal Water District ***	2.5 to 13.0	3	4,800	--	--	--	--	--
EMWD	City of Hemet **	5.7 to 6.0	1	1,600	NA	NA	NA	NA	NA
IEUA	Cucamonga Valley Water District *	3.2 to 9.0	6	3,250	--	--	--	--	--
IEUA	City of Ontario *	4.2 to 12.0	7	21,300	4	6,200	9	17,940,000	261,000
IEUA	Fontana Union Water Company *	3.7 to 18.0	9	29,700	7	24,050	5	7,500,000	3,250,000
IEUA	City of Chino *	5.0 to 17.0	6	15,800	--	--	4	10,000,000	2,400,000
IEUA	City of Chino Hills **	4.3 to 4.4	1	1,600	NA	NA	NA	NA	NA
SBVMWD	City of Redlands MUD ***	4.0 to 90.0	7	17,900	3	8,950	1	NA*	NA*
SBVMWD	East Valley Water District *	5.5 to 11.0	6	9,600	--	--	--	--	--
SBVMWD	City of Loma Linda *	2.9 to 8.0	3	12,100	--	--	--	--	--
SBVMWD	City of Rialto ***	4.0 to 74.0	5	15,500	5	15,500	3	3,000,000	1,500,000
SBVMWD	West Valley Water District *	3.0 to 800	8	17,650	6	12,100	2	1,500,000	600,000
SBVMWD	City of Colton ***	4.0 to 11.0	3	7,600	--	--	--	--	--
SBVMWD	City of San Bernardino **	6.4 to 9.0	2	3,200	NA	NA	NA	NA	NA
SBVMWD	Inland Valley Development Agency-Norton **	5.3 to 5.5	1	1,600	NA	NA	NA	NA	NA
SBVMWD	Loma Linda University *	4.7 to 8.4	2	1,350	--	--	--	--	--
	Total		171	387,300	27	68,550	28	55,040,000	10,026,000

Note:
NA not available
* Data and cost estimates based upon survey
** Costs estimated based upon March 2004 DHS database data
*** Data and cost estimated based upon phone conversation and/or personal interview
NA* not available to the public

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California Department of Toxic Substances Control (DTSC) website: http://www.dtsc.ca.gov/

Addressing Perchlorate Contamination of Drinking-Water Sources in California, January 2004

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United States Geologic Services (USGS), Online Geologic Publications website: http://www.geopubs.wr.usgs.gov/