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MEMORANDUM

TO: Regional Board Members

FROM: Dennis Dickerson, Executive Officer

DATE: January 24, 2003

SUBJECT: UPDATE ON PERCHLORATE GROUNDWATER POLLUTION WITHIN THE LOS ANGELES REGION

A. RECENT PERCHLORATE DETECTIONS

Regional Board staff last reported on perchlorate contamination on April 25, 2002. This report is intended to provide the Regional Board with an update on the current status of perchlorate groundwater contamination in the Region.

Groundwater polluted by perchlorate is now affecting 38 water supply systems within the Los Angeles Region and based on current impact trends, additional systems may be impacted in the near future. Widening perchlorate pollution coupled with 20 to 30 feet drops in the regional water table due to ongoing drought conditions will increase the severity of this impact. Though only about 20 wells have been taken off-line exclusively due to perchlorate, six of which were taken off-line as a result of increasing volatile organic compound (VOC) concentrations.

The economic impact of discovering perchlorate contamination is significant because conventional water treatment systems are unable to remove the chemical. Furthermore, the presence of perchlorate in groundwater could delay and dramatically increase the cost of many ongoing regional and site specific cleanup efforts. To resolve the problem, drinking water treatment plants may now need to be re-designed or augmented to remove perchlorate and other emergent chemicals such as; 1,4-dioxane, n-nitrosodimethylamine (NDMA) and in a few areas, hexavalent chromium with attendant higher costs.

Federal, State and local regulatory agencies, in addition to water supply companies, are looking to the Regional Board for assistance with identifying perchlorate contaminant source areas since most are unknown. This critical task of source identification needs to be conducted so that Regional Board staff can begin directing assessment. The perchlorate update includes: 1) background information on perchlorate; 2) a summary of recent developments and the occurrences of perchlorate throughout the region; 3) past and current Regional Board

accomplishments; 4) information on perchlorate removal technologies, 5) resources challenges and finally 6) conclusions and recommendations.

B. BACKGROUND INFORMATION

The term *perchlorate* is used to describe a group of very strong oxidizing industrial chemicals. Perchlorate originates as a contaminant in the environment from the inorganic salts of ammonium, potassium, magnesium or sodium perchlorate. Ninety per cent of perchlorate manufactured is in the form of ammonium perchlorate. The perchlorate part of the salts is quite soluble in water. The resultant anion (ClO_4^-) is exceedingly mobile in aquifer systems. It can persist for many decades under typical groundwater and surface water conditions because of its resistance to react with other available constituents. Facilities impacted by perchlorate often have volatile organic compounds (VOCs) and, sometimes heavy metal pollution as additional contaminants of concern.

C. PUBLIC HEALTH AND REGULATORY ISSUES

The human health concern surrounding perchlorate involves its ability to interfere with iodine uptake by the thyroid gland. Such an effect decreases production of thyroid hormones, which are needed for prenatal and postnatal growth and development, as well as for normal body metabolism. In adults, the thyroid helps to regulate metabolism. In children, the thyroid plays a major role in proper development an addition to metabolism. Impairment of thyroid function in expectant mothers may impact the fetus and newborn and result in effects in behavior, delayed development and decreased learning capability.

No state or federal drinking water standard or maximum contaminant level (MCL) exists for perchlorate. DHS will be adopting an MCL by January 1, 2004. In 1995, EPA set a provisional reference dose for perchlorate that converts to a drinking water equivalent level of 4 to 18 µg/L. In May 1997, the action level (non-regulatory) in drinking water for perchlorate was established by DHS at 18 µg/L. In January 2002, the action level for perchlorate was lowered by the California Department of Health Services (DHS) from 18 to 4 µg/L. In December 2002, the Office of Environmental Health Hazard Assessment (OEHHA) released a draft public health goal (PHG) for the contaminant's concentration in drinking water. OEHHA's PHG for perchlorate ranges from 2 to 6 µg/L, based on the inhibitory effect of perchlorate on the uptake of iodide by the thyroid gland in humans.

D. LOCAL PERCHLORATE OCCURENCES

Perchlorate is used as an oxygen-adding component in solid propellant fuels for rockets, missiles, explosives, munitions, pyrotechnics, military countermeasures, highway safety flares, fireworks, matches and in electroplating. Ammonium perchlorate is also used in certain fertilizers (up to 1%), the manufacture of matches, and in analytical chemistry. Commercially, it has been

primarily used by local rocket research companies like **Aerojet** (Azusa/Baldwin Park, South El Monte), **Lockheed Martin** (Valencia) **Whittaker-Bermite** (Valencia**), NASA/Jet Propulsion Laboratories** (Pasadena), **US. Naval Air Station** (San Nicholas Island), **Boeing's** (former Rocketdyne) Santa Susanna Field Laboratory, and in some **agricultural areas**. Groundwater monitoring wells in and around these facilities have detected perchlorate. Drinking water wells in the cities of Alhambra, Arcadia, Azusa, Duarte, San Marino, Commerce, Covina, El Monte, Glendora, City of Industry, La Puente, Pasadena, Pomona, La Verne, Santa Clarita, Los Angeles (Tujunga Well Field), Norwalk, Bellflower, Baldwin Park, Monrovia, Monterey Park, San Gabriel, South Pasadena, San Dimas, Vernon and Whittier have detected perchlorate in recent years (1997 to present). Prior to 1997, there were no requirements from DHS to test water systems.

An estimated 33% of the source sites contributing to perchlorate groundwater pollution are known, but many sources are unknown (See Table I). Please also reference the enclosed maps that show the impacted areas in the Los Angeles Region.

Outside our region, in the Southern California area, perchlorate has been detected in groundwater monitoring wells around several **firework-manufacturing companies** (Colton/Rialto), at **Lockheed Propulsion Company** (Riverside) and at **Aerojet** (Rancho Cordova, near Sacramento). A major perchlorate spill in 1997 by Kerr McGee Corporation impacted the Las Vegas Wash, a tributary that enters Lake Mead and the lower Colorado River, which are the source waters for the Metropolitan Water District's (MWD) California supply. Original perchlorate concentrations after the release were as high as 3,700,000 µg/L in the Las Vegas Wash area. As perchlorate was washed into the Lake Mead its concentrations were diluted downgradient in Lake Mead to 10 µg/L and now range from 4 up to 9 µg/L in the lower Colorado River. MWD announced on April 17, 2002 that that a new remediation system installed under the direction of the Nevada Division of Environmental Protection will soon intercept additional groundwater contaminated with perchlorate.

We have included a USEPA Fact Sheet that contains maps that depict perchlorate-polluted sites across the United States. As you can see, perchlorate appears to be national problem but its clearly a major threat to the Los Angeles area drinking water supply. To make this point, it is noteworthy to point out that the Mercury News in San Jose reports that residents of the Mogan Hill community will be receiving 4,000 bottles of drinking water because their supply wells have become polluted with perchlorate (Appendix A).

E. AREA SUMMARIES

RECENT DETECTIONS IN THE LOS ANGELES REGION

As of mid-December 2002, according to the California Department of Health Services, over 150 surface water (springs/reservoirs) and groundwater sampling points within the Los Angeles

Region (see attached Tables I) have detected perchlorate (ranging from 4 µg/L to 159 µg/L). The groundwater sampling points involve supply wells, water treatment inffluent/effluent, irrigation and monitoring wells. Site specific groundwater monitoring has verified a wider impact throughout the Los Angeles Region.

1. VENTURA COUNTY (Figures 1 and 2)

Subsurface investigations required by the California Department of Toxic Substances Control (DTSC) under a stipulated enforcement order has identified a perchlorate plume beneath Boeing's Santa Susana Field Laboratory (SSFL) near Simi Valley. This site is located just west of the Los Angeles County/Ventura County borderline and 2 miles east of the Ahmanson Ranch well that recently detected perchlorate (one sample, not repeated). At the SSFL, the highest perchlorate concentration of 600 µg/L was detected along the eastern part of the facility in the fractured Chatsworth Formation. Investigations continue in an effort to understand the relationship, if any, to the Ahmanson Ranch Well No. 1 that detected perchlorate up to 28 µg/L in August 2002.

Perchlorate has also been detected in two supply wells at the United States Naval facility on San Nicholas Island. It is believed the perchlorate contained in explosive ordinances is the source. There have been no other detections of perchlorate in any other municipal supply wells throughout Ventura County.

2. LOS ANGELES COUNTY

(i) Central Groundwater Basin (Figure 3)

There have been only five sporadic perchlorate detections reported in the Central Groundwater Basin. Perchlorate impact on drinking water supply systems has been reported in Vernon, Commerce, Norwalk and Bellflower. Perchlorate concentrations range from 4 to 13-µg/L (Table I). The source sites are currently unknown.

(ii) Raymond Groundwater Basin (Figure 4)

The latest water quality information on perchlorate from the City of Pasadena for December 2002 indicates that they have decided to shut down 9 of their 13 drinking water supply wells due to perchlorate pollution. Twelve other nearby wells are also impacted by perchlorate, bringing the total to 25. The source of the Pasadena perchlorate pollution is attributed to the National Aeronautics and Space Administration (NASA)/Jet Propulsion Laboratories (JPL) Complex. This facility engages in, among other things rocket research, testing and production where by solid rocket propellant fuel containing perchlorate is used. NASA/JPL is proceeding in a timely manner with implementing an approved a *Remedial Action Plan* (RAP) to remove perchlorate and VOCs from

groundwater onsite and offsite. This is being done under Regional Board and USEPA regulatory oversight.

(iv) San Gabriel Valley Groundwater Basin (Figure 5)

Based on the information provided by DHS for December 2002 (Table I), 60 water supply wells have become contaminated by perchlorate. Wells taken off-line are located in different areas, such as Pomona Valley, Pasadena, Azusa/Irwindale, West Covina, City of Industry and South El Monte. Federal and State regulatory agencies, municipalities, as well as water supply companies are tracking these events. In August 2002, six of these drinking water wells were taken out of service in South El Monte due to elevated concentrations of perchlorate and VOCs beyond the already identified City of Monterey Park Wells No. 5 and No. 12. Over 9,000 gallons per minute (gpm) of drinkable water has been temporarily lost due to well shutdowns. All of these wells lie within the South El Monte Operable Unit (SEMOU).

The Main San Gabriel Basin Watermaster indicates that the list of perchlorate-impacted municipal wells continues to grow. In the City of Industry, Waterworks Wells Nos. 3 and 4 remain shut down due to elevated perchlorate concentrations. In West Covina, Valencia Heights Well Nos. 1, 2 and 4 have also been shut down.

(v) Pomona Valley (Figure 6)

The City of Pomona reports that as many as 23 drinking water wells have detected perchlorate at various times during 2002. These detections, in addition to increasing VOC concentrations, have caused the shut down of 2 of these 23 drinking water wells. Perchlorate concentrations range from 4 µg/L to as high as 19 µg/L. To reduce the impact of increasing perchlorate concentrations, the City of Pomona blends impacted groundwater with non-impacted water prior to sending it through their 15 million gallon per day treatment plant.

F. PERCHLORATE REMOVAL TECHNOLOGIES

There are several effective treatment technologies available that will reduce perchlorate concentrations in groundwater. The most widely used removal technology is an ion exchange system, which removes the perchlorate (ClO_4^-) anion from groundwater down to levels of 4 µg/L. Hence, this treatment process is relatively expensive, starting at approximately $100 per acre-foot of treated water. Furthermore, during the ion exchange process, a brine solution is produced which requires special handling and disposal. Ion exchange systems for perchlorate removal and destruction can allow the recycling of brine solution, but are available at much greater cost for treatment, starting at approximately $500 per acre-foot of treated water.

An ion exchange system would utilize multiple ion exchange beds (made of resin) that are mounted to slowly rotate. Beds move in a continuous sequence of operations that include perchlorate adsorption, backwash, regeneration, rinse, and displacement. This treatment will remove nitrate and sulfate from the water along with perchlorate. DHS has approved this technology for treatment to drinking water standards. Calgon Carbon Corporation's Engineered Solutions Division has been hired by the Baldwin Park Operable Unit (BPOU) Cooperating Respondents (CRs, aka PRPs) and the Main San Gabriel Watermaster to design, construct and operate drinking water treatment plants that remove and destroy perchlorate using their patented ISEP® Ion Exchange Separations technology. The perchlorate treatment project located in La Puente has a flow rate of 2,500 gpm and the project in San Gabriel has a flow rate of 7,800 gpm. Contaminated water being treated may have perchlorate concentrations of up to 200 µg/L.

Another promising remedial technology uses biological treatment to remove perchlorate to non-detect levels. This technology utilizes a fluidized bed bioreactor for perchlorate removal. The VOCs are removed first, followed by perchlorate removal. However, the biological process may produce unwanted VOC byproducts. This treatment process is very expensive, with a typical low-flow system costing $2 to $3 million to operate. DHS is evaluating this technology and will soon issue its opinion. The Ground-Water Remediation Technologies Analysis Center (GWRTAC) has listed 65 perchlorate treatment studies on its website: http://www.frtr.gov under "Treatment Technology." Also, the results of a federally funded perchlorate treatment research program, managed by the American Water Works Research Foundation (AWWARF) are now available for reference on the following website: http://www.awwarf.com/research/spperch.asp.

G. WATER TREATMENT AND SPREADING GROUNDS

The presence of perchlorate in groundwater is widespread in the San Gabriel Basin and in Pomona Valley. Figure 7 shows the locations of perchlorate impacted drinking water wells, the imported Colorado River water supplied by Metropolitan Water District (MWD) of Southern California, the spreading grounds for treated wastewater or infiltration/recharge projects and the locations of publicly owned treatment works plants (POTWs). Releases of perchlorate have infiltrated through the soil thus impacting groundwater. The potential impact of perchlorate contaminated imported water from the Colorado River, the probable lack of POTW removal capability and the possibility that groundwater spreading/recharge projects may play a role in spreading perchlorate pollution (Table II) are all concerns worth noting. In the San Gabriel Valley, for example, under water recycling requirements POTWs treat wastewater by blending with non-impacted water prior to being discharged to spreading grounds. Considering the large amounts of water that are percolated (up to 3,222 million gallons per year in one spreading ground), the spreading grounds may be contributing to low concentrations of perchlorate basin-wide. Currently, POTWs are not monitoring for perchlorate on a regular basis, so little data is available. In mid-January Regional Board staff sent out 433 letters to dischargers subject to waste discharge requirements to furnish technical or monitoring reports that include analytical results of onetime sampling for emergent chemicals, which include perchlorate.

H. RECENT REGIONAL BOARD STAFF ACTIONS

(i) Source Identification Efforts:

1997– The City of El Monte, water supply companies and some dischargers were directed to sample for perchlorate. The analytical results ranged from 1 to 5 µg/L.
1998 - Identification of perchlorate contaminant sources in the Azusa/Baldwin Park Area.
1998 - Assisted USEPA with the revision of the 1994 Record of Decision for the Baldwin Park Operable Unit amended to include perchlorate.
1999 - Directed PRPs in El Monte Operable Unit to sample for perchlorate.
2000 - Directed Lockheed (in San Fernando Basin) and NASA/JPL (Raymond Basin) to sample for perchlorate.
2001 - Directed dischargers in Monrovia and South El Monte to sample for perchlorate.
2002 - USEPA/Regional Board direct PRPs in South El Monte and Puente Valley Operable Units to sample for perchlorate and other emergent chemicals.

(ii) Groundwater Remediation:

Regional Board staff has been working in conjunction with the United States Environmental Protection Agency (USEPA) and the Department of Toxic Substances Control (DTSC) staff to coordinate the soil and groundwater cleanup activities at the NASA/JPL site in Pasadena. This site has been divided into three Superfund Operable Units. Operable Unit I, II and III include the groundwater beneath the site, the soil beneath the site, and the groundwater off-site, respectively (Figure 8). In September 2002, the Record of Decision (ROD) for Operable Unit II was finalized. A pilot study to start remediation of groundwater beneath the site (Operable Unit I) using and in-situ reactive zone technology for perchlorate treatment was submitted to this Regional Board in October 2002. The final Engineering Evaluation Cost Analysis (EECA) for operable Unit III will be submitted by the end of January 2003. The projected activities covered under this EECA include the treatment of off-site groundwater in the down-gradient end of the plume and its subsequent up-gradient recharge. This will prevent the further migration of the plume off-site.

In the San Gabriel Valley, another Superfund area, the 1994-ROD for the BPOU that included groundwater treatment water for VOCs had to be reevaluated and the remedy redesigned due to the emergent chemicals; perchlorate, 1,4-dioxane and NDMA (see Appendix B). The groundwater treatment systems make use of a variety of processes to remove the contaminants from the groundwater: ion exchange (to remove perchlorate and nitrate); ultraviolet light and hydrogen peroxide (to remove NDMA, 1,4-dioxane, and VOCs); and air stripping and off-gas treatment (to remove VOCs). An initial pilot-scale test of a biological treatment system for perchlorate removal was completed between November 1997 and May 1998. The testing demonstrated that the treatment system, which converts the perchlorate to chloride, a non-toxic

form of chlorine, could reduce the concentration of perchlorate in the groundwater to non-detectable levels. The CRs completed a second phase of testing in 2000 to determine whether the treatment system could reliably produce water of drinking water quality. Although the results of the phase 2 testing were positive, a decision was made to use an ion exchange system, rather than the biological treatment system, for perchlorate removal. In March 2002, USEPA published a *Perchlorate Update* fact sheet to provide information on environmental occurrence, toxicity assessment and the health hazard threat posed by perchlorate to the public (see Appendix C). The California Environmental Protection Agency has also released a *Perchlorate Fact Sheet* (Appendix D).

I. CONCLUSIONS AND RECOMMENDATIONS

1. From Table I it is apparent that many of the localized perchlorate sources are unknown at this time. A sustained State-led source identification effort is necessary to ensure that perchlorate pollution assessment, monitoring and cleanup continues throughout the Los Angeles Region, in particular in the San Gabriel Basin, Pomona Valley, Santa Clarita Valley and in Simi Valley. Regional Board staff will be requesting assistance from USEPA for the San Gabriel Basin investigation.

2. We have requested the assistance of the State's Fire Marshal's Office with identifying the manufacturers of perchlorate end-products such as pyrotechnics, explosives, highway safety flares, munitions, military countermeasures, rocket propellant fuel, fertilizer, circuit boards and related chemical oxidizers in the Los Angeles Region. They have promised to provide useful information soon.

3. More intra- and inter-departmental coordination amongst Regional Board staff, State Board, DTSC, DHS and County agencies is necessary to ensure accelerated source identification, assessment, expanded groundwater monitoring, information exchange, and conformity in regulatory action.

4. The effects on groundwater supply and recharge needs to be coordinated and studied with MWD, the San Gabriel Basin Water Quality Authority (WQA), the respective Watermasters and local regulatory agencies in order to access the present and future threat to water resources.

5. Information obtained from dischargers subject to WDRs will be used to better understand the overall distribution of perchlorate in groundwater within the region. We will be making recommendations to dischargers, regulatory agencies and water supply companies based partially on these findings.

6. We are considering sending a 13267 letter to MWD requesting information on perchlorate impacted imported water from the Colorado River and an evaluation report on the receiving water supply systems within our region.

7. In the event that the DHS or USEPA establish a lower MCL of perchlorate in the future, there may be a significant increase in the number of impacted wells and, possibly, surface water bodies due to perchlorate contamination.

APPENDIX A

Posted on Mon, Jan. 20, 2003

The Mercury News

South County residents fear their drinking water may be contaminated

By Frank Sweeney
Mercury News

More than 1,200 South County residents, worried that a chemical used in rocket fuel and highway flares has contaminated their drinking water, have contacted the Santa Clara Valley Water District to arrange for free tests of their wells.

By Monday evening, four days after officials disclosed that the chemical perchlorate has spread in an underground plume four miles south from Morgan Hill through San Martin, appointments had been made to test more than 450 private wells beginning Wednesday, water district officials said. Most of the wells serve more than one house.

The district also has launched a program to provide everyone potentially affected by the contamination with free bottled water for drinking and cooking.

District officials have gotten initial requests for more than 4,000 bottles of water. About 200 homes were getting the free water from Crystal Springs on Monday, with an additional 200 scheduled to receive bottled water Wednesday. The sudden demand resulted in the water company temporarily running out of bottles, said water district spokesman Mike Di Marco.

Meanwhile, officials continued to investigate how far the perchlorate has spread into the underground water aquifers. If past groundwater pollution incidents are any guide, the cleanup will take years and could cost millions of dollars.

Perchlorate is a salt that disrupts iodine intake in the thyroid gland, which regulates hormone functions. It is especially harmful to pregnant women and infants, and can interfere with neurological development in fetuses. Some studies suggest it can cause thyroid cancer.

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Water district officials estimate as many as 450 wells could be contaminated by perchlorate that has leached from a 13-acre site at Tennant and Railroad avenues in Morgan Hill where the Olin Corp. manufactured highway safety flares from 1955 to 1996.

Last March, perchlorate was detected at a Morgan Hill municipal well 250 feet from the Olin site. City officials shut down the well immediately. That event caused the water district and the Central Coast Regional Water Quality Control Board, a state agency, to test water in some wells off the Olin site.

``When the contamination hit the city well, there was no indication that the plume extended beyond there,'' Di Marco said. ``It was reasonable to think that the concentrations were accumulating at the site because of the power of the well to move water toward it.''

Further well tests in concentric circles around the site indicated the plume moved south. Perchlorate has turned up four miles away in a well near Masten Avenue in Gilroy.

``When the test results came in last week, they indicated a larger problem than we anticipated,'' Di Marco said.

The highest concentrations were found in a well at the U-Save Rockery near the Olin site. Lesser amounts were found farther away.

Once the extent of the contamination has been determined, the clean-up will be a long, difficult process, officials said.

IF YOU'RE INTERESTED

Private well owners in the affected area should contact the water district on the Perchlorate Hot Line, 265-2607 ext. 2649 to arrange for free testing of their water. More information is available on the district's web site, www.valleywater.org.

Contact Frank Sweeney at fsweeney@sjmercury.com or (408) 920-5675.

» more photos

APPENDIX B

EPA San Gabriel Valley Superfund Sites / Baldwin Park Operable Unit

Los Angeles
San Gabriel Basin

U.S. Environmental Protection Agency • Region 9 • San Francisco, CA • May 1999

EPA Updates Cleanup Plan for the Azusa-Irwindale-Baldwin Park Area

Los Angeles County, California

The United States Environmental Protection Agency (EPA) is updating the Superfund cleanup plan for the Baldwin Park area of the San Gabriel Valley in response to the discovery, in 1997 and 1998, of several new pollutants in the groundwater. The EPA adopted the cleanup plan in 1994, after extensive public comment. The newly discovered chemicals include perchlorate, N-nitrosodimethylamine (NDMA), and 1,4-dioxane. Perchlorate is used in solid rocket fuel; NDMA has been found in liquid rocket fuel; and 1,4-dioxane has been used as a stabilizer in chlorinated solvents. Discharges of these chemicals to the ground are believed to have stopped many years ago, but a significant amount of contamination has reached the groundwater basin and requires cleanup. In addition to perchlorate, NDMA, and 1,4-dioxane, groundwater in the Baldwin Park area is contaminated with perchloroethylene (PCE), trichloroethene (TCE), and other chlorinated solvents. Chlorinated solvents are sometimes referred to as *volatile organic compounds* or VOCs.

The discovery of perchlorate, NDMA, and 1,4-dioxane will change the cleanup project, known as the Baldwin Park Operable Unit (OU), in three ways:

1) Additional treatment processes must be used to reduce perchlorate, NDMA, and 1,4-dioxane concentrations in the groundwater to safe levels. The technologies typically used to remove chlorinated solvents from water (air stripping and carbon adsorption) will not effectively remove perchlorate, NDMA, or 1,4-dioxane. Final decisions on treatment processes will be made during remedial design, later this year or early next year.

2) More of the treated groundwater is expected to be used locally, to replace water supplies lost when perchlorate and NDMA forced local water companies to shut down some groundwater wells. Previously, local agencies were advocating the export of most of the treated groundwater to communities outside of the San Gabriel Valley.

3) Some of the groundwater extraction wells will be located further south than previously planned to prevent the spread of perchlorate and NDMA, as well as VOCs, to clean portions of the groundwater basin.

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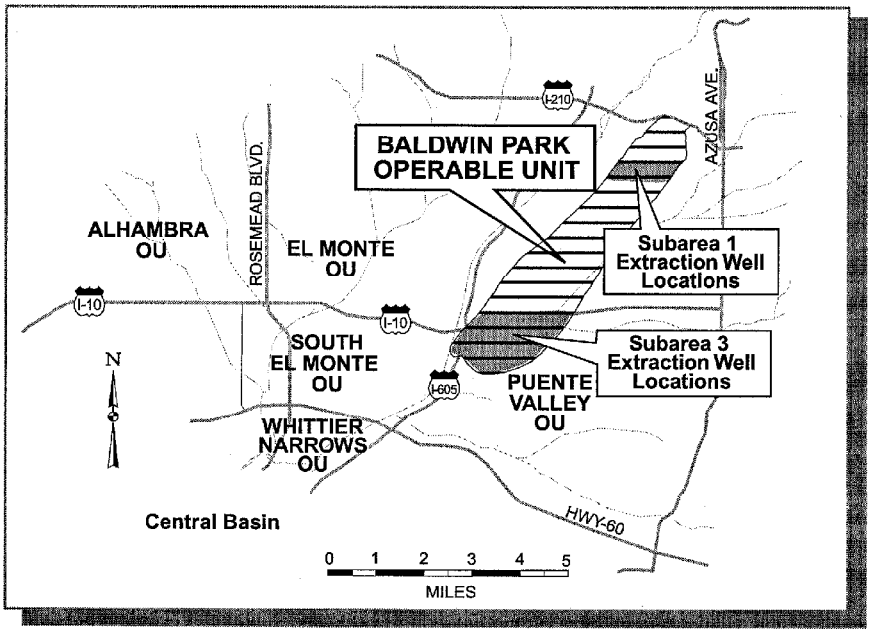

Figure 1: Location map of the Baldwin Park Operable Unit and other San Gabriel Valley Superfund Site Projects

These changes have delayed construction of the cleanup facilities by about two years while tests of perchlorate treatment technologies and changes to the groundwater extraction plan are completed. The treatment studies and updated extraction plan are almost complete. The changes will significantly increase the cost of cleanup, as described below.

If and when significant changes are needed in a Superfund cleanup plan, the EPA informs the community through an Explanation of Significant Differences. This fact sheet is intended to fulfill that requirement. We welcome comments on new aspects of the cleanup highlighted in this fact sheet and on other issues raised by the discovery of perchlorate, NDMA, and 1,4-dioxane in the Baldwin Park area. We will, if appropriate, make additional changes in the cleanup plan in response to comments. EPA previously requested and considered comments on other aspects of the cleanup in 1993. The State of California, through its Department of Toxic Substances Control, supports the changes described in this fact sheet.

The remainder of the fact sheet provides a brief history of the Baldwin Park cleanup, summarizes the 1994 cleanup plan, and describes the changes to the 1994 plan in more detail.

The Baldwin Park Cleanup: A Brief History

1994: EPA Adopts Cleanup Plan

On March 31, 1994, the EPA adopted a cleanup plan for the Azusa-Irwindale-Baldwin Park area known as the *Baldwin Park Operable Unit Record of Decision.* The plan addresses a several-mile-long area of groundwater contamination in the San Gabriel Valley. The contamination results from the use and improper handling and disposal of carbon tetrachloride (CTC), PCE, TCE, and other chemicals. These chemicals were used in large quantities at industrial facilities in Azusa and surrounding areas as early as the 1940s, and by hundreds of businesses in the 1960s, 1970s and 1980s for degreasing, metal cleaning, and other purposes. The chemicals were probably released to the ground by a combination of onsite disposal, careless handling, leaking tanks and pipes, and other means.

The groundwater contamination was discovered in 1979. In 1984, the EPA added four portions of the San Gabriel Valley to the national Superfund list. The Baldwin Park area is officially known as the *San Gabriel Valley Area 2* Superfund site. Subsequent investigation by the EPA and others revealed the tremendous extent of groundwater contamination. During the past 15 years, more than one-quarter of the approximately 366 water supply wells in the San Gabriel Valley have been found to be contaminated. In response to the contamination, water companies have shut down contaminated wells, installed new treatment facilities, and taken other steps to ensure that they can continue to supply water meeting State and Federal drinking water standards.

The EPA's 1994 cleanup plan calls for the extraction and treatment of contaminated groundwater from two broad subareas of contamination. The northernmost of the two subareas is termed *Subarea 1.* Subarea 1 includes most of the known sources of the groundwater contamination, where contaminant concentrations in groundwater are hundreds of times drinking water standards. The southernmost subarea is termed *Subarea 3,* where contaminant concentrations are lower but still

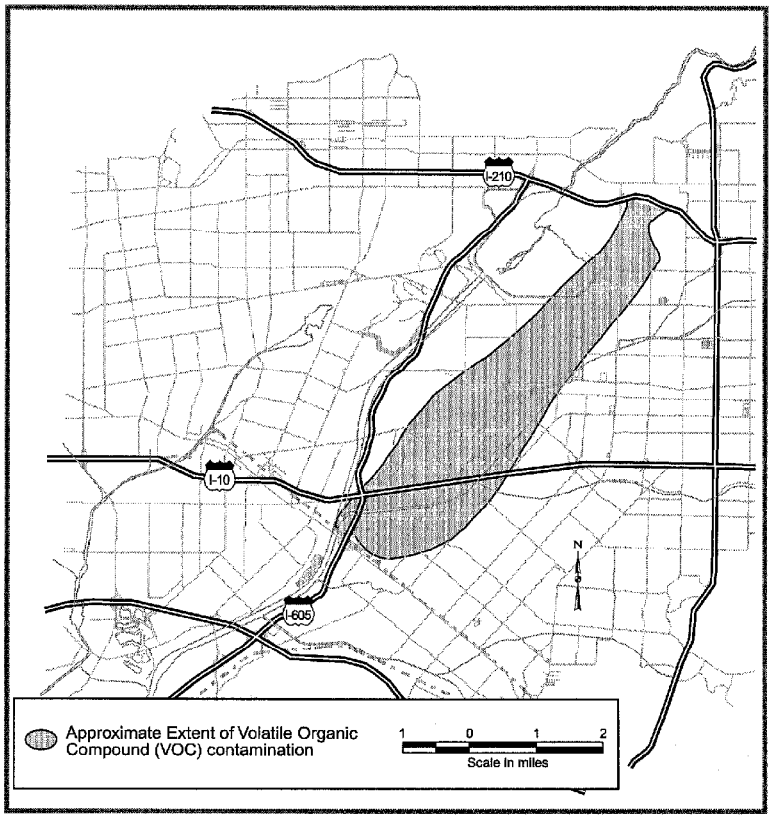

Figure 2: Approximate extent of VOC contamination in groundwater in the Azusa-Irwindale-Baldwin Park area.

exceed drinking water standards (see Figure 1).

The goals of the 1994 cleanup plan are to limit the movement of contaminated groundwater to clean or less contaminated areas and depths, remove a significant mass of contamination from the groundwater, and provide the data necessary to determine final clean up standards for the area. The plan calls for the construction and operation of groundwater extraction wells, treatment facilities, and conveyance facilities capable of pumping and treating approximately 19,000 gallons per minute of contaminated groundwater. The plan recommends the use of existing water supply wells, treatment systems, and pipelines to the extent possible, and the construction of new facilities where needed. Final decisions on extraction rates and locations were to be made during remedial design. In 1994, the EPA estimated the cost of the cleanup at $47 million in capital costs and $4 million/year for operation and maintenance. EPA's revised cost estimate is $85 million in capital costs and $10 million/year for operation and maintenance

1995 - 1997: Potentially Responsible Parties (PRPs) Complete Pre-Design Work

In January 1995, the EPA began to name the companies responsible for the groundwater contamination. To date, the EPA has named 19 companies and property owners as Potentially Responsible Parties, also known as PRPs. In late 1995, a majority of these companies organized themselves into a group named the Baldwin Park Operable Unit Steering Committee. From 1995 to early 1997, the Steering Committee funded more than $2 million of *pre-design* work needed as part of the cleanup. The Steering Committee installed and sampled a network of eight deep groundwater monitoring wells to improve our understanding of the extent of contamination and developed a detailed groundwater extraction plan. During this period, negotia-

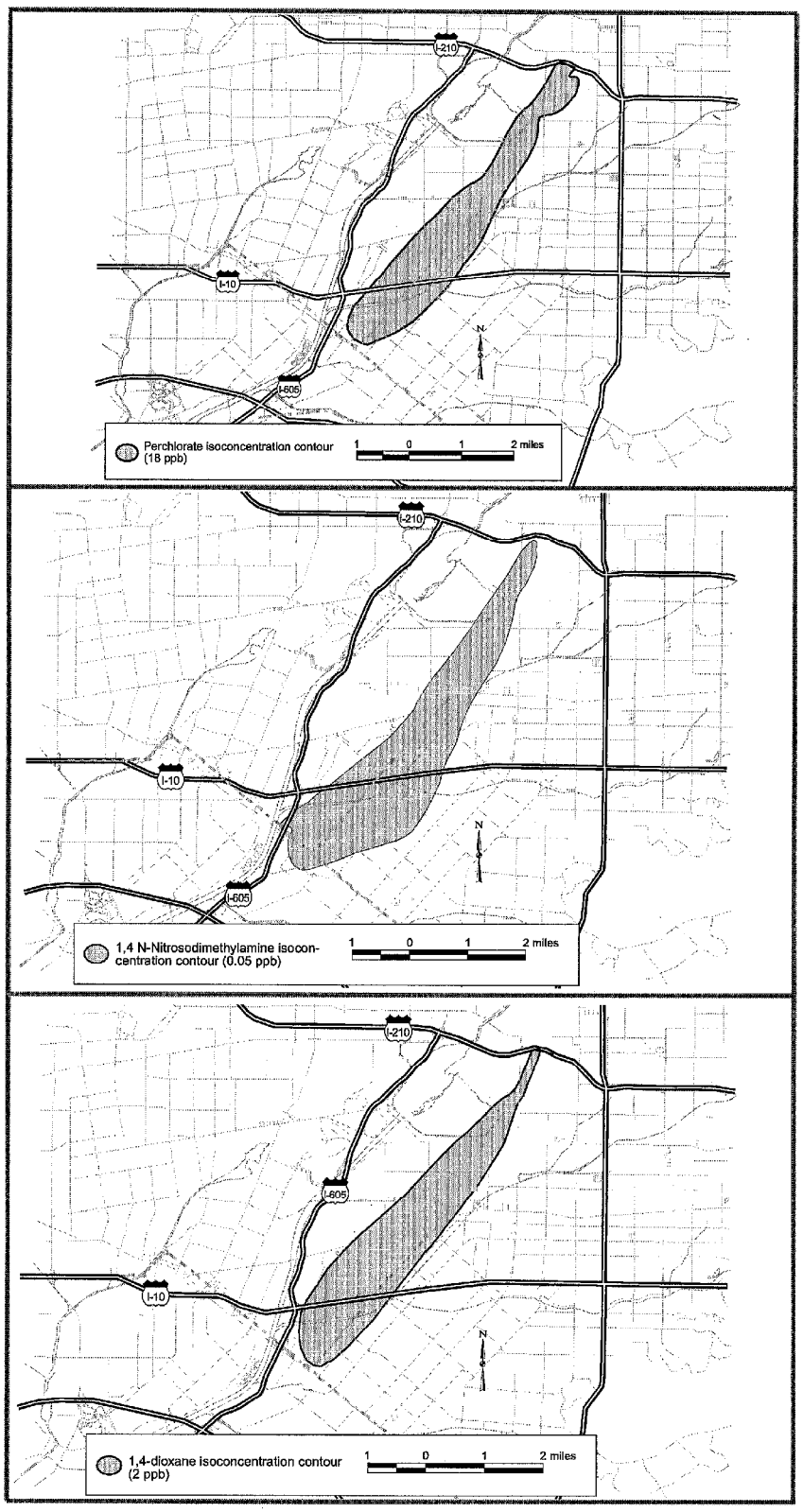

Figure 3: Approximate extent of perchlorate, NDMA and 1,4-dioxane contamination in groundwater

tions with water agencies continued, and a tentative water distribution and use plan was developed which called for delivery of the treated groundwater to the Metropolitan Water District of Southern California. The plan, labeled the *Consensus Plan,* called for export of the treated groundwater to areas now dependent on more expensive and less dependable imported water, in order to reduce the region's dependence on imported water supplies and raise revenue through sales of the treated water.

1997 - 1999: Discovery of Perchlorate Extends Negotiations and Triggers Need for Additional Pre-Design Work

In May 1997, the EPA sent *Special Notice* letters to 19 PRPs to begin formal EPA-PRP negotiations. The EPA's purpose in initiating the negotiations was to obtain a binding commitment from the PRPs to carry out the Baldwin Park cleanup plan (i.e., to design, construct, and operate the groundwater extraction, treatment, and delivery facilities). The negotiations were expected to conclude in late 1997, but the discovery in June 1997 of perchlorate at levels above 18 parts per billion (ppb) in groundwater forced an extension in the negotiations. At that time, no one knew the extent of perchlorate contamination in the Baldwin Park area and little was known about the cost, effectiveness, and reliability of possible treatment methods.

The discovery of perchlorate occurred soon after the California Department of Health Services developed an improved analytical method capable of detecting perchlorate at concentrations as low as 4 ppb in groundwater. The EPA had attempted to determine whether perchlorate was present in the groundwater in the mid 1980s, but the analytical methods available at the time were not capable of determining with certainty whether perchlorate was present. NDMA and 1,4-dioxane were discovered in the Baldwin Park area in 1998.

The highest concentrations of perchlorate, NDMA, and 1,4-dioxane are found in the groundwater in Azusa, in Subarea 1. Maximum concentrations of perchlorate and NDMA are more than 100 times the State drinking water action levels of 18 and 0.002 ppb respectively. The maximum concentration of 1,4-dioxane is more than 20 times the State drinking water action level of 3 ppb. Up to six miles downgradient of the industrial source area in Azusa, at the likely groundwater extraction locations in Subarea 3, perchlorate and NDMA concentrations remain above State action levels. The concentration of 1,4-dioxane in this area has, to date, been below the State action level. Figure 3 depicts the approximate extent of perchlorate, NDMA and 1,4-dioxane contamination in groundwater in the Baldwin Park OU.

In response to the discovery of perchlorate, the EPA extended its formal negotiations with the PRPs until July 1999. In exchange for the extension, the Steering Committee agreed to immediately proceed to complete additional predesign work. The additional work included completion of a pilot-scale study of one perchlorate-removal technology (biological treatment); support for studies of a second perchlorate-removal technology (ion exchange); installation of four additional groundwater monitoring wells to help define the extent of perchlorate, NDMA, and 1,4-dioxane contamination; and revisions to the groundwater extraction plan. The ion exchange studies have been funded largely by the Main San Gabriel Basin Watermaster.

The treatment studies have successfully demonstrated that both technologies can remove perchlorate from groundwater down to non-detectable levels. Pilot-scale studies were not needed for NDMA or 1,4-dioxane removal, because experience at other sites has demonstrated that NDMA and 1,4-dioxane can be removed down to non-detectable levels using commercially-available treatment systems. See page 6 for a more detailed description of perchlorate, NDMA, and 1,4-dioxane treatment technologies. The additional treatment technologies needed to remove the new contaminants are responsible for most of the increase in the estimated cost of the cleanup.

At the same time that the treatment studies have been underway, the EPA, the PRPs, and local water agencies have continued efforts to determine the best use of the treated groundwater. Although no final decisions have been made, there has been a renewed interest in recent months in using the treated groundwater *within* the San Gabriel Basin, rather than exporting the water out of the Basin. This change in interest resulted in part because perchlorate and NDMA have forced water companies to shut down several water supply wells in the San Gabriel Basin, prompting water companies to look for additional supplies of clean water to replace the lost production. Ultimately, it is likely that much of the treated water will be used locally, but some may still be exported outside of the San Gabriel Basin. Since late 1998, discussions have been underway between the EPA, the PRPs, the Main San Gabriel Basin Watermaster, and affected water companies. The Watermaster and the affected water companies are interested in taking responsibility for building and operating some or all of the Baldwin Park cleanup facilities.

There are also multiple efforts underway to reduce the PRPs' share of the cleanup costs by securing other sources of funding. A Federal grant provided through the U. S. Bureau of Reclamation has paid for more than $1 million in predesign costs and is expected to provide additional money for

Table 1. Comparison of Cleanup Plans - Most Aspects of the 1994 Plan Have Not Changed

	ORIGINAL CLEANUP PLAN	UPDATED CLEANUP PLAN
Remedial Objectives	Limit further migration of contaminated groundwater, begin to remove contamination from the groundwater, and provide data necessary to determine final clean up standards	Same
Groundwater Extraction Areas	Extract groundwater from two broad areas of contamination (Subareas 1 and 3)	Same, except Subarea 3 is extended further south
Groundwater Extraction Rates	Extract contaminated groundwater at rates needed to meet remedial objectives. Determine final rates during remedial design. Initial estimate was 19,000 gpm	Same. Revised estimate is 20,000-21,000 gpm
Groundwater Treatment Technologies	Use air stripping, carbon treatment, and/or oxidation technologies to remove VOCs from the groundwater. Select technologies during remedial design	Use same technologies to remove VOCs. Also use ion exchange or biological treatment to remove perchlorate, UV light to remove NDMA, and UV oxidation to remove 1,4-dioxane. Select technologies during remedial design
Groundwater Treatment Standards	Design treatment systems to reduce contaminant concentrations to below MCLs	Reduce contaminant concentrations to below MCLs and reduce perchlorate, NDMA, and 1,4-dioxane concentrations to below State action levels
Use of Treated Groundwater	Supply to water companies for distribution, and/or recharge into the groundwater basin. Make final decision during remedial design	Same
Project Costs	Estimated capital costs of $47 million; estimated operation and maintenance costs of $4 million/year	Estimated capital costs increase to $85 million; estimated operation and maintenance costs increase to $10 million/year

design and construction costs (up to 25% of the project's capital costs). In March 1999, three of the San Gabriel Valley's U.S. Congressional Representatives cosponsored the San Gabriel Basin Drinking Water Initiative, which would, if it became law, provide up to $75 million in additional Federal funding for groundwater cleanup in the Baldwin Park area and other contaminated areas in the San Gabriel Valley and an additional $25 million for research on perchlorate treatment technologies.

The cleanup plan remains protective of human health and the environment and will continue to meet all applicable or relevant and appropriate requirements identified in the 1994 Record of Decision, as required by CERCLA Section 121(d).

Schedule

- **Spring 1999** - Design of treatment facilities at the La Puente Valley County Water District (LPVCWD) wellfield
- **Summer 1999** - Construction of treatment facilities at the LPVCWD wellfield
- **July 1999** - Deadline for Potentially Responsible Parties to submit a *Good Faith Offer* committing to design, construct, and operate the Baldwin Park cleanup facilities
- **Fall 1999** - Deadline for negotiation of Consent Decree
- **Late 1999-2001** - Design of remaining Baldwin Park cleanup facilities
- **2001-2003** - Construction of remaining Baldwin Park cleanup facilities

Treatment Options

Perchlorate

Since 1997, when perchlorate was discovered in the San Gabriel Valley groundwater basin, much progress has been made in developing treatment methods capable of removing perchlorate from the groundwater. Most of the attention has been directed at two technologies: biological treatment and ion exchange.

In the biological treatment process, microbes destroy perchlorate by converting the perchlorate ion to oxygen and chloride. Oxygen and chloride are present at low levels in all drinking water. Nutrients must be added to sustain the microbes. The Steering Committee has completed a six month pilot-scale study of an anaerobic biological process, demonstrating the reduction of perchlorate from approximately 75 ppb to below detectable levels. The same process is being used in a recently-constructed full-scale treatment system at the Aerojet Superfund Site in Northern California. A similar process has also been used at a Utah facility to treat non-potable wastewaters resulting from the manufacture and maintenance of rocket motors.

Biological treatment methods are capable of producing potable water, but additional testing must be completed to determine whether a biological process can reliably and cost-effectively remove perchlorate and produce drinking quality water. The necessary tests are planned for later this year, when a 300-500 gallon per minute biological treatment system should be in operation. The treatment system is expected to include a biological reactor, followed by a biologically-active multimedia filter and granular activated carbon (GAC) *polishing treatment* (see Figure 4). The system will also include ultraviolet light treatment for removal of NDMA and VOCs. Biological treatment methods are new to many water utilities, but *biologically active* filters have been used in drinking water treatment for decades to help remove particles and biodegradable organic matter.

The second of the two perchlorate-removal technologies receiving the most attention is ion exchange, in which the perchlorate ion is replaced by chloride, a chemically similar but non-toxic ion. Ion exchange processes have been used in homes and businesses for *softening* hard water for decades. Bench- and pilot-scale studies have demonstrated that ion exchange systems can reliably reduce perchlorate concentrations in San Gabriel Valley groundwater from approximately 75 ppb to below detectable levels. The studies have also provided valuable information on resin selection and regeneration, brine volume, and cost that will guide the design and operation of full scale systems. By summer 1999, a 2500 gallon per minute ion exchange system is expected to go online, producing potable water for use in the San Gabriel Valley.

The principal disadvantage of ion exchange systems is that they produce a concentrated brine that requires disposal and/or further treatment. Research is underway to try to identify methods of reducing the volume of perchlorate-contaminated brines to reduce the high cost of disposal.

What are Perchlorate, NDMA, and 1,4-Dioxane?

Perchlorate is a highly soluble inorganic molecule made of chlorine and oxygen. Its chemical formula is ClO_4^-. In solid form, as ammonium perchlorate, it is highly explosive. At low concentrations in water, as is found in the San Gabriel groundwater basin, perchlorate is unreactive and persistent. Ammonium perchlorate and potassium perchlorate were used at two facilities in Azusa in the 1940s in the testing of solid fuel rockets and the manufacture of photoflares. Ammonium perchlorate is still in use today - in the solid fuel rockets that launch the space shuttle, in some missiles and fireworks, and other applications.

NDMA (N-nitrosodimethylamine) is a highly soluble organic chemical that was used, until about 1976, in the production of the liquid rocket fuel 1,1-dimethylhydrazine (also known as unsymmetrical dimethylhydrazine [UDMH]). NDMA has reportedly been present as an impurity in UDMH, and may be formed as a result of the chemical breakdown of UDMH. NDMA has been detected at trace levels in some manufactured products and foods, and can reportedly be produced as a byproduct of a number of chemical reactions. Its chemical structure is $(CH_3)_2N\text{-}N{=}O$. Hydrazine-containing fuels were used in Azusa as early as the 1940s.

The chemical *1,4-dioxane* is a highly soluble compound used as a stabilizer in chlorinated solvents, particularly 1,1,1-trichloroethane. Its chemical formula is $C_4H_8O_2$. It belongs to a class of organic compounds known as ethers. It is a different chemical than the similar-sounding dioxins. Chlorinated solvents likely to have contained 1,4-dioxane, including 1,1,1-trichloroethane, have been used in Azusa and Baldwin Park for many years.

An added benefit of both biological treatment and ion exchange processes is that they would also remove much of the nitrate from the water. The groundwater in some parts of the San Gabriel Valley is unusable because of high levels of nitrate. The nitrate is believed to result from past agricultural practices in the Valley.

Two other technologies have also been demonstrated to be capable of removing perchlorate from water, but probably at higher cost. Reverse osmosis and nanofiltration were tested by researchers at the Metropolitan Water District of Southern California and shown to be effective in removing perchlorate, but they are likely to be much more expensive to operate than ion exchange processes or biological treatment. Liquid phase granular activated carbon (GAC) also removes perchlorate, but only for a limited period of time before regeneration or replacement of the carbon is required. Frequent carbon replacement would make relying solely on GAC for perchlorate removal very expensive. Perchlorate cannot be removed from water by conventional filtration, sedimentation, or air stripping technologies.

NDMA and 1,4-Dioxane Treatment

NDMA can be removed from groundwater by ultraviolet (UV) light treatment. In a UV treatment system, the water passes though a tank containing high-intensity ultraviolet lamps. The NDMA molecules absorb the light energy and are broken down into smaller nontoxic molecules. The chemical 1,4-dioxane can also be removed by UV light treatment, in combination with an oxidant such as hydrogen peroxide. UV treatment systems have been successfully built and operated to remove both chemicals from water in locations throughout the United States.

Treatment Levels

The treatment technologies used at the Baldwin Park Operable Unit will have to be capable of effectively and reliably removing VOCs, perchlorate, NDMA, and 1,4-dioxane from the groundwater. If any of the treated groundwater is to be used as drinking water, the treatment technologies must reduce the concentrations of all contaminants to below Federal and State drinking water standards in existence at the time that the water is served. These standards, known as Maximum Contaminant Levels (MCLs), must be met at the tap. There are MCLs for some but not all of the chemicals present in the groundwater in the Baldwin Park area.

Safe levels for some chemicals that lack MCLs are specified by *action levels* developed by the California Department of Health Services (DHS). There are action levels for perchlorate (at 18 ppb); NDMA (at 0.002 ppb); and 1,4-dioxane (at 3 ppb). Although not an enforceable standard, an action level is the concentration of a contaminant in drinking water that DHS has determined, based on available scientific information, provides an adequate margin of safety to prevent potential risks to human health. California Health & Safety Code Section 116455 requires that the operator of a public water system notify local government authorities when a drinking water well exceeds an action level. In addition, DHS recommends that drinking water systems provide public notification if action levels are exceeded, unless the wells in question are taken out of service. Public water systems virtually always shut down wells if action levels are exceeded.

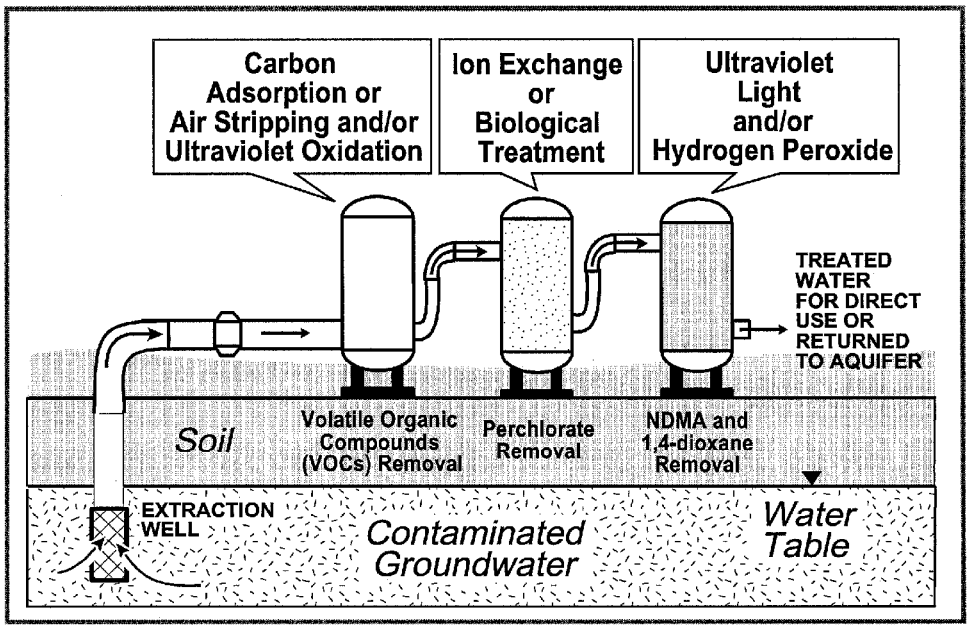

Figure 4: Groundwater treatment technologies

Accordingly, in any water to be served as drinking water, the concentrations of perchlorate, NDMA, and 1,4-dioxane will be reduced to below action levels in existence at the time the water is served.

EPA's cleanup plan also allows some or all of the treated water to be recharged back into the groundwater basin instead of being delivered as drinking water. As discussed

in greater detail in the Record of Decision, any water that is to be recharged must comply with the pertinent water quality objectives in the Los Angeles Regional Water Quality Control Board Basin Plan. In addition, State Water Resources Control Board Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California," is applicable to any recharge of treated groundwater into the aquifer. Resolution No. 68-16 requires maintenance of existing State water quality unless it is demonstrated that a change will benefit the people of California, will not unreasonably affect present or potential uses, and will not result in water quality less than that prescribed by other State policies. In light of these requirements, any groundwater recharged into the aquifer will be treated to levels below action levels for perchlorate, NDMA, and 1,4-dioxane.

The treatment levels discussed above apply to the groundwater after it is pumped above ground. Neither the 1994 cleanup plan nor this update establish cleanup levels in situ (i.e., in the aquifer). EPA will propose in situ cleanup levels in a future action.

Final Selection of Treatment Technologies

The EPA believes that a final decision to select treatment technologies for the Baldwin Park Operable Unit should be deferred until later this year or early next year. That way, the results of continuing treatment studies in the San Gabriel Valley and elsewhere can be incorporated into the decision. By the end of 1999, it is likely that full scale ion exchange and biological treatment systems will be operating in the San Gabriel Valley, providing additional cost and performance data to guide the selection of treatment technologies.

EPA is issuing this Explanation of Significant Differences in part to satisfy its public participation responsibilities under CERCLA Section 117(c) and NCP Section 300.435(c)(2)(I).

Table 2. Status of the Five San Gabriel Valley Superfund Projects

U.S. EPA PROJECT	LOCATION	STATUS	UPCOMING ACTIONS
Baldwin Park Operable Unit (OU)	Portions of the cities of Azusa, Irwindale, Baldwin Park, and West Covina	Regional investigation completed; cleanup plan adopted; 19 PRPs identified; pre-design work completed.	See remainder of fact sheet for detailed update.
Whittier Narrows OU	In and adjacent to the Whittier Narrows Recreation Area	New cleanup plan proposed November 1998. No PRPs named.	Record of Decision expected by mid 1999. EPA-funded pre-design activities underway. Remedial Design to be completed in 2000.
Puente Valley OU	Portions of the cities of Industry and La Puente	More than 70 PRPs identified; regional investigation complete; cleanup plan adopted in September 1998.	EPA-PRP Consent Decree negotiations expected to begin in late 1999. Goal is to obtain a binding commitment from the PRPs to carry out the Puente Valley cleanup plan.
El Monte OU	Portions of the cities of El Monte and Temple City	20 PRPs identified; regional investigation completed; cleanup plan proposed in November 1998; seven early action monitoring wells installed	Record of Decision expected by June 1999. Formal EPA-PRP Consent Decree negotiations expected to begin later this year.
South El Monte OU	Portions of the cities of South El Monte, southern El Monte, and Rosemead	50 PRPs identified; regional investigation completed	Proposed cleanup plan expected by mid-1999.

Who's Who?

It's difficult to keep track of the many agencies and groups with a stake in the cleanup. Here is a quick summary of seven of the most active:

U.S. Environmental Protection Agency (EPA) - The EPA is ultimately responsible for cleanup of the groundwater contamination in the Basin, through the Superfund program. The Superfund program remains one of the most effective means of resolving the nation's historical contamination problems. The Federal law that established the program (known as CERCLA) includes a prohibition against lawsuits to delay or stop cleanup; stringent liability provisions to ensure that responsible parties pay; a trust fund of government money to be used if responsible parties fail to carry out their cleanup responsibilities; numerous opportunities for public involvement; and flexibility to tailor cleanup projects to reduce costs, meet local water supply goals, and satisfy other local needs.

Baldwin Park Operable Unit Steering Committee - The Steering Committee consists of a majority of the companies named as Potentially Responsible Parties. As of May 1999, 14 of the 19 companies named as PRPs were members of the Steering Committee. To date, the Steering Committee has spent more than $3 million on investigation and treatment work needed for the cleanup.

Main San Gabriel Basin Watermaster - The Watermaster was created by a judgment of the California Superior Court to manage the San Gabriel groundwater basin under the jurisdiction of the Court. In 1991, the Watermaster's management responsibilities were expanded to further the cleanup and help preserve the basin's water resources. The Watermaster has been the primary sponsor of the ion exchange studies recently completed in the San Gabriel Valley, and is interested in taking responsibility for building and operating some or all of the Baldwin Park cleanup facilities.

San Gabriel Basin Water Quality Authority (WQA) - The WQA is a public agency created by State legislation to assist in the cleanup of the San Gabriel Basin. The WQA has offered a variety of ideas on how to carry out the Superfund cleanups in the San Gabriel Valley, and has funded construction of several interim cleanup projects in the Valley. The WQA has the authority to raise millions of dollars in funds through a tax on water production in the Valley.

The California Department of Toxic Substances Control (DTSC) - The DTSC is a State agency which has also funded wellhead treatment facilities in the San Gabriel Valley, and serves as the support agency for all of the San Gabriel Valley Superfund cleanups.

The California Regional Water Quality Control Board - The Regional Board is a State agency which has worked cooperatively with EPA to identify the sources of soil and groundwater contamination in the San Gabriel Valley.

The California Department of Health Services (DHS) - The DHS develops California MCLs and action levels, and regulates and monitors approximately 8500 public drinking water systems in California. DHS staff have participated in the recent testing of perchlorate treatment technologies in the San Gabriel Valley, and must approve any treatment systems used in the Baldwin Park cleanup to provide potable water.

For Copies of Documents

This document will become part of the Administrative Record file for the Baldwin Park Operable Unit. To examine or obtain copies of this document or other documents related to this project, contact:

EPA Region 9 Superfund Records Center
95 Hawthorne Street
San Francisco, CA 94105 • (415) 536-2000

The Record Center's hours are 8:00 am to 5:00 p.m., Monday through Friday. The Superfund Records Center can make documents available for viewing in San Francisco, photocopy and mail requested documents, or create and send you a CD-ROM containing requested documents. A subset of documents related to the Baldwin Park Operable Unit is also available at:

West Covina Public Library &	**Rosemead Library**
1601 West Covina Parkway	8800 Valley Boulevard
West Covina, CA 91790	Rosemead, CA 91770
(626) 962-3541	(626) 573-5220

Call to check their hours. Documents available at all locations include:

Perchlorate Treatment Studies (prepared by Harding Lawson Associates for the Baldwin Park Operable Unit Steering Committee, unless noted otherwise)

- 09-29-1997 Draft Technology Screening for Treatability of Perchlorate in Groundwater, Baldwin Park OU
- 10-30-1998 Big Dalton Perchlorate Removal Pilot Study, prepared by Calgon Carbon Corporation for the Main San Gabriel Basin Watermaster (ion exchange)
- 02-12-1999 Final Phase 2 Treatability Study Workplan, Pilot Scale Groundwater Treatment System, Baldwin Park OU (biological treatment)
- 04-1999 Results of Bench-Scale and Pilot-Scale Studies of Ion Exchange for Perchlorate Removal, prepared by Montgomery Watson for the Main San Gabriel Basin Watermaster (ion exchange)
- 04-12-1999 Final Phase 1 Treatability Study Report, Perchlorate in Groundwater, Baldwin Park OU (biological treatment)

Groundwater Monitoring and Groundwater Extraction Plan (prepared by Harding Lawson Associates for the Baldwin Park Operable Unit Steering Committee, unless noted otherwise)

- 12-1996 Pre-Remedial Design Report..., Baldwin Park Operable Unit, prepared by Camp Dresser & McKee for the Baldwin Park Operable Unit Steering Committee
- 4-28-1998 Draft Phase 2A Well Installation and Groundwater Sampling Report..., Baldwin Park Operable Unit
- 1-21-1999 Draft Addendum to the Pre-Remedial Design Report, Baldwin Park Operable Unit

Information on Physical, Chemical, and Toxicological Properties of Perchlorate, NDMA, and 1,4-dioxane

- 7-1998 Action Level for N-NDMA (see DHS website: http://www.dhs.ca.gov/ps/ddwem/chemicals/ndma/ndmaindex.htm, updated 7/9/1998)
- 3-1999 Action Level for 1,4-dioxane (see DHS website: http://www.dhs.ca.gov/ps/ddwem/chemicals/mcl/mclindex.htm, updated 3/12/1999)
- 4-1999 Action Level for perchlorate (see DHS website: http://www.dhs.cahwnet.gov/org/ps/ddwem/chemicals/perchl/perchl_standards.htm, updated 4/23/1999)

For more information about the EPA Superfund Program and EPA activities in the San Gabriel Valley, check
- **EPA's national website: http://www.epa.gov**
- **EPA's Region 9 website: http://www.epa.gov/region09**

Catherine McCracken, Community Involvement Specialist
U.S. Environmental Protection Agency Region 9
75 Hawthorne Street (SFD-3)
San Francisco, CA 94105

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Alhambra OU _____

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Public Comments Welcomed

We welcome comments on new aspects of the cleanup highlighted in this fact sheet, and on other issues raised by the discovery of perchlorate, NDMA, and 1,4-dioxane in the Baldwin Park area. Please send comments by July 2, 1999 to:

Wayne Praskins, EPA Project Manager
75 Hawthorne Street (SFD-7)
San Francisco, CA 94105

phone: (415) 744-2256
fax: (415) 744-2180
Email: praskins.wayne@epa.gov

For More Information

For general questions about the EPA Superfund program and the San Gabriel Valley Superfund Sites, you may contact the following U.S. EPA staff:

- **Puente Valley and Alhambra Operable Units**
  Penny McDaniel (415) 744-2407
- **Baldwin Park Operable Unit**
  Wayne Praskins (415) 744-2256
- **El Monte and South El Monte Operable Units**
  Bella Dizon (415) 744-2155
- **Whittier Narrows Operable Unit**
  Doug Frazer (415) 744-2259
- **Community Involvement**
  Catherine McCracken
  (415) 744-2182 (phone), (415) 744-1796 (fax)
  or mccracken.catherine@epa.gov
- **Media inquiries**
  Randy Wittorp, press officer
  (415) 744-1589

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APPENDIX C

EPA Perchlorate Update

United States Environmental Protection Agency

MARCH 2002

The United States Environmental Protection Agency (EPA) has released its revised draft toxicity assessment, "Perchlorate Environmental Contamination: Toxicological Review and Risk Characterization." When finalized, this assessment will be an important update of EPA's health assessment that reflects the state of the science regarding the health effects of the chemical perchlorate. The preliminary revised human health risk estimates found in the document are still undergoing review and deliberations both by the external scientific community and within EPA, and do not represent EPA policy at this stage.

How To Review and Comment on EPA's Draft Perchlorate Toxicity Assessment

The draft perchlorate toxicity assessment is available at EPA's National Center for Environmental Assessment (NCEA) Web site www.epa.gov/ncea under "what's new." Written public comments on the scientific literature and on EPA's characterization of the science in the draft perchlorate assessment will be accepted by EPA's contractor, Eastern Research Group, for consideration during the Agency's document revision process. These comments will be made available to the peer reviewers. Public comments must be received by April 5, 2002. Send your comments to: Eastern Research Group ERG, Attn: Meetings, 100 Hartwell Avenue, Lexington, MA 02421. If your comments are under 50 pages in length, you can send them via email attachment (in Word, WordPerfect or PDF) to *meetings@erg.com.*

What is Perchlorate?

Perchlorate is both a naturally occurring and man-made chemical. Most of the perchlorate manufactured in the United States is used as the primary ingredient of solid rocket propellant. Wastes from the manufacture and improper disposal of perchlorate-containing chemicals are increasingly being discovered in soil and water.

How Can Perchlorate Affect Human Health?

Perchlorate interferes with iodide uptake into the thyroid gland. Because iodide is an essential component of thyroid hormones, perchlorate disrupts how the thyroid functions. In adults, the thyroid helps to regulate metabolism. In children, the thyroid plays a major role in proper development in addition to metabolism. Impairment of thyroid function in expectant mothers may impact the fetus and newborn and result in effects including changes in behavior, delayed development and decreased learning capability. Changes in thyroid hormone levels may also result in thyroid gland tumors. EPA's draft analysis of perchlorate toxicity is that perchlorate's disruption of iodide uptake is the key event leading to changes in development or tumor formation.

What are the Preliminary Conclusions of the Draft Toxicity Assessment?

The EPA draft assessment concludes that the potential human health risks of perchlorate exposures include effects on the developing nervous system and thyroid tumors. The draft assessment includes a draft reference dose (RfD) that is intended to be protective for both types of effects. It is based on early events that could potentially result in these effects, and factors to account for sensitive populations, the nature of the effects, and data gaps were used. The draft RfD is 0.00003 milligrams per kilogram per day (mg/kg/day). The RfD is defined as an estimate, with uncertainty spanning perhaps an order of magnitude, of a daily exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of adverse effects over a lifetime. As with any EPA draft assessment document containing a quantitative risk value, that risk value is also draft and should not at that stage be construed to represent EPA policy. Thus, the draft RfD for perchlorate is still undergoing science review and deliberations both by the external scientific community and within the Agency.

The assessment provides a hypothetical conversion of the draft RfD to a drinking water equivalent level, assuming factors of 70 kilograms (kg) body weight and 2 liters (L) of water consumption per day. The converted draft estimate would be 1 microgram per liter (ug/L) or 1 part per billion (ppb). If the Agency were to make a determination to regulate perchlorate, the RfD, along with other considerations would factor into the final value.

Does Perchlorate Cause Cancer?

Perchlorate is associated with disruption of thyroid function which can potentially lead to thyroid tumor formation. This draft toxicity assessment accounts for both developmental and tumor formation effects.

Does My Water Contain Perchlorate?

Confirmed perchlorate releases have occurred in at least 20 states throughout the United States (see Figure 2). In EPA Region 9, perchlorate releases have occurred in California, Arizona, and Nevada. Perchlorate has also been released into the Colorado River, which is a drinking water source for some areas of the region. Additional information and maps detailing those sites are available in Chapter 1 of the draft of the "Perchlorate Environmental Contamination: Toxicological Review and Risk Characterization." EPA, other federal agencies, states, water suppliers and industry are already actively addressing perchlorate contamination through monitoring for perchlorate in drinking water and surface water. The full extent of perchlorate contamination is not known at this time.

What is Being Done about Perchlorate?

A peer review of the draft perchlorate toxicity assessment will be held March 5 and 6, 2002 in Sacramento, CA. The purpose of the peer review is to provide an independent review of the scientific information and interpretation used in the document. Once the assessment is finalized, the reference dose will be used in EPA's ongoing efforts to address perchlorate problems. EPA's draft reference dose represents a preliminary estimate of a protective health level and is not a drinking water standard. In the future, EPA may issue a Health Advisory that will provide information on protective levels for drinking water. This is one step in the process of developing a broader response to perchlorate including, for example, technical guidance, possible regulations and additional health information. A federal drinking water regulation for perchlorate, if ultimately developed, could take several years.

In 1998, perchlorate was placed on EPA's Contaminant Candidate List for consideration for possible regulation. In 1999, EPA required drinking water monitoring for perchlorate under the Unregulated Contaminant Monitoring Rule (UCMR). Under the UCMR, all large public water systems and a representative sample of small public water systems are required to monitor for perchlorate over the next two years to determine whether the public is exposed to perchlorate in drinking water nationwide.

How is Perchlorate Removed from Water?

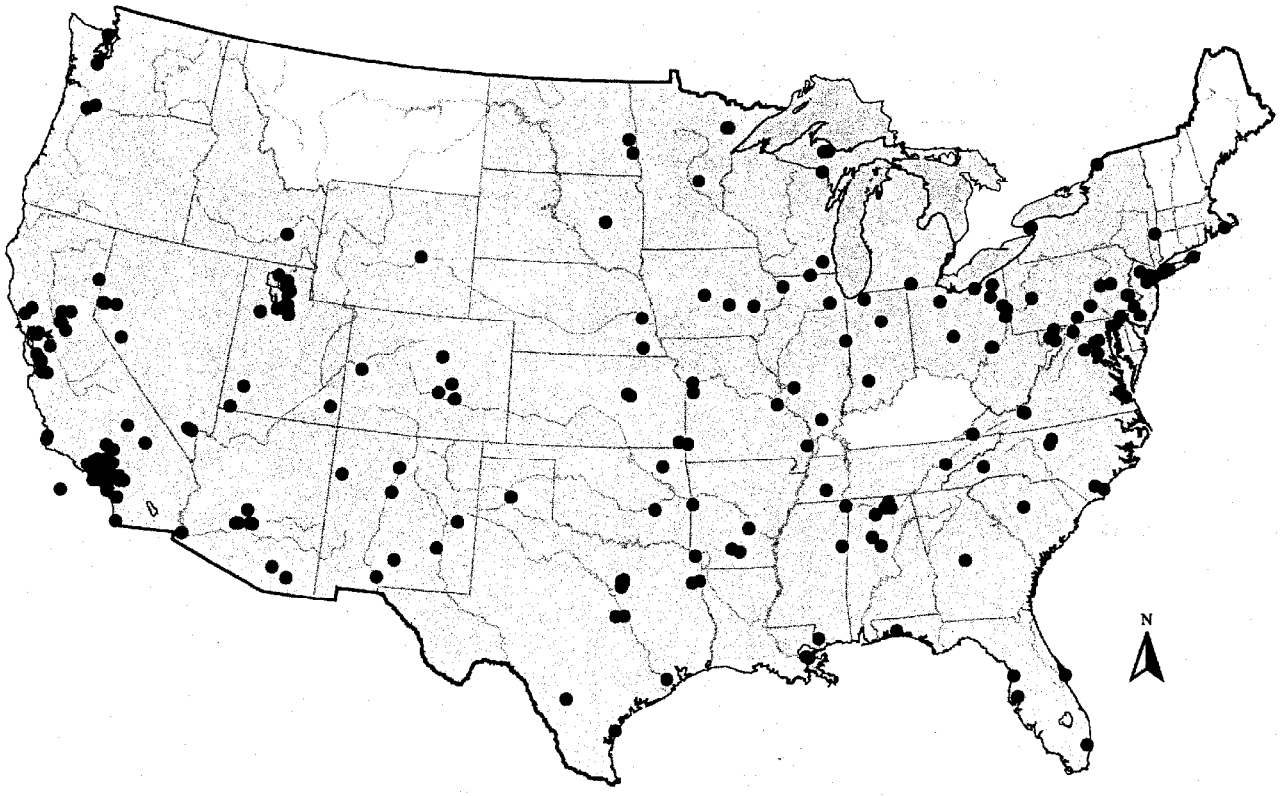
Several types of treatment systems designed to reduce perchlorate concentrations are operating around the United States, reducing perchlorate to below the 4 ppb reporting level. Biological treatment and ion (anion) exchange systems are among the technologies that are being used, with additional treatment technologies under development.

Many other perchlorate studies have been completed during the last several years. A May 2001 summary of 65 perchlorate treatment studies is available online at www.gwrtac.org/ (click on "Technical Documents" then look for "Technology Status Reports"). The summary report was prepared by the Ground-Water Remediation Technologies Analysis Center. Most of the projects described in the report are bench-scale and pilot-scale demonstrations of water treatment technologies, although several entries describe full-scale systems and soil treatment methods. Most of the projects employ biological treatment methods or ion (anion) exchange technology, although reverse osmosis, nanofiltration, granular activated carbon, and chemical reduction are also discussed. Results of federally-funded perchlorate treatment research, managed by the American Water Works Association Research Foundation (AWWARF), are also becoming available (see www. awwarf. com/ research/spperch.asp).

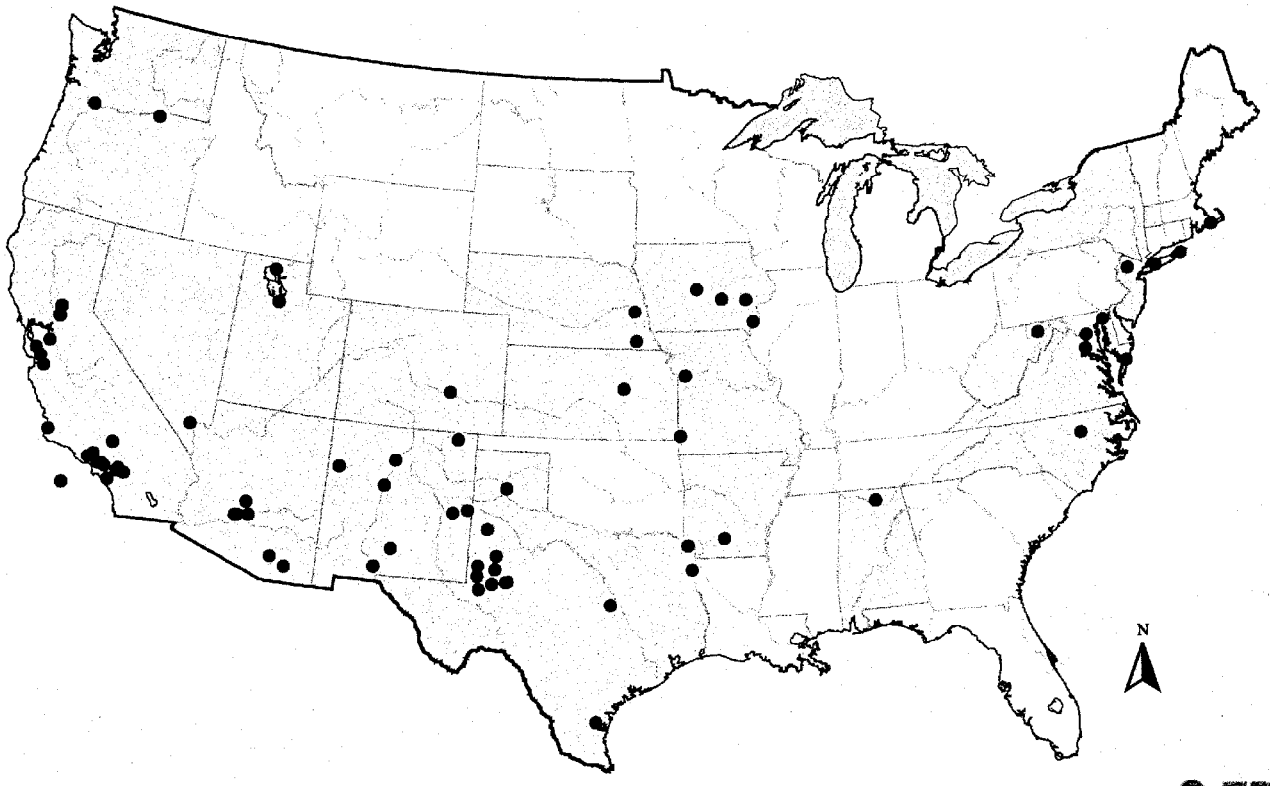
Is Perchlorate-contaminated Water Safe to Drink?

EPA's draft toxicity assessment is preliminary and thus, it is difficult to make definitive recommendations at this stage. Other factors that influence the answer to this question include how much water is consumed, the degree of perchlorate contamination and the health status of the consumer.

Sensitive populations, like pregnant women, children and people who have health problems or compromised thyroid conditions, should follow the advice of their health care provider regarding the amount and type of liquids, including water that should be consumed.

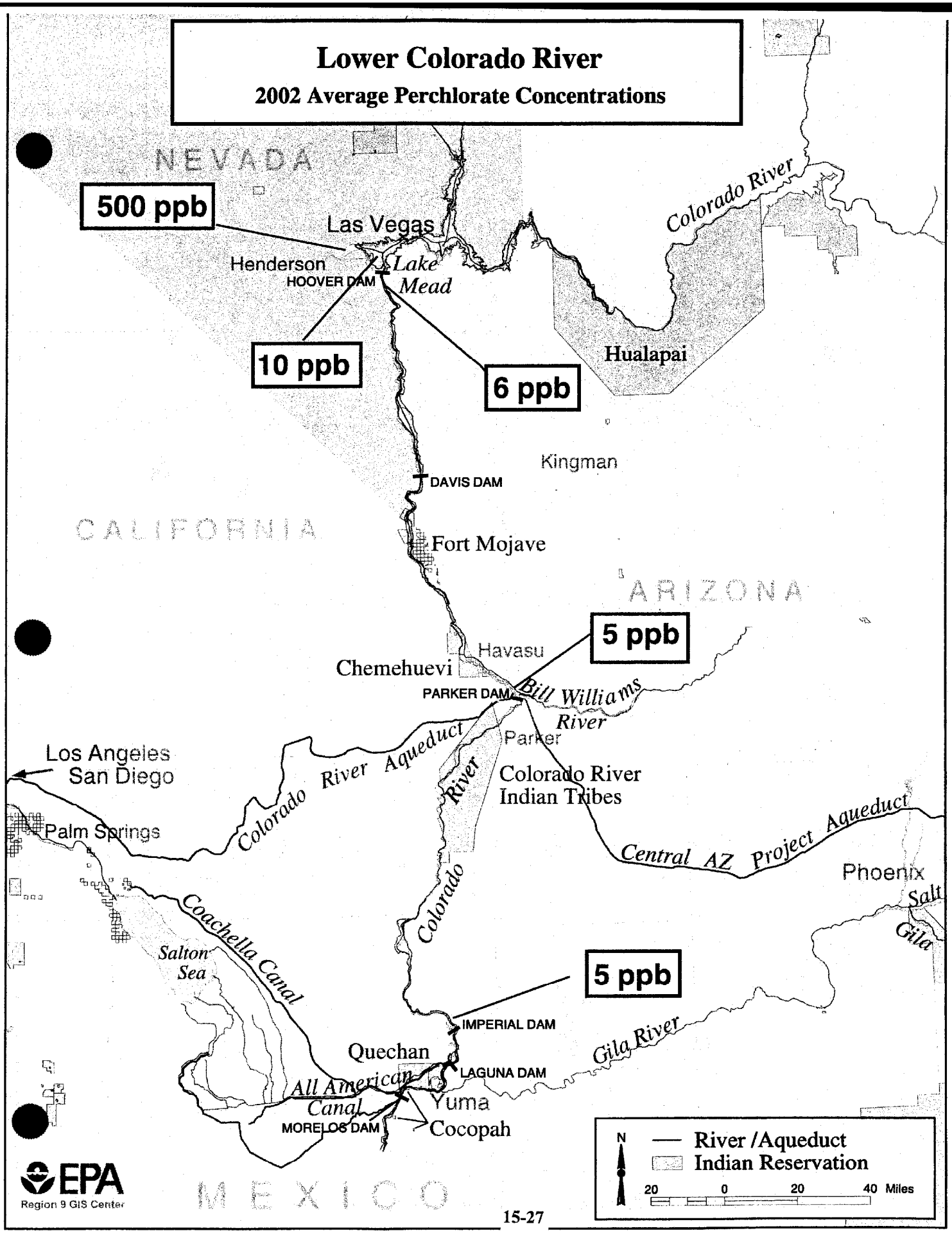


U.S. Perchlorate Manufacturers and Users, as of December 2002



Reported Releases of Perchlorate into the Environment, as of December 2002

EPA
Region 9 GIS Center


Lower Colorado River
2002 Average Perchlorate Concentrations
NEVADA
500 ppb
Las Vegas
Henderson
HOOVER DAM
Lake Mead
10 ppb
6 ppb
Colorado River
Hualapai
Kingman
DAVIS DAM
CALIFORNIA
Fort Mojave
ARIZONA
5 ppb
Havasu
Chemehuevi
PARKER DAM
Bill Williams River
Parker
Los Angeles
San Diego
Colorado River Aqueduct
Colorado River Indian Tribes
Palm Springs
Central AZ Project Aqueduct
Phoenix
Salt
Gila
Coachella Canal
Salton Sea
Colorado River
5 ppb
IMPERIAL DAM
Quechan
LAGUNA DAM
Gila River
All American Canal
Yuma
MORELOS DAM
Cocopah
EPA
Region 9 GIS Center
MEXICO
N
River /Aqueduct
Indian Reservation
20 0 20 40 Miles

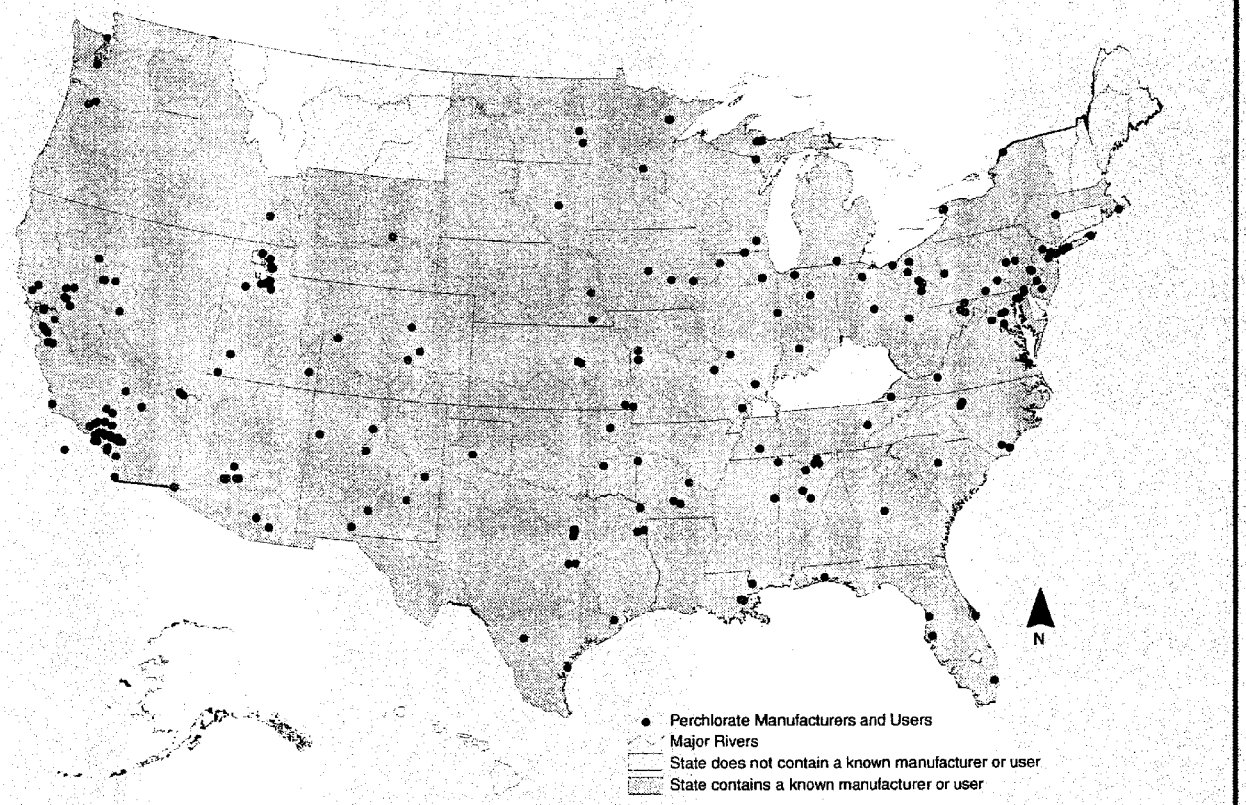


Figure 1: U.S. Perchlorate Manufacturers and Users, as of October 2001

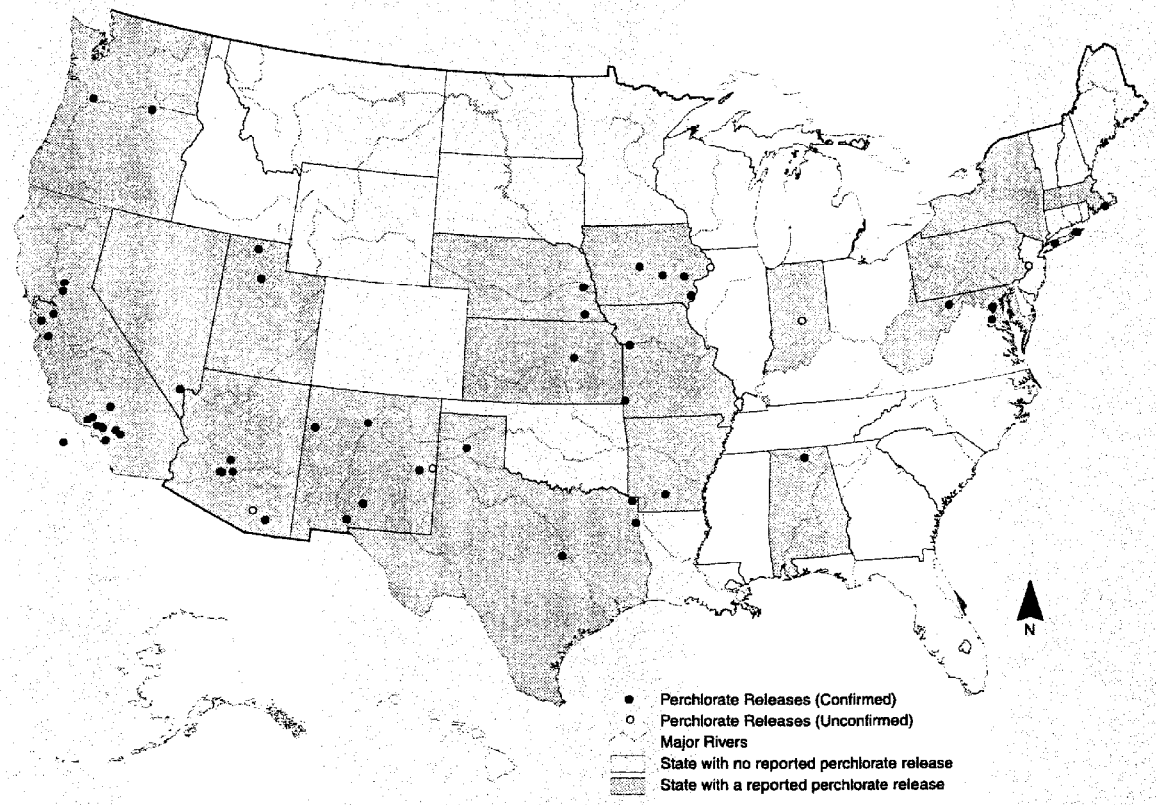


Figure 2: Reported Releases of Perchlorate into the Environment, as of November 2001

For more information

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Richard David
Immediate Office of the Assistant Administrator
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Direct questions about community involvement or the mailing list to:
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Region 9 Community Involvement Coordinator
Superfund Division
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APPENDIX D

PERCHLORATE FACT SHEET

The California Environmental Protection Agency has prepared this fact sheet to provide general information about the role of the Office of Environmental Health Hazard Assessment (OEHHA), State Water Resources Control Board (SWRCB), and the Department of Toxic Substances Control (DTSC) in managing perchlorate, a drinking water contaminant.

OFFICE OF ENVIRONMENTAL HEALTH HAZARD ASSESSMENT

OEHHA is responsible under law for developing a Public Health Goal (PHG) for perchlorate and other drinking water contaminants. A PHG is the level of a contaminant in drinking water that would not be expected to pose a significant acute or long-term human health risk. PHGs are based strictly on public health criteria and are not regulatory requirements. Under law, the Department of Health Services is required to set the regulatory Maximum Contaminant Level (MCL) for a contaminant as close to the corresponding PHG as is economically and technically feasible.

STATE WATER RESOURCES CONTROL BOARD

The Water Boards are the principal state agencies with primary responsibility for the coordination and control of water quality in the state. Water Code Section 13304 authorizes the Water Boards to require cleanup of all wastes discharged and restoration of affected water. Perchlorate sites are a high priority for the Water Boards because of the impact that perchlorate has had on water supply wells. Water Boards have identified approximately 30 site-specific sources of perchlorate and responded by initiating investigations and cleanup at several sites in the Central Valley, Los Angeles, and Santa Ana Regional Board areas. Water Boards have been involved in perchlorate cleanups since 1997 at Aerojet near Sacramento. SWRCB/RWQCBs and DTSC are working jointly to share data and streamline regulatory oversight of a statewide problem.

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

State and federal law vest DTSC with the authority to require the cleanup of any site in California where a toxic substance has been released, including perchlorate.

Corrective Action Orders at Hazardous Waste Management Facilities. Under Chapter 6.5 of the Health and Safety Code, DTSC oversees cleanup activities at hazardous waste generator facilities, hazardous waste management facilities, and illegal operations in order to protect human health and the environment. Any facility that generates hazardous waste or has a permit or a grant of authorization to store, treat, or dispose of hazardous waste is required to perform

corrective action (cleanup) where hazardous wastes or constituents have been released into the soil, ground water, surface water, or air. Cleanup at these facilities involves investigating the extent of contamination, assessing the risks from exposure, and developing and implementing remediation plans with public involvement. There are currently seven known sites involving perchlorate contamination.

Site Remediation. Under Chapter 6.8 of the Health and Safety Code, DTSC conducts and oversees the remediation of properties throughout the State, including former industrial plants, military bases, small businesses, and landfills that are contaminated with some level of toxic substances in order to protect public health and the environment. DTSC's site evaluation and cleanup process includes the discovery, investigation, and cleanup of properties where uncontrolled releases of hazardous substances have occurred. Work is currently underway on hundreds of contaminated properties throughout the State, approximately 15 of which are known to involve perchlorate.

TABLES

TABLE I **Municipal Wells Containing Perchlorate in the Los Angeles Region**

Drinking Water Supply System	Well/Source Name	Number of Samples Collected	Perchlorate Concentration Range (ug/l)	Dates of Detections
ARCADIA-CITY, WATER DIVISION	ST. JOSEPH WELL 02	2	4.2-8.6	2002
AZUSA LIGHT AND WATER	WELL 10 (AVWC8)	15	5-12	1997-2002
BELLFLOWER - SOMERSET MWC	WELL 833	2	6.1-6.7	1999-1999
CAL/AM WATER COOMPANY - SAN MARINO	1921 A - OAK KNOLL CIRCLE - INACTIVE	3	4.4-5.7	1997
CAL/AM WATER COOMPANY - SAN MARINO	1921 B - OSWEGO - TREATED	2	4.5-20	1997
CAL/AM WATER COOMPANY - SAN MARINO	1923 - PATTON - INACTIVE	3	4.3-5.2	1997
CAL/AM WATER COOMPANY - SAN MARINO	1928 - LAMANDA PARK - TREATED	4	4-4.3	1997-2001
CAL/AM WATER COOMPANY - SAN MARINO	1947 - ROANOKE - INACTIVE	2	4.2-5.6	1997
CALIFORNIA DOMESTIC WATER COMPANY	IX INFLUENT HEADER - RAW	10	8.6-11	2002
CALIFORNIA DOMESTIC WATER COMPANY	WELL 02	67	4-9	1997-2002
CALIFORNIA DOMESTIC WATER COMPANY	WELL 03	138	2.49-110	1997-2002
CALIFORNIA DOMESTIC WATER COMPANY	WELL 08	6	4-5.9	2002
CALIFORNIA DOMESTIC WATER COMPANY	WELL 14	40	4.6-14	1998-2002
CALIFORNIA WATER SERVICE CO. - ELA	WELL 10-03	9	6.2-8.5	2000-2001
CITY OF INDUSTRY WATERWORKS SYSTEMS	WELL 03 - STANDBY	7	5.3-14	1997-2001
CITY OF INDUSTRY WATERWORKS SYSTEMS	WELL 4 - STANDBY (12-27-01)	14	5-14.8	1998-2002
CITY OF INDUSTRY WATERWORKS SYSTEMS	WELL 5 - STANDBY (12-27-01)	12	5-10	1997-2002
COVINA-CITY, WATER DEPT.	GRAND AVE. WELL - INACTIVE	5	20-23	1997-1999
FOOTHILL MUNICIPAL WATER DIST.	PURCHASED TREATED WATER - MWD (WEYMOUTH)	5	4.1-4.3	2001-2002
GLENDALE-CITY, WATER DEPT.	CS-VPB-04 - MONITORING SITE	2	4.7-5.3	2001-2002
GLENDALE-CITY, WATER DEPT.	GOU GN-3 DISCHARGE	4	5.2-6.9	2000-2001
LA CANADA IRRIGATION DIST.	WELL 01	9	4.2-6.4	1997-2002
LA PUENTE VALLEY CWD	POST UVTERRA/PRECHLORINATION EFF-TREATED	9	3.4-4.8	2001-2002
LA PUENTE VALLEY CWD	WELL 02 - STANDBY	9	55-129	1997-2002
LA PUENTE VALLEY CWD	WELL 04 - STANDBY	6	60-159	1997-2001
LA VERNE, CITY WD	AMHERST WELL	3	10-15	2002
LA VERNE, CITY WD	CARTWRIGHT	4	12-20.4	1998-2001
LA VERNE, CITY WD	LA VERNE HEIGHTS WELL 02	2	5.08-5.3	1998
LA VERNE, CITY WD	LA VERNE HEIGHTS WELL 03	8	13-19	1998-2002
LA VERNE, CITY WD	LINCOLN	12	11.1-22	1998-2002
LA VERNE, CITY WD	MILLS TRACT	7	15-20	1998-2002
LA VERNE, CITY WD	OLD BALDY	13	7.9-26	1998-2002
LAS FLORES WATER CO.	VOC/NT BLENDING SUMP - TREATED	10	4-5.6	2001-2002
LINCOLN AVENUE WATER CO.	GAC - COMBINED EFFLUENT	4	5.8-10	1997
LINCOLN AVENUE WATER CO.	WELL 05	28	2-7.2	1997-2002
LOS ANGELES-CITY, DEPT. OF WATER & POWER	MISSION WELL 05	13	4.36-6	2000-2002
LOS ANGELES-CITY, DEPT. OF WATER & POWER	RINALDI TOLUCA WELL 03	7	4.2-5.4	2000-2002
LOS ANGELES-CITY, DEPT. OF WATER & POWER	RINALDI TOLUCA WELL 06	5	5.8-9.2	2000-2002
LOS ANGELES-CITY, DEPT. OF WATER & POWER	RINALDI TOLUCA WELL 07	8	4.2-7.9	2000-2002
LOS ANGELES-CITY, DEPT. OF WATER & POWER	RINALDI TOLUCA WELL 08	2	6.1-6.6	2002
LOS ANGELES-CITY, DEPT. OF WATER & POWER	TUJUNGA WELL 05	2	4.1-4.7	2001-2002

TABLE I **Municipal Wells Containing Perchlorate in the Los Angeles Region**

Drinking Water Supply System	Well/Source Name	Number of Samples Collected	Perchlorate Concentration Range (ug/l)	Dates of Detections
LOS ANGELES-CITY, DEPT. OF WATER & POWER	TUJUNGA WELL 07	3	4.2-5.4	2001-2002
LOS ANGELES-CITY, DEPT. OF WATER & POWER	TUJUNGA WELL 08	3	4.5-4.9	2001-2002
LOS ANGELES-CITY, DEPT. OF WATER & POWER	TUJUNGA WELL 10	16	4.6-11	2000-2002
LOS ANGELES-CITY, DEPT. OF WATER & POWER	TUJUNGA WELL 11	11	9.9-21	2000-2002
LOS ANGELES-CITY, DEPT. OF WATER & POWER	TUJUNGA WELL 12	3	4.3-8.1	2002
METROPOLITAN WATER DIST. OF SO. CAL.	DIAMOND VALLEY LAKE - WB CENTER - RAW	3	4-5	2001-2001
METROPOLITAN WATER DIST. OF SO. CAL.	DIEMER PLANT EFFLUENT - TREATED	6	4-6	1999-2002
METROPOLITAN WATER DIST. OF SO. CAL.	DIEMER PLANT INFLUENT	2	5-6	1999
METROPOLITAN WATER DIST. OF SO. CAL.	LAKE HAVASU - NEAR WHITSETT INTAKE	18	4-8	1997-2002
METROPOLITAN WATER DIST. OF SO. CAL.	LAKE MATHEWS HEADWORKS (EFFLUENT)	16	4.2-9	1997-2002
METROPOLITAN WATER DIST. OF SO. CAL.	LAKE SKINNER OUTLET CONDUIT	6	4-6	2001-2002
METROPOLITAN WATER DIST. OF SO. CAL.	SAN JACINTO TUNNEL	17	4-7	1999-2002
METROPOLITAN WATER DIST. OF SO. CAL.	SKINNER PLANT EFFLUENT #1 - TREATED	4	4-5	1999-2001
METROPOLITAN WATER DIST. OF SO. CAL.	SKINNER PLANT EFFLUENT #2 - TREATED	4	4-5	1999-2001
METROPOLITAN WATER DIST. OF SO. CAL.	SKINNER PLANT INFLUENT	4	4-5	1999-2001
METROPOLITAN WATER DIST. OF SO. CAL.	SKINNER RESERVOR EFFLUENT - TREATED	4	4-5	2001-2002
METROPOLITAN WATER DIST. OF SO. CAL.	WEYMOUTH PLANT EFFLUENT - TREATED	6	4-6	1999-2001
METROPOLITAN WATER DIST. OF SO. CAL.	WEYMOUTH PLANT INFLUENT	3	5-6	1999
MONROVIA-CITY, WATER DEPT.	MONROVIA WELL 01 - ABANDONED	6	6-8.4	1999-2002
MONTEREY PARK-CITY, WATER DEPT.	FERN WELL	2	2-5.3	1997-2002
MONTEREY PARK-CITY, WATER DEPT.	WELL 06 - STANDBY	2	4.6-5.9	2002
MONTEREY PARK-CITY, WATER DEPT.	WELL 12 - INACTIVE (PCE > 10X MCL)	6	8-14	1997-2002
Newhall CWD-Newhall	WELL 11 - INACTIVE	10	12-20	1997-2001
PARK WC - BELLFLOWER-NORWALK	WELL 29-K	14	4-7.05	1998-2001
PASADENA-CITY, WATER DEPT.	AERATION - NORTH TOWER - INFLUENT	3	9-28	1997
PASADENA-CITY, WATER DEPT.	AERATION - SOUTH TOWER - INFLUENT	2	5-27	1997
PASADENA-CITY, WATER DEPT.	AERATION TOWERS EFFLUENT	4	4-17	1997
PASADENA-CITY, WATER DEPT.	ARROYO - INACTIVE	5	2.97-54	1997-1999
PASADENA-CITY, WATER DEPT.	BANGHAM	58	2.92-9.03	1997-2002
PASADENA-CITY, WATER DEPT.	CHAPMAN	3	3.98-9	1999-2001
PASADENA-CITY, WATER DEPT.	COPELIN	65	3.93-17.43	1997-2002
PASADENA-CITY, WATER DEPT.	CRAIG	16	2.5-5.84	1999-2002
PASADENA-CITY, WATER DEPT.	GARFIELD	28	3.09-27.7	1999-2002
PASADENA-CITY, WATER DEPT.	MONTE VISTA	16	1.49-4.59	1999-2002
PASADENA-CITY, WATER DEPT.	SUNSET	54	2.49-12.7	1999-2002
PASADENA-CITY, WATER DEPT.	SUNSET RESERVOIR-A BASIN-NO3 & VOC BLEND	23	2.34-12.38	1999-2001
PASADENA-CITY, WATER DEPT.	SUNSET RESERVOIR-TANK #1-NO3 & VOC BLEND	35	3.98-20.18	1999-2001
PASADENA-CITY, WATER DEPT.	SUNSET RESERVOIR-TANK #2-NO3 & VOC BLEND	43	3-29	1999-2001
PASADENA-CITY, WATER DEPT.	VENTURA	87	2.72-9	1997-2002
PASADENA-CITY, WATER DEPT.	VILLA	26	2.97-7.24	1999-2001
PASADENA-CITY, WATER DEPT.	WELL 52	115	6-34.88	1997-2002

TABLE I **Municipal Wells Containing Perchlorate in the Los Angeles Region**

Drinking Water Supply System	Well/Source Name	Number of Samples Collected	Perchlorate Concentration Range (ug/l)	Dates of Detections
PASADENA-CITY, WATER DEPT.	WINDSOR	84	1.87-13.59	1999-2002
PASADENA-CITY, WATER DEPT.	WINDSOR RESERVOIR - NO3 & VOC BLENDING	120	4-18.66	1997-2002
PASADENA-CITY, WATER DEPT.	WOODBURY	2	2.42-3.41	2001-2002
POMONA- CITY, WATER DEPT.	ANION EXCHANGE FACILITY - BLEND	135	4.8-18.7	1998-2002
POMONA- CITY, WATER DEPT.	ANION EXCHANGE FACILITY - RAW	143	5.6-15.2	1998-2002
POMONA- CITY, WATER DEPT.	ANION EXCHANGE FACILITY - TREATED	32	3.1-7.82	1998-2002
POMONA- CITY, WATER DEPT.	RESERVOIR 6 EFFLUENT AT BOOSTER 3	91	4.3-8.8	2000-2002
POMONA- CITY, WATER DEPT.	WELL 01B - INACTIVE	4	4.58-7	1998
POMONA- CITY, WATER DEPT.	WELL 04	30	4-13.5	1997-2002
POMONA- CITY, WATER DEPT.	WELL 05B	10	5-7.24	1998-2002
POMONA- CITY, WATER DEPT.	WELL 06	23	9.8-16.3	1998-2002
POMONA- CITY, WATER DEPT.	WELL 07 - INACTIVE	6	8.28-11.9	1998-1999
POMONA- CITY, WATER DEPT.	WELL 08B - INACTIVE	6	6.9-12	1998-1999
POMONA- CITY, WATER DEPT.	WELL 09B	3	4.4-12	2002
POMONA- CITY, WATER DEPT.	WELL 10	9	5.9-9.5	1998-2002
POMONA- CITY, WATER DEPT.	WELL 11	50	9.2-17	1998-2002
POMONA- CITY, WATER DEPT.	WELL 12	45	9.5-19	1998-2002
POMONA- CITY, WATER DEPT.	WELL 15	22	7.3-13	1998-2002
POMONA- CITY, WATER DEPT.	WELL 16	41	4-19	1997-2002
POMONA- CITY, WATER DEPT.	WELL 17	22	8.8-17	1998-2002
POMONA- CITY, WATER DEPT.	WELL 18	26	4.4-16	1998-2002
POMONA- CITY, WATER DEPT.	WELL 23	11	5.5-10	1998-2002
POMONA- CITY, WATER DEPT.	WELL 25	4	3.2-6.5	1998-2002
POMONA- CITY, WATER DEPT.	WELL 26	9	4.7-8	1998-2002
POMONA- CITY, WATER DEPT.	WELL 28	2	3.1-4.68	1998-2002
POMONA- CITY, WATER DEPT.	WELL 34	25	9.91-16.1	1998-2002
SAN GABRIEL CWD	WELL 07	5	4.3-5	2002
SAN GABRIEL VALLEY WATER CO.-EL MONTE	RESVR B5 - NO3, BLEND, WELLS B5A,B5B,B5C	2	4-5	1997
SAN GABRIEL VALLEY WATER CO.-EL MONTE	WELL B11A	7	4.4-8	1997-2002
SAN GABRIEL VALLEY WATER CO.-EL MONTE	WELL B5A LACFCD 2994V	5	5.9-14	1997-2001
SAN GABRIEL VALLEY WATER CO.-EL MONTE	WELL B5B LACFCD 2994Q	2	9-12	1997
SAN GABRIEL VALLEY WATER CO.-EL MONTE	WELL B6C - AIR STRIPPING EFF - INACTIVE	2	72-77	1997
SAN GABRIEL VALLEY WATER CO.-EL MONTE	WELL B6C - INACTIVE	2	71-74	1997
SAN GABRIEL VALLEY WATER CO.-EL MONTE	WELL B6D - INACTIVE	1	6-6	1998
SAN GABRIEL VALLEY WATER CO.-EL MONTE	WELLS B6C, B6D BLEND NO3-RES-EFF-INACTIV	2	38-42	1996-1997
SANTA CLARITA WATER CO.	SAUGUS WELL 01 - INACTIVE	4	21-34	1997-1998
SANTA CLARITA WATER CO.	SAUGUS WELL 02 - INACTIVE	4	12-47	1997-1998
SCWC - CLAREMONT	CAMPBELL WELL 01 - INACTIVE	3	6-7.4	1998-1999
SCWC-SAN DIMAS	BASELINE WELL 04	20	5-20	1997-2002
SCWC-SAN DIMAS	COLUMBIA WELL 07	3	3.9-5.2	1997-2002
SCWC-SAN DIMAS	DURWARD	9	8.5-17.9	1999-2002

TABLE I **Municipal Wells Containing Perchlorate in the Los Angeles Region**

Drinking Water Supply System	Well/Source Name	Number of Samples Collected	Perchlorate Concentration Range (ug/l)	Dates of Detections
SCWC-SAN DIMAS	HIGHWAY RESERVOIR - NO3 BLEND, EFFLUENT	4	4.2-4.8	2001-2001
SCWC-SOUTH SAN GABRIEL	SAN GABRIEL WELL 01	2	4.1-5.5	2002
SOUTH PASADENA-CITY, WATER DEPT.	GRAVES WELL 02	8	4-6.8	1997-2002
SUBURBAN WATER SYSTEMS-SAN JOSE	126-W2	5	5.2-6.5	1998-2001
SUBURBAN WATER SYSTEMS-SAN JOSE	139-W2	25	8-16	1997-2001
SUBURBAN WATER SYSTEMS-SAN JOSE	139-W4	16	4-11.3	1997-2001
SUBURBAN WATER SYSTEMS-SAN JOSE	139-W5	8	2-9.7	1997-2001
SUBURBAN WATER SYSTEMS-SAN JOSE	139-W6 - INACTIVE	20	7-35.4	1998-2001
SUBURBAN WATER SYSTEMS-SAN JOSE	140-W3	28	5-14.6	1997-2002
SUBURBAN WATER SYSTEMS-SAN JOSE	140-W4	10	4.8-10	1997-2002
SUBURBAN WATER SYSTEMS-SAN JOSE	140W4-POST RAYOX/PRE CL2 EFFL	3	5-7	2001-2002
SUBURBAN WATER SYSTEMS-SAN JOSE	140-W5	5	4.3-7.2	1999-2001
SUBURBAN WATER SYSTEMS-SAN JOSE	BIG DALTON TREATMENT - EFFLUENT-INACTIVE	3	5-39	1997
SUBURBAN WATER SYSTEMS-SAN JOSE	BIG DALTON TRTMNT-3/4 SAMP TAP-V1-INACTV	1	41-41	1997
SUBURBAN WATER SYSTEMS-SAN JOSE	BIG DALTON TRTMNT-3/4 SAMP TAP-V2-INACTV	2	40-42	1997
SUBURBAN WATER SYSTEMS-SAN JOSE	BIG DALTON TRTMNT-3/4 SAMP TAP-V3-INACTV	5	5-41	1997
SUBURBAN WATER SYSTEMS-SAN JOSE	BLENDING RESERVOIR 121-R1	40	5.3-12	1997-2001
SUBURBAN WATER SYSTEMS-SAN JOSE	BLENDING RESERVOIR 128-R1	34	4.3-8.4	1998-2002
VALENCIA HEIGHTS WATER CO.	WELL 01 LACFCD 3113A	12	4-8.5	1997-2002
VALENCIA HEIGHTS WATER CO.	WELL 02 LACFCD 3113	14	4.9-8	1997-2002
VALENCIA HEIGHTS WATER CO.	WELL 04 LACFCD 3102B - INACTIVE	22	18-33	1997-2002
VALENCIA WATER CO.	WELL 157	3	7-14	1997-1998
VALLEY COUNTY WATER DIST.	WELL 03 MORADA ST. - INACTIVE	2	12-13	1997
VALLEY COUNTY WATER DIST.	WELL 07 LANTE STREET - INACTIVE	5	61-94	1997-1998
VALLEY COUNTY WATER DIST.	WELL 09 BIG DALTON - INACTIVE	8	21-48	1997-1998
Ventura County				
U.S.N., San Nicolas Island	WINDMILL SPRINGS	14	6.8-16.0	1999-2002
U.S.N., San Nicolas Island	ZITNIC SPRINGS	12	7.0-20.0	1998-2002

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TABLE II **REGIONAL BOARD PERMITTED POTWs AND WASTEWATER TI**

NON CHAPTER 15 Program								
Discharger	Facility	Address		CI	WDID	Order No.	Order Effective Date	Recharge Area
		Street	City					
Fillmore, City of	Fillmore WWTP, Non-NPDES	c Street & River Street	Fillmore	1076	4A560101001	97-038	4/7/97	
LA City Bureau of Sanitation	L.A.-Glendale WWRP, Non-NPDES	4600 Colorado Avenue	Los Angeles	6183	4B190106048	86-016	3/24/86	
Los Angeles County San Dist	Long Beach WWRP, Non-NPDES	7400 East Willow Street	Long Beach	6184	4B190107086	87-047	4/27/87	
Camrosa Water District	Camrosa WWRP, Non-NPDES	1900 S. Lewis Road	Camarillo	0821	4A560106001	97-040	4/7/97	
LA Co Dept of Public Works	Malibu Mesa WWRP	3863 Malibu County Road	Malibu	5669	4B190107055	00-167	11/9/00	
Las Virgenes MWD	Tapia WWRP, Las Virg, Malibu	731 Malibu Canton Road	Calabasas	5752	4B191023001	94-055	6/13/94	
Las Virgenes MWD	Tapia WWRP, Non-NPDES	731 Malibu Canton Road	Calabasas	6189	4B190104003	87-096	6/22/87	
Los Angeles County San Dist	San Jose Creek WWRP, Non-NPDES	19655 Workman Mill Road	Whittier	6372	4B190107029	87-050	2/17/01	Whittier Narrows Spreading Ground a Spreading Ground
Los Angeles County San Dist	Whittier Narrows WWRP Non-NPDE	301 North Rosemead Blvd.	El Monte	6844	4B190107097	88-107	10/24/88	Whittier Narrows Spreading Ground a Spreading Ground
Ventura Co Water Works Dist.	Moorpark WWTP, Non-NPDES	9550 Los Angeles Avenue	Moorpark	6374	4A560103002	00-048	4/13/00	
LA City Bureau of Sanitation	Hyperion WWRP, Non-NPDES	12000 Vista Del mar Blvd.	Playa Del Rey	6369	4B190106016	79-160	10/22/79	
San Buenaventura City Of	Sludge Disposal, Ventura WWRP	1400 Spinnaker Drive	Ventura	6190	4A560311001	80-03402	7/28/80	
San Buenaventura City Of	Ventura WWRP, Non-NPDES	1400 Spinnaker Drive	Ventura	6190	4A560107002	87-045	4/27/87	
Simi Valley, City Of	Simi Valley WWRP, Non-NPDES	600 West Los Angeles Avenue	Simi Valley	6406	4A560110003	87-046	4/27/87	
Burbank, City Of Public Works	Burbank WWRP, Non-NPDES	740 N. Lake Street	Burbank	6753	4B190101005	91-101	9/9/91	
Los Angeles County San Dist	Pomona WWRP, Non-NPDES	295 Humane Way	Pomona	6241	4B190107017	81-034	7/27/81	Whittier Narrows Spreading Ground a Spreading Ground
LA City Bureau of Sanitation	Tillman WWRP, Non-NPDES	6100 Woodley Avenue	Van Nuys	6185	4B190106047	86-039	6/23/86	
Las Virgenes MWD	Sludge Inj.Rancho Las Virgenes			6430	4B190310002	79-107	6/25/79	
Los Angeles City of DWP	East Valley Recycling Project			7599	4B190106096	95-133	9/18/95	
Los Angeles County San Dist	Valencia WWRP, Non-NPDES	28185 The Old Road	Valencia	6186	4A190107084	87-048	4/27/87	
Camarillo Sanitary District	Camarillo WWRP, Non-NPDES	150 E. Howard Road	Camarillo	6187	4A560100002	87-132	9/28/87	
Los Angeles County San Dist	Saugus WWRP, Non-NPDES	26200 Springbrook Avenue	Saugus	6188	4A190107083	87-049	4/27/87	
West Basin Municipal Water Dis	West Basin Water Recycling Fac	1935 Hughes Way	El Segundo	7453	4B190137002	01-043	4/17/01	
West Basin Municipal Water Dis	West Basin Water Recycling Pl.	1935 Hughes Way	El Segundo	7485	4B190137003	95-014	1/23/95	
Los Angeles County San Dist	Montebello Forebay Gw Recharge			5728	4B190124001	91-100	9/9/91	
Los Angeles County San Dist	Los Coyotes WWRP, Non-NPDES	16515 Piuma Avenue	Cerritos	6182	4B190107085	87-051	4/27/87	

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TABLE II

REGIONAL BOARD PERMITTED POTWs AND WASTEWATER TREATMENT PROJECTS

NON CHAPTER 15 Program																				
Discharger	Facility	Address		CI	WDID	Order No.	Order Effective Date	Recharge Area	Recycled Water Use											
		Street	City						Total RW Delivered in 2001 (MGY)	Ag Irrigation	Landscape Irrigation& Impoundment	WWTP	Industrial	Groundwater Recharge	Seawater Barrier	Recreational Impoundment	Wildlife Habitat	Geyser or Energy Production	Other
Fillmore, City of	Fillmore WWTP, Non-NPDES	c Street & River Street	Fillmore	1076	4A560101001	97-038	4/7/97													
LA City Bureau o' Sanitation	L.A.-Glendale WWRP, Non-NPDES	4600 Colorado Avenue	Los Angeles	6183	4B190106048	86-016	3/24/86		1,200		1,175							25		
Los Angeles County San Dist	Long Beach WWRP, Non-NPDES	7400 East Willow Street	Long Beach	6184	4B190107086	87-047	4/27/87		4,327		3,265							1,062		
Camrosa Water District	Camrosa WWRP, Non-NPDES	1900 S. Lewis Road	Camarillo	9821	4A560106001	97-040	4/7/97		254	254										
LA Co Dept of Public Works	Malibu Mesa WWRP	3863 Malibu County Road	Malibu	9889	4B190107095	00-167	11/9/00		127.6 AFY		127.6 AFY									
Las Virgenes MWD	Tapia WWRP, Las Virg, Malibu	731 Malibu Canlon Road	Calabasas	5752	4B191023001	94-055	8/13/94													
Las Virgenes MWD	Tapia WWRP, Non-NPDES	731 Malibu Canlon Road	Calabasas	6189	4B190104003	87-086	6/22/87		2086.4		1,864	205					17			
Los Angeles County San Dist	San Jose Creek WWRP, Non-NPDES	19655 Workman Mill Road	Whittier	5972	4B190107029	87-050	2/17/01	Whittier Narrows Spreading Ground and Rio Hondo Spreading Ground	33,185	151	2,055		258	30,129				592		
Los Angeles County San Dist	Whittier Narrows WWRP Non-NPDE	301 North Rosemead Blvd	El Monte	6544	4B190107097	88-107	10/24/88	Whittier Narrows Spreading Ground and Rio Hondo Spreading Ground	8,663		71			8,592						
Ventura Co Water Works Dist.	Moorpark WWTP, Non-NPDES	9550 Los Angeles Avenue	Moorpark	6374	4A560103002	00-048	4/13/00													
LA City Bureau o' Sanitation	Hyperion WWRP, Non-NPDES	12000 Vista Del mar Blvd.	Playa Del Rey	6369	4B190106016	79-160	10/22/79		0											
San Buenaventura City Of	Sludge Disposal, Ventura WWRP	1400 Spinnaker Drive	Ventura	9190	4A560311001	80-03402	7/28/80		0											
San Buenaventura City Of	Ventura WWRP, Non-NPDES	1400 Spinnaker Drive	Ventura	9190	4A560107002	87-045	4/27/87		340	190	150									
Simi Valley, City Of	Simi Valley WWRP, Non-NPDES	600 West Los Angeles Avenue	Simi Valley	6408	4A560110003	87-046	4/27/87		13.37			6								8
Burbank, City Of Public Works	Burbank WWRP, Non-NPDES	740 N. Lake Street	Burbank	6753	4B190101005	91-101	9/9/91		879.54 AFY		447.23 AFY									432.31 AFY
Los Angeles County San Dist	Pomona WWRP, Non-NPDES	295 Humane Way	Pomona	6241	4B190107017	91-034	7/27/91	Whittier Narrows Spreading Ground and Rio Hondo Spreading Ground	11,262	816	2,269		4,921	3,222				35		
LA City Bureau o' Sanitation	Tillman WWRP, Non-NPDES	6100 Woodley Avenue	Van Nuys	6185	4B190106047	86-039	6/23/86		13,290								7,960	2,080		3,250
Las Virgenes MWD	Sludge Inj.Rancho Las Virgenes			5430	4B190310002	79-197	6/25/79		0											
Los Angeles City of DWP	East Valley Recycling Project			7599	4B190106096	95-133	9/18/95													
Los Angeles County San Dist	Valencia WWRP, Non-NPDES	28185 The Old Road	Valencia	6186	4A190107084	87-048	4/27/87		0											
Camarillo Sanitary District	Camarillo WWRP, Non-NPDES	150 E. Howard Road	Camarillo	6187	4A560100002	87-132	9/28/87		421	420	1									
Los Angeles County San Dist	Saugus WWRP, Non-NPDES	26200 Springbrook Avenue	Saugus	6188	4A190107083	87-049	4/27/87		0											
West Basin Municipal Water Dis	West Basin Water Recycling Fac	1935 Hughes Way	El Segundo	7453	4B190137002	01-043	4/17/01		19,131		2,497		16,634							
West Basin Municipal Water Dis	West Basin Water Recycling Pl.	1935 Hughes Way	El Segundo	7485	4B190137003	95-014	1/23/95		6,901						6,901					
Los Angeles County San Dist	Montebello Forebay Gw Recharge			9728	4B190124001	91-100	8/9/91													
Los Angeles County San Dist	Los Coyotes WWRP, Non-NPDES	16515 Piuma Avenue	Cerritos	6182	4B190107085	87-051	4/27/87		5,321	18	4,732									

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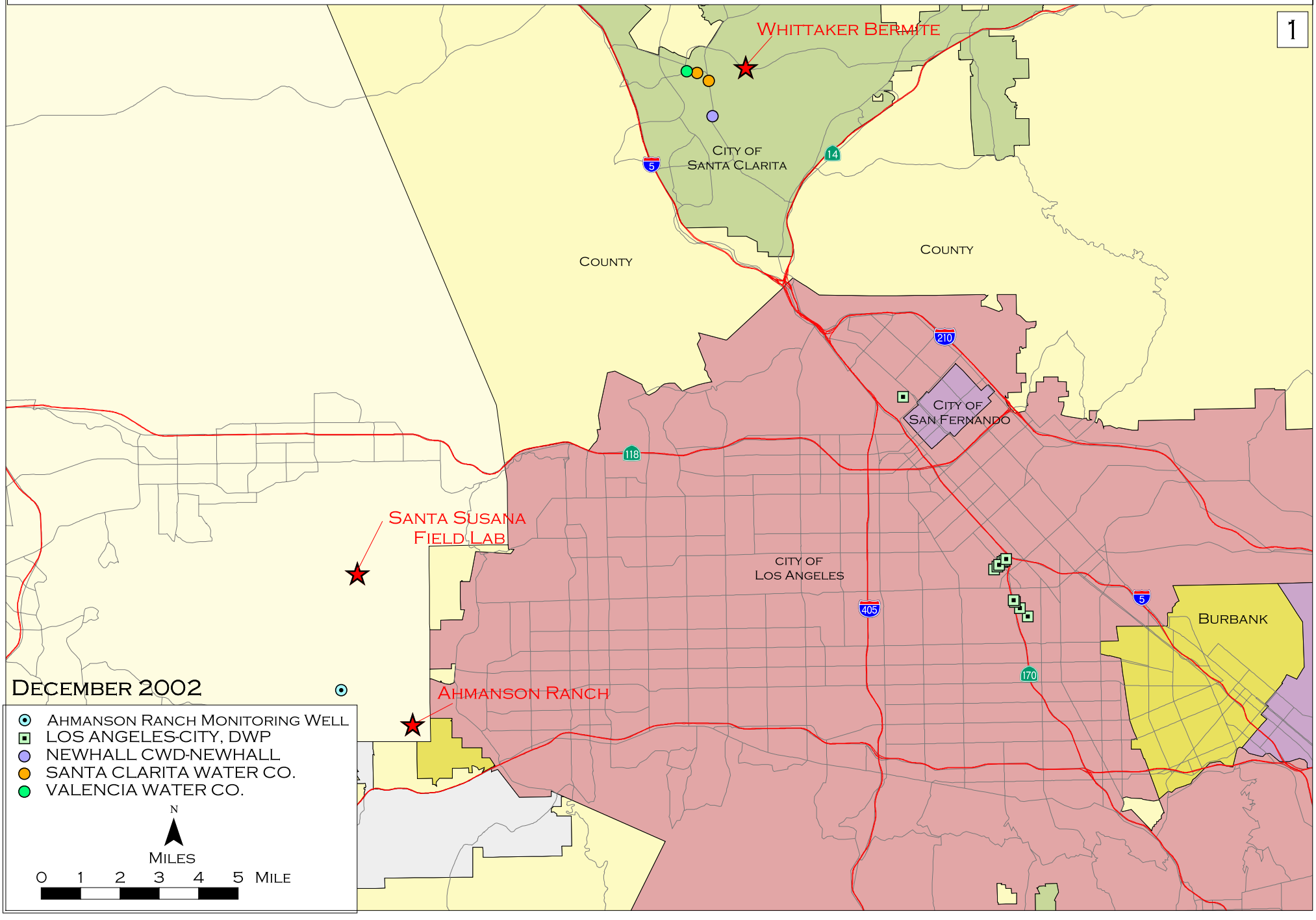
FIGURES

Impacted Drinking Water Sources in the Santa Clarita and San Fernando Valleys



Impacted Drinking Water Sources on San Nicholas Island

December 2002

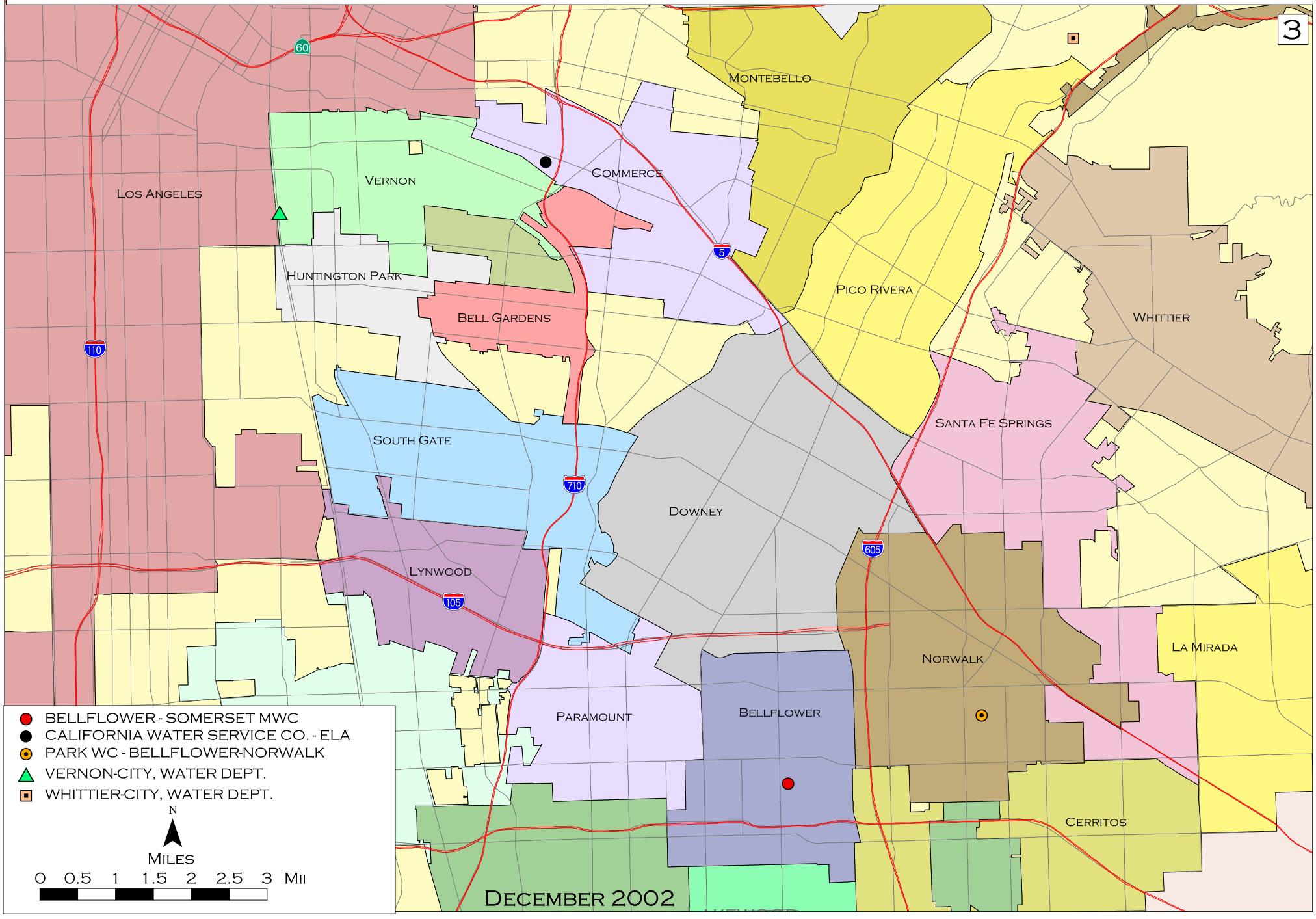
U. S. Navy

N

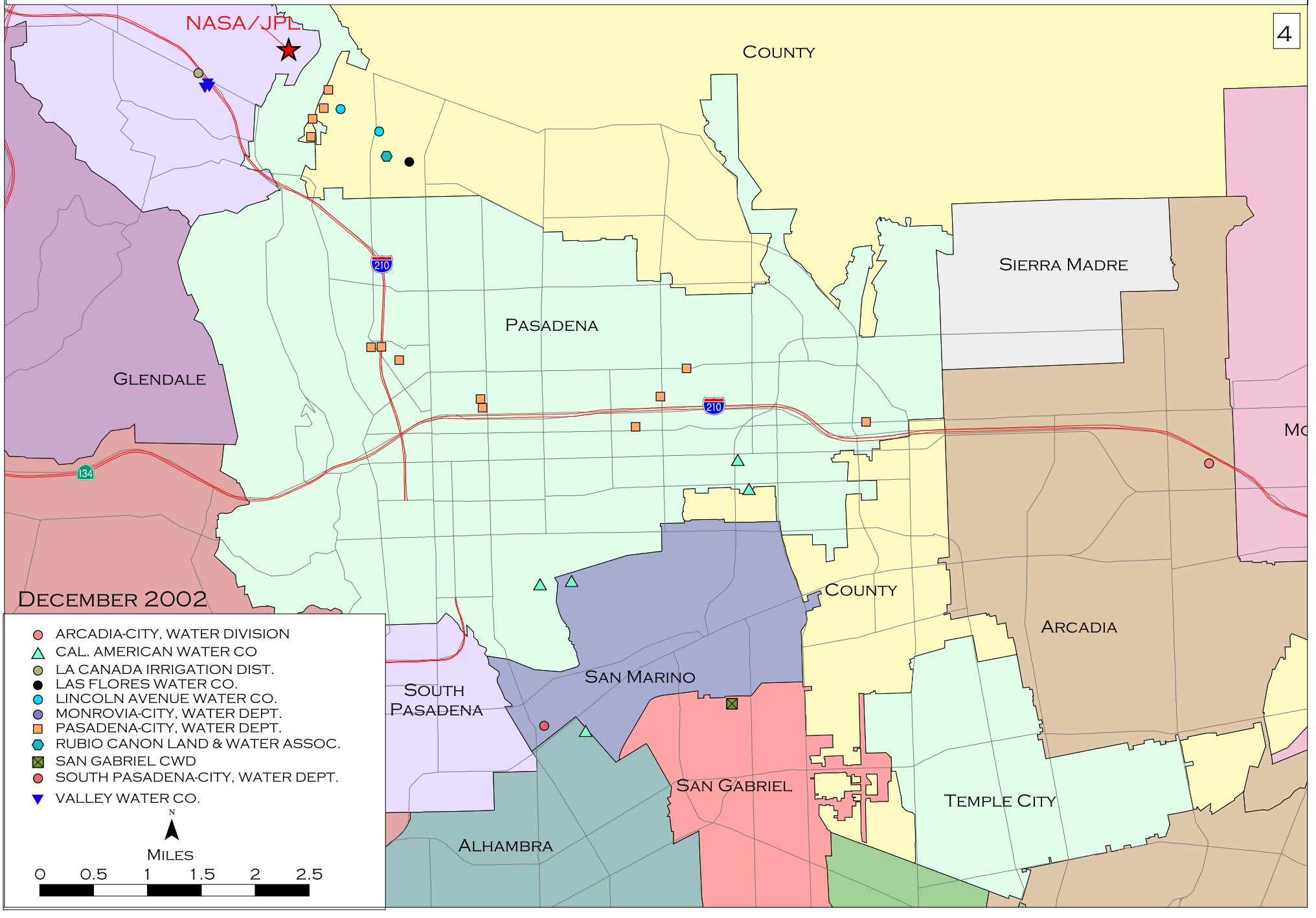
Miles

0 0.5 1 1.5

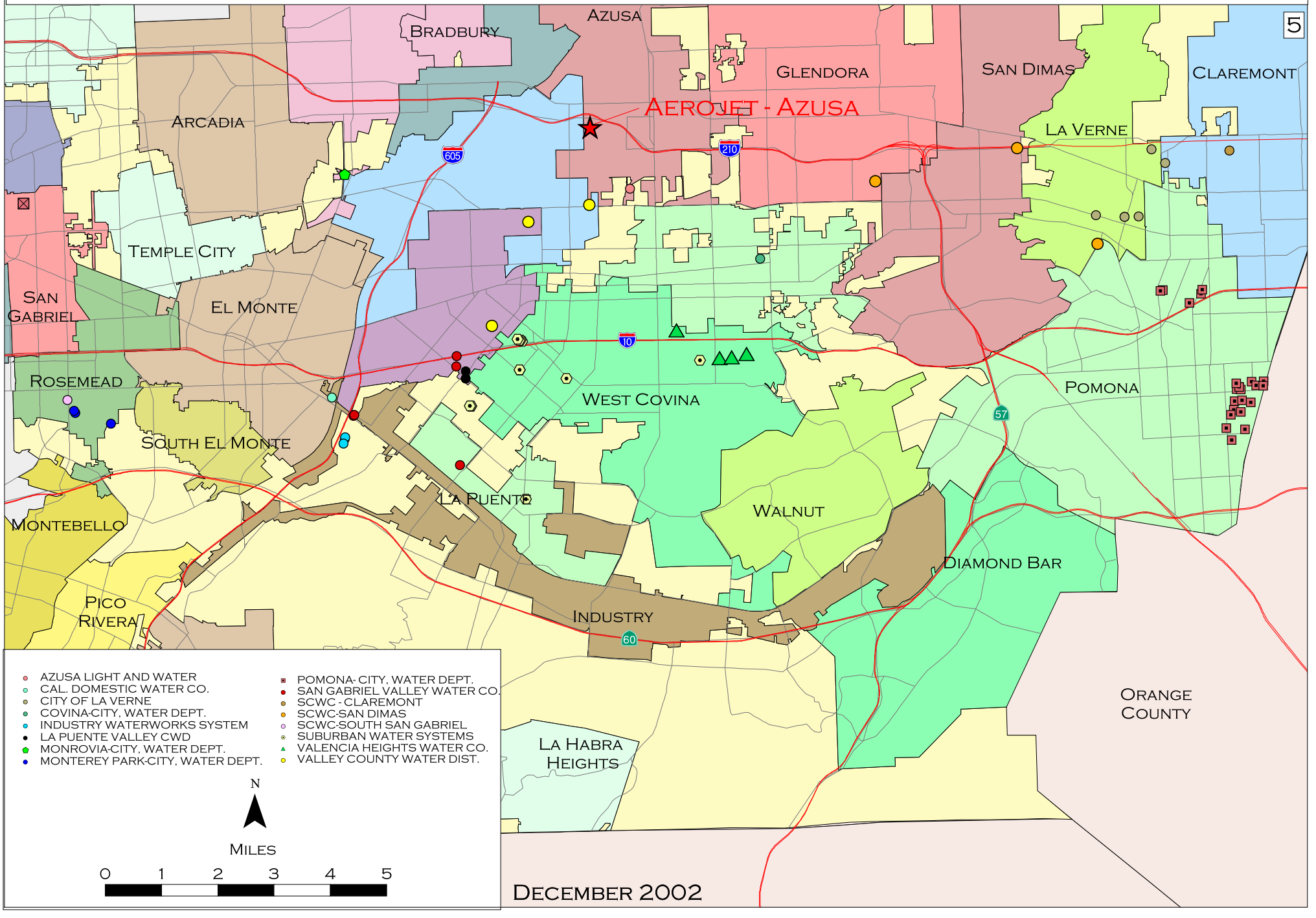
Impacted Drinking Water Sources in the Central Basin



Impacted Drinking Water Sources in the Raymond Basin



Impacted Drinking Water Sources in the San Gabriel Valley



San Gabriel Basin/Pomona Valley Perchlorate Impact on Water Supply Systems: Groundwater, Spreading Grounds & Water Treatment Plants

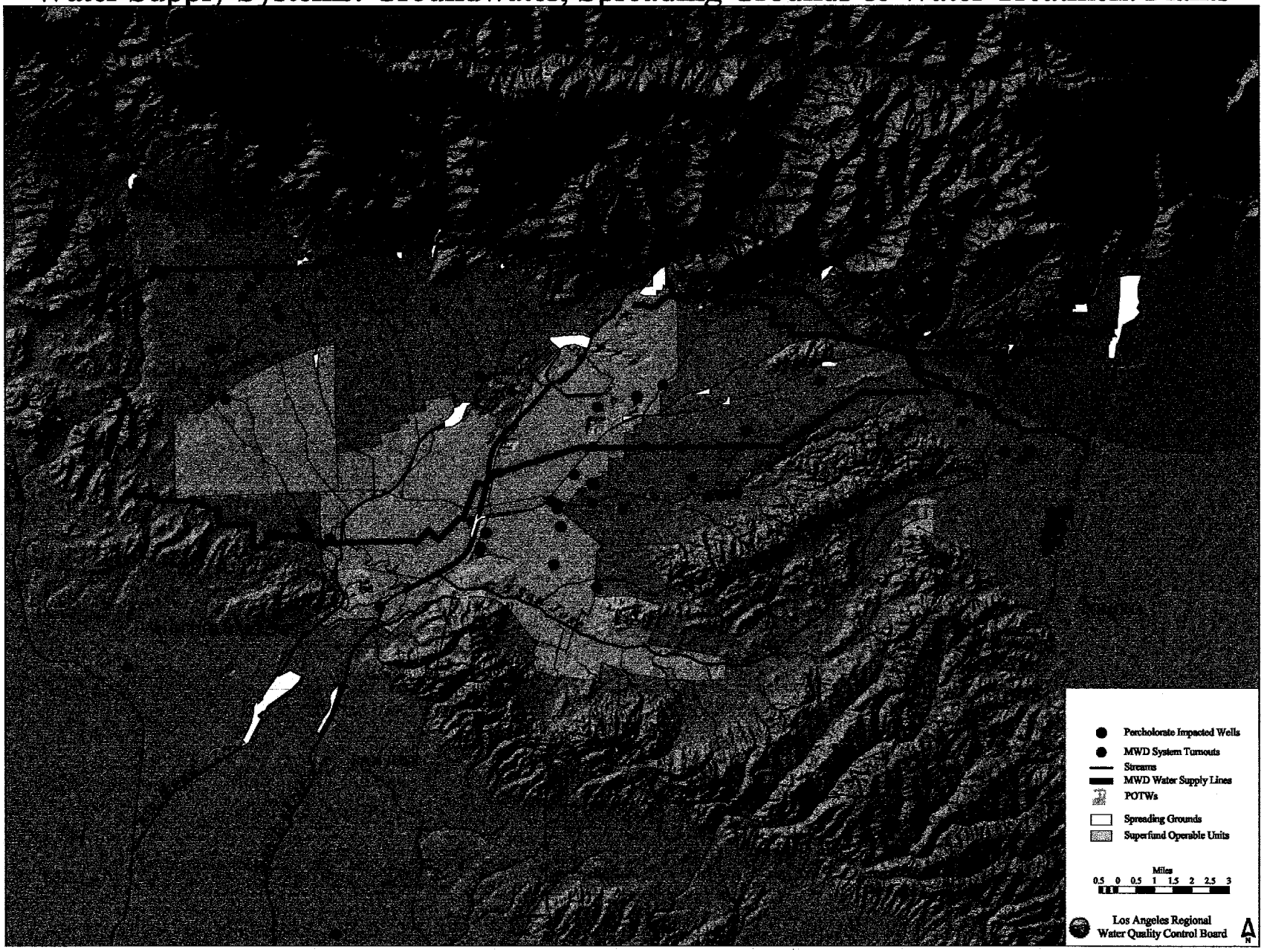


Figure 6

Groundwater Basins at the Boundary of Region 4 and 8

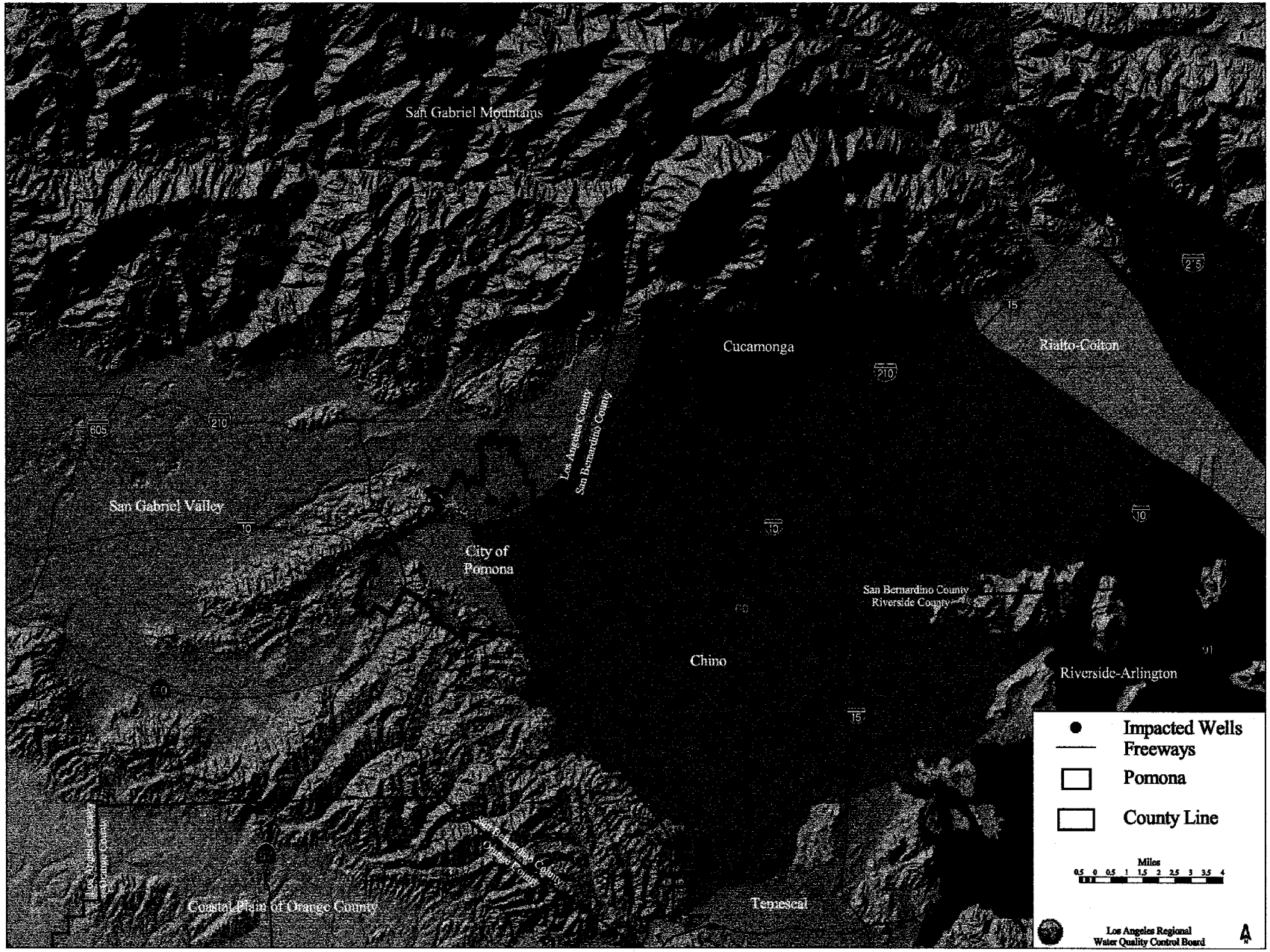


FIGURE 7

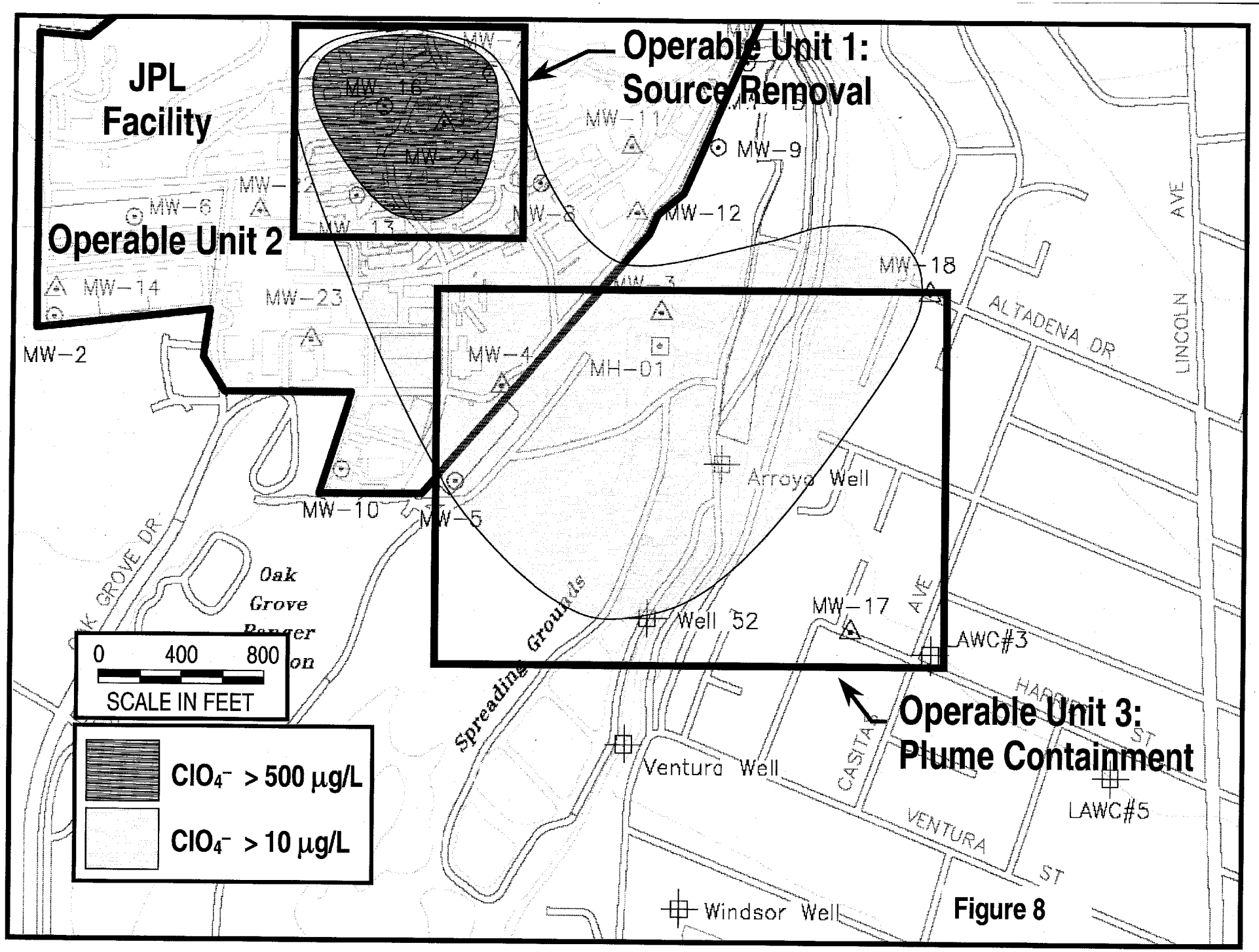

JPL
Facility
Operable Unit 1:
Source Removal
Operable Unit 2
Operable Unit 3:
Plume Containment
MW-16
MW-24
MW-11
MW-9
MW-12
MW-18
MW-6
MW-14
MW-23
MW-2
MW-4
MH-01
Arroyo Well
MW-10
MW-5
Well 52
MW-17
AWC#3
Ventura Well
LAWC#5
Windsor Well
ALTADENA DR
LINCOLN AVE
OAK GROVE DR
Oak Grove Ranger
Spreading Grounds
CASITAS AVE
VENTURA ST
HARDING ST
0 400 800
SCALE IN FEET
ClO4- > 500 µg/L
ClO4- > 10 µg/L

Figure 8