THE CITY OF SAN DIEGO

Public Utilities Department
Report on Water Quality Relative to Public Health Goals

June 30, 2013

Background:

Provisions of the California Health and Safety Code specify that the City of San Diego Public Utilities Department, and other water utilities with more than 10,000 service connections, prepare a special report by July 1, 2013, if their water quality measurements exceeded any Public Health Goal (PHG) in calendar years 2010, 2011 and 2012. PHGs are non-enforceable goals established by the California Office of Environmental Health Hazard Assessment (OEHHA). The law also requires that where OEHHA has not adopted a PHG for a contaminant, the water suppliers are to use the Maximum Contaminant Level Goals (MCLGs) adopted by the U.S. Environmental Protection Agency (USEPA). Only contaminants that have an existing enforceable mandatory Maximum Contaminant Level (MCL) and have exceeded either a PHG or MCLG are to be addressed in this report. Included in this report is the numerical public health risk associated with the MCL and PHG or MCLG, the category or type of risk to health that could be associated with each contaminant, and an estimate of the cost to implement specific treatment if it is appropriate and feasible.

PHGs are set by the OEHHA and are based solely on public health risk considerations. None of the practical risk management factors that are considered by the USEPA or the California Department of Public Health (CDPH) in setting MCLs are considered in setting the PHGs. These factors include analytical detection capabilities, treatment technology availability, benefits and costs. The PHGs are not enforceable and are not required to be met by any public water system. MCLGs are the USEPA's equivalent to PHGs.

Water Quality Data Considered:

All of the water quality data collected by our water system between 2010 and 2012 for purposes of determining compliance with drinking water standards were considered for this report. These data were summarized in our 2010, 2011 and 2012 annual Consumer Confidence Reports, which were mailed or distributed electronically to all of our customers in June of each year. Copies of these reports and additional information concerning water quality and the Public Utilities Department may be viewed at http://www.sandiego.gov/water/quality/reports.shtml.

Best Available Treatment Technology and Cost Estimates:

Both the USEPA and CDPH specify best available technologies (BATs), which are the best known methods of reducing contaminant levels, to meet the legally enforceable MCL. Costs can be estimated for such technologies. However, since many PHGs and MCLGs are set much lower than the MCL, it is not always possible, nor feasible, to determine what treatment is needed to further reduce a contaminant to the PHG or MCLG, many of which are set at zero. In some cases, installing treatment to try and further reduce very low levels of one contaminant may have adverse effects on other aspects of water quality. For example, using reverse osmosis will reduce the hardness of the water, but would increase corrosion within the distribution system. The increased corrosion would decrease the life expectancy of the water mains and household plumbing. Corrosion also increases lead and copper dissolving from household plumbing.

Contaminants Detected that Exceed a PHG or a MCLG:

During the years 2010, 2011, and 2012 considered for this report, there were no constituents that exceeded state or federal compliance standards. However, there were a few that were above the PHG or MCLG. Water delivered in the City of San Diego that exceeded the PHG's or MCLG's during this period is summarized below:

- uranium ranged from 1.2 to 1.9 pCi/L (picocuries per liter), well below the 20 pCi/L MCL; the uranium Public Health Goal is 0.43 pCi/L.
- gross alpha was detected at 3.3 pCi/L, well below the 15 pCi/L MCL; the Public Health Goal is 0 pCi/L.
- chlorite ranged from 0.32 to 0.30 mg/L, well below the 1.0 mg/L MCL; the Public Health Goal is 0.05 mg/L.
- bromate ranged from 0.0001 to 0.0005 mg/L, well below the 0.01 mg/L MCL; the Public Health Goal is 0.0001 mg/L.
- coliform % positive ranged from 0.5% to 3.8%, below the Treatment Technique standard of 5%; the Public Health Goal is 0 %.

These detections do not constitute a violation of drinking water regulations or indicate the water was unsafe to drink. The results could be considered typical for a California water agency.

Constituents Detected That Exceed a PHG or a MCLG:

The following is a discussion of constituents that were detected in one or more of our drinking water sources at levels above the PHG, or if no PHG exists, above the MCLG.

Uranium

The State of California has a uranium MCL of 20 pCi/L based on earlier studies of toxicity to the kidney in rabbits. Cancer risk is stated in terms of excess cancer cases per million (or fewer) population exposed for a lifetime (theoretically 70 years). The numerical health risk at the MCL is $5x10^{-5}$. This means five cancer cases per 100,000

population. The numerical health risk at the PHG is $1x10^{-6}$. This means one cancer case per 1,000,000 population. The health risk category for uranium is carcinogenicity: chronic toxicity. Carcinogenic risk means capable of producing cancer. Chronic toxicity risk means there may be adverse effects that usually develop gradually from low levels of chemical exposure and that persist for a long time.[1] The primary non-carcinogenic toxic effect is on kidneys. [2]

Uranium is a naturally occurring radioactive element that is present in the earth's crust. Uranium is found in ground and surface waters due to natural occurrence in geological formations. The average uranium concentration in surface, ground, and domestic water are 1, 3 and 2 pCi/L, respectively.

Gross Alpha

The State of California has a gross alpha MCL of 15 pCi/L based on earlier studies of toxicity. Cancer risk is stated in terms of excess cancer cases per million (or fewer) population exposed for a lifetime (theoretically 70 years). The numerical health risk at the MCL is $1x10^{-3}$. This risk assessment is based on the California MCL for only the most potent alpha emitter, ^{210}Po.

Chlorite

The State of California has a chlorite MCL of 1.0 mg/L and a PHG of 0.05 mg/L. Chlorite ranged from 0.32 to 0.30 mg/L. The levels detected were below the MCL at all times. Chlorite is a disinfection byproduct produced in the treatment of drinking water with chlorine dioxide.

The PHG is based on hematological effects observed in offspring at 3 mg/kg-day and higher in a two-generation rat reproductive study. There are no acceptable carcinogenicity studies on chlorite. Several of these studies (subchronic, chronic, and developmental) reveal that oral exposure to chlorite can result in significant hematological, endocrine, reproductive, and gastrointestinal effects as well as changes in neurobehavioral development.

The U.S. Environmental Protection Agency Maximum Contaminant Level Goal (MCLG) for chlorite is 0.8 mg/L. This value is based on the same study utilized by OEHHA (CMA, 1996), but inferring a no observed adverse effect level (NOAEL) of 3 mg/kg-day based on the reduced response to auditory stimuli. The U.S. EPA calculated a reference dose (RfD) of 0.03 mg/kg-day, using a combined uncertainty factor of 100 (U.S. EPA 1998a,b, 2000). Their recommended health-protective chlorite level (the MCLG) is calculated using adult water consumption values.

Bromate

[1] *Health Risk Information for Public Health Goal Exceedance Report, Office of Environmental Health Hazard Assessment, Water Toxicology Section, April 2010*

[2] *Public Health Goals for Chemicals in Drinking Water – Uranium, Office of Environmental Health Hazard Assessment California Environmental Protection Agency, August 2001*

The State of California has a bromate MCL of 0.010 mg/L and a PHG of 0.0001 mg/L. Bromate values ranged from 0.0001 to 0.0005 mg/L. The levels detected were below the MCLs at all times. Bromate can be found in drinking water as a byproduct of the ozonation disinfection process.

The Office of Environmental Health Hazard Assessment (OEHHA) has developed a Public Health Goal for bromate in drinking water, based on its carcinogenicity. The numerical health risk at the MCL is $1x10^{-4}$. This means one cancer cases per 10,000 population. The numerical health risk at the PHG is $1x10^{-6}$. This means one cancer case per 1,000,000 population.

Best Available Treatment Technology and Cost Estimates:

The best available technology (BAT) to lower the level of these compounds below the PHG is reverse osmosis. Since the levels are already below the MCL, reverse osmosis would be required to attempt to lower the levels to below the PHG. Please note that accurate cost estimates are difficult, if not impossible, and are highly speculative and theoretical. All costs including annualized capital, construction, engineering, planning, environmental, contingency, and O&M are included, but only very general assumptions can be made for most of these items. Costs estimating guides from the Association of California Water Agencies guidance report were used in determining the estimated cost to implement the BAT. The City's 2012 treatment capacity is 295 million gallons per day. However, the current expansion of plant capacities will increase capacity to 445 million gallons per day and the cost will increase upon the completion of the expansion projects. The estimated annualized capital and operation and maintenance costs, based on the current capacity of 295 million gallons per day, to install and operate a reverse osmosis system at the City's three treatment plants would be between $147.2 million and $281.7 million/year for the life of the system. The cost per customer service connection would range from $537 to $1,028 per year. There would be additional costs for corrosion control because water treated by reverse osmosis is corrosive and could cause the water to exceed the lead and copper regulations.

Coliform Bacteria:

The State of California has a coliform Treatment Technique of 5 % and a PHG of 0%. Each month during this reporting period more than 500 samples were collected throughout the distribution system for coliform analysis. Occasionally, a sample was found to be positive for coliform bacteria, but check samples were negative and follow up actions were taken. A maximum of 3.8% of these samples were positive in any month.

The MCL for coliform is 5% positive samples of all samples per month and the MCLG is zero. The purpose of the coliform drinking water standard is to minimize the possibility of the water containing pathogens, which are organisms that cause waterborne disease. Because coliform is only a surrogate indicator of the potential presence of pathogens, it is not possible to state a specific numerical health risk. While USEPA normally sets

MCLGs “at a level where no known or anticipated adverse effects on persons would occur”, they indicate that they cannot do so with coliforms.

Coliform bacteria are an indicator organism that are ubiquitous in nature and are not generally considered harmful. They are used because of the ease in monitoring and analysis. If a positive sample is found, it indicates a potential problem that needs to be investigated and follow up sampling conducted. It is not at all unusual for a system to have an occasional positive sample. It is difficult, if not impossible, to assure that a system will never get a positive sample.

We add ozone or chlorine dioxide at our water treatment plants to assure that the water served is microbiologically safe. Chlorine and chloramines are added post filtration to ensure a disinfectant residual in the distribution system. The chloramine residual levels are carefully controlled to provide the best health protection without causing the water to have undesirable taste and odor or increasing the disinfection byproduct level. This careful balance of treatment processes is essential to continue supplying our customers with safe drinking water.

Other equally important measures that we have implemented include: an effective cross-connection control program, maintenance of a disinfectant residual throughout our system, an effective monitoring and surveillance program, and maintaining positive pressures in our distribution system. Our system has already taken all of the steps described by CDHP as “best available technology” for coliform bacteria in Section 64447, Title 22, CCR.

Recommendations for Further Action:

The drinking water quality of the City of San Diego meets all state and federal drinking water standards set to protect public health. To further reduce the levels of contaminants identified in this report, which are already significantly below the health-based MCLs to provide “safe drinking water,” would require costly treatment processes. The effectiveness of the treatment process to provide significant reductions in contaminant levels at these already low values is uncertain. The health protection benefits of these further hypothetical reductions are not at all clear and may not be quantifiable. In addition, treatment processes to reduce levels of contaminants could result in MCLs, PHGs or MCLGs to be exceeded for other contaminants. Therefore no action is proposed at this time.