Attachment A

PASADENA WATER AND POWER

REPORT ON CITY'S WATER QUALITY RELATIVE TO PUBLIC HEALTH GOALS

June 2013

BACKGROUND

The California legislature has established a criteria for adopting Maximum Contaminant Levels (MCLs) in drinking water by creating the concept of a Public Health Goal (PHG). A PHG is a health risk assessment, not a proposed drinking water standard. It is the level of a contaminant in drinking water, which is considered not to pose a significant risk to health if consumed for a lifetime. This determination is made without regard to cost or treatability. The California Department of Public Health (CDPH) is to set the MCL as close to the PHG as is economically and technical feasible.

Provisions of the California Health and Safety Code Section 116470 (b) (Attachment 1) requires that large water utilities (>10,000 service connections) prepare a special report by July 1, 2013 if their water quality measurements have exceeded any PHGs. The law also requires that where California Office of Environmental Health Hazard Assessment (OEHHA) has not adopted a PHG for a contaminant, the water suppliers are to use the Maximum Contaminant Level Goal (MCLG) adopted by the United States Environmental Protection Agency (USEPA). MCLGs are the federal equivalent to PHGs, but are determined in a different method and thus often differ. Only constituents which have a California MCL and for which either a PHG or MCLG has been set are to be addressed in this report. Attachment 2 is a list of all regulated constituents with MCLs and PHGs or MCLGs shown.

There are a few constituents that are routinely detected in water systems at levels usually well below the MCL for which no PHG or MCLG has yet been adopted by OEHHA or USEPA, such as Total Trihalomethanes (TTHMs). These will be addressed in future required reports after PHGs or MCLGs have been adopted.

This report provides the following information as specified in the Health and Safety Code (Attachment 1) for any constituent detected in the City of Pasadena's (City) water supply in 2010, 2011, and 2012 at a level exceeding an applicable PHG or MCLG:

- Numerical public health risk associated with the MCL and the PHG or MCLG;
- Category or type of risk to health that could be associated with each constituent;
- Best Available Treatment Technology that could be used to reduce the constituent level;
- Estimate of the cost to install that treatment if it is appropriate and feasible.

WHAT ARE PHGs?

- PHGs are set by the OEHHA which is part of California EPA.
- PHGs are based solely on public health risk considerations. None of the risk-management factors that are considered by the USEPA or the CDPH in setting MCL are considered in setting the PHGs. These factors include analytical detection capabilities, treatment technology available, benefits and costs.
- PHGs are not enforceable and are not required to be met by any public water system. MCLGs are federal equivalent to PHGs and are set by the USEPA.

WATER QUALITY DATA CONSIDERED

All of the water quality data collected for our water system between 2010 and 2012 for purposes of determining compliance with drinking water standards was considered. This information was summarized in the 2010, 2011 and 2012 Annual Consumer Confidence Report on Water Quality (CCR), which are mailed to our customers during the month of June in 2011, 2012, and 2013 (Attachment 3).

Most of the constituents in the water delivered to our customers were reported as "not detected" or ND. This generally means that the laboratory report indicated that the compound was not detected, but it could also mean that it was detected at a level less than the State's Detection Level for purposes of Reporting (DLR).

GUIDELINES FOLLOWED

The Association of California Water Agencies (ACWA) formed a workgroup, which prepared guidelines for water utilities to use in preparing the PHG reports. These guidelines were used in the preparation of this report. No general guidelines are available from the state regulatory agencies.

ACWA's workgroup also prepared guidelines for water utilities to use in estimating the costs to reduce a constituent to the MCL. Attachment 4 provides cost estimates for the best treatment technologies, which are available today.

BEST AVAILABLE TREATMENT TECHNOLOGY AND COST ESTIMATES

Both the USEPA and CDPH have adopted what are known as Best Available Technologies (BAT), which are the best known methods of reducing the contaminant levels. Capital construction and operation and maintenance (O&M) costs can be estimated for such technologies. However, since many PHGs and MCLGs are set a lot lower than the MCL, it is not always possible or feasible to determine what treatment is needed to further reduce a constituent down to or near the PHG or MCLG level. For example, USEPA sets the MCLG for potential cancer-causing chemicals at zero. Estimating the costs to reduce a constituent to zero is difficult, if not impossible, because it is not possible to verify by analytical means that the level has been lowered to zero. In some cases, installing treatment to try and further reduce very low levels of one constituent may have adverse effects on other aspects of water quality.

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 exceeding the PHG, or if no PHG, above the MCLG. The City, using multiple treatment methods approved by CDPH, consistently delivers safe water at the lowest possible cost to our customers. Constituents that were detected in one or more of our drinking water sources at levels above the MCLs were reduced to acceptable levels. The health risk information for regulated constituents with MCLs, PHGs or MCLGs is provided in Attachment 2.

WATER SYSTEM DESCRIPTION AND WATER QUALITY

The majority of the City's water supply comes from local groundwater sources and imported water purchases from the Metropolitan Water District of Southern California (MWD). The City maintains 17 groundwater wells and has 5 interconnections with MWD. Water quality issues have been discovered at several wells. The City uses a combination of removing a well from service, blending, and treatment to ensure water delivered to the customers does not exceed the MCL. The most common water quality issues are nitrate, perchlorate, and volatile organic compound (VOC) contamination.

Sunset Reservoir Blending Plan

Five groundwater wells are blended with MWD water at the Sunset Reservoir before delivery to the customers. These wells are Bangham, Copelin, Garfield, Sunset, and Villa, or commonly known as the Sunset blending wells. Copelin and Sunset wells have nitrate, perchlorate, and VOC levels above the MCL. Bangham Well has nitrate and perchlorate levels above the MCL while Garfield and Villa wells have perchlorate levels above the MCL. MWD water has very low, if not detected, levels of nitrate, perchlorate and VOC.

The City created the Sunset Reservoir Blending Plan to provide operational procedures for blending the Sunset wells with MWD water. The goal of the plan is to assure that the City meets the nitrate, perchlorate, and VOC MCLs by maintaining the concentrations below 80% of the MCL in the Sunset Reservoir and the distribution system. This is done by blending lower contaminant level water sources with the higher contaminant level water sources. The blending plan takes effect if any of the Sunset blending wells is in operation. Regular water quality monitoring at the Sunset Reservoir is done to ensure that the water delivered to the customers is below nitrate, perchlorate, and VOC MCL.

Monk Hill Treatment System (MHTS)

Elevated levels of perchlorate and VOCs in the groundwater in the Arroyo Seco area resulted in the shutdown of four local groundwater wells between 1997 and 2002. These wells are the Arroyo, Ventura, Well 52, and Windsor wells. In October 2011, the City inaugurated the Monk Hill Treatment System (MHTS). The treatment system was designed to remove perchlorate by ion-exchange technology and VOCs by liquid phase granular activated carbon (LGAC) technology. The treated water is disinfected and discharged to the Windsor Reservoir before delivery to the customers. The treatment goal for the ion-exchange and LGAC system is a non-detect contaminant at the plant effluent and the Windsor Reservoir. Weekly water quality monitoring is done to ensure compliance with the MHTS treatment goals.

Eastside Well Collector Pipeline

There are seven local groundwater wells located in the eastside portion of Pasadena. Jourdan and Monte Vista, two of the seven eastside wells, were found to have exceeded the MCL for nitrate and perchlorate and were taken out of service in 1995 and 2007.

A plan to construct an Eastside well collector pipeline is already on the way. The pipeline will divert water flows from Chapman, Jourdan, Monte Vista, Twombly, Wadsworth, and Woodbury wells to the Jones reservoir where water will be blended with MWD water before delivery to the customers. The main objective of this project is to increase the City's groundwater pumping capacity; however, it will also allow blending of lower contaminant level water sources with the higher contaminant level water sources. Blending will result in lower, if not non detected, nitrate and perchlorate levels at Jones reservoir and the distribution system. This project will also allow disinfection of the groundwater water prior to delivery to the customer. The pipeline is expected to be completed by January 2014.

Carbon Tetrachloride (CTC)

The PHG for CTC is 0.0001 milligrams per liter (mg/L) while the MCL or the drinking water standard is 0.0005 mg/L. CTC is a VOC that has primarily been released in the environment by chemical plants and other industries.

Arroyo Well, Ventura Well, Well 52, and Windsor Well were taken out of service for many years due to VOC and perchlorate contamination. Between 2011 and 2012, the City detected CTC in Arroyo Well at concentrations ranging from 0.00064 to 0.00401 mg/L. Water from the Arroyo Well is treated at MHTS using the LGAC system. Weekly water quality monitoring is done to ensure a non-detect CTC at the LGAC combined plant effluent and Windsor Reservoir.

The category of health risk associated with CTC, and the reason that a drinking water standard was adopted for it, is that people who drink water containing CTC above the MCL for many years may experience liver problems and may have increased risk of getting cancer. The numerical health risk of ingesting drinking water with CTC at the PHG is $1X10^{-6}$, or one additional theoretical cancer case in one million people drinking two liters of water a day for 70 years.

The BAT for CTC to reduce the concentration level below the MCL is either Granular Activated Carbon (GAC) or Packed Tower Aeration (PTA). The cost to treat a CTC using a LGAC treatment system is $1.36 per 1,000 gallons of treated water.

cis-1,2-Dichloroethylene (c-1,2, DCE)

The PHG for c-1,2-DCE is 0.10 mg/L while the MCL is 0.006 mg/L. cis-1,2-DCE is a VOC that has primarily been released in the environment by chemical plants. It is also a biodegradation by-product of groundwater contamination of TCE and PCE.

The City detected cis-1,2-DCE in Copelin Well at concentrations ranging from 0.0077 to 0.0296 mg/L between 2011 and 2012. Water from Copelin Well is blended with other groundwater wells and MWD water at the Sunset Reservoir. The blending activity at the reservoir is governed by the Sunset Reservoir Blending Plan to ensure that the water delivered to the customers meets cis-1,2-DCE MCL. Weekly water quality monitoring is done to ensure compliance with the Sunset Reservoir Blending Plan. Because there is no treatment of the influent groundwater going to the Sunset Reservoir, a small amount of cis-1,2-DCE at concentrations ranging from non-detect to 0.0012 mg/L can enter the distribution system through the blended supply. At no time did the cis-1,2-DCE concentration in the blended water exceed the MCL.

The category of health risk associated with cis,1,2-DCE and the reason that a drinking water standard was adopted for it, is that people who drink water

containing cis-1,2-DCE above the MCL for many years may experience liver problems. There are no studies on the carcinogenicity of cis-1,2-DCE.

The BAT for cis-1,2-DCE to reduce the concentration level below the MCL is either GAC or PTA. The cost to operate a LGAC treatment system that will treat the Sunset Blending wells to reliably reduce the cis-1,2-DCE level would cost $1.36 per 1,000 gallons of treated water.

Trichloroethylene (TCE)

The PHG for TCE is 0.0017 mg/L while the MCL is 0.005 mg/L. TCE is a VOC that has primarily been released into the environment by industries that use solvents.

The City detected TCE from Copelin Well, Sunset Well, and Ventura Well at levels ranging from 0.00073 to 0.02160 mg/L between 2010 and 2012.

Copelin Well had an annual TCE average of 0.0072 mg/L in 2010, 0.0029 mg/L in 2011, and 0.0037 mg/L in 2012. Sunset Well had an annual TCE average of 0.0036 mg/L in 2010, 0.0059 mg/L in 2011, and 0.0069 mg/L in 2012. Water from Copelin, Sunset and other groundwater wells are blended with MWD water at the Sunset Reservoir. Once blended, the TCE level at the reservoir is well below the MCL. Because there is no treatment of the influent groundwater going to the Sunset Reservoir, a small amount of TCE at concentrations ranging from non-detect to 0.0016 mg/L can enter the distribution system through the blended supply.

Ventura Well had an annual TCE average of 0.0024 mg/L in 2011 and 0.0025 mg/L in 2012. These are below the MCL but above the PHG level. Ventura Well water is treated for TCE at the MHTS using the LGAC system. The treatment goal is a non-detect TCE at the LGAC effluent and the Windsor Reservoir. Weekly water quality monitoring is done to ensure compliance with the MHTS treatment goals. At no time did the level of TCE in blended water exceed the MCL.

The category of health risk associated with TCE, and the reason that a drinking water standard was adopted for it, is that people who drink water containing TCE above the MCL for many years could experience an increased risk of getting cancer. The numerical health risk of ingesting drinking water with TCE at the PHG is $1X10^{-6}$, or one additional theoretical cancer case in one million people drinking two liters of water a day for 70 years.

The BAT for TCE to reduce the concentration level below the MCL is either GAC or PTA. The cost to operate a LGAC treatment system that will reliably reduce the TCE level would cost $1.36 per 1,000 gallons of treated water.

Tetrachloroethylene (PCE)

The PHG for PCE is 0.00006 mg/L and the MCL is 0.005 mg/L. PCE is also a VOC that has been released into the environment by industries that use solvents.

The City detected PCE from the following wells (Arroyo, Bangham, Copelin, Sunset, Ventura, and Well 52) at levels ranging from 0.0002 to 0.0330 mg/L between 2010 and 2012.

Arroyo Well had an annual PCE average of 0.0005 mg/L in 2011 and 0.0001 mg/L in 2012. Ventura Well had an annual PCE average of 0.0009 mg/L in 2011 and 2012 while Well 52 had an annual PCE average of 0.0005 mg/L in 2012. These wells are treated at the MHTS using the LGAC system. The treated water is discharged to the Windsor Reservoir before delivery to the customers. Weekly water quality monitoring is done to ensure compliance with the MHTS treatment goals.

Between 2010 and 2012, the City detected PCE in Bangham , Copelin and Sunset wells. Bangham Well had an annual PCE average of 0.0008 mg/L in 2010, 0.0015 mg/L in 2011, and 0.0017 mg/L in 2012. Copelin Well had an annual PCE average of 0.0036 mg/L in 2010, 0.0107 mg/L in 2011, and 0.0132 mg/L in 2012. Sunset Well had an annual PCE concentration of 0.0017 mg/L in 2010, 0.0019 mg/L in 2011, and 0.0028 mg/L in 2012. Bangham, Copelin and Sunset wells are blended with MWD water at the Sunset Reservoir. The resulting PCE concentration at the reservoir is below the MCL. Because there is no treatment of the groundwater entering the Sunset Reservoir, a small amount of PCE at concentrations ranging from non-detect to 0.0012 mg/L can enter the distribution system through the blended supply. At no time did the level of PCE in blended water exceed the MCL.

The category of health risk associated with PCE, and the reason that a drinking water standard was adopted for it, is that people who drink water containing PCE above the MCL for many years could experience liver problems, and may have increased risk of getting cancer. The numerical health risk of ingesting drinking water with PCE at the PHG is $1X10^{-6}$, or one additional theoretical cancer case in one million people drinking two liters of water a day for 70 years.

The BAT for PCE to reduce the concentration level below the MCL is either GAC or PTA. The cost to operate a LGAC treatment system that will reliably reduce the PCE level would cost $1.36 per 1,000 gallons of treated water.

Arsenic

The PHG for arsenic is 0.000004 mg/L. The MCL for arsenic is 0.010 mg/L. Arsenic is a metallic element and it is both naturally occurring and released into

the environment because of its use in agricultural pesticides and in chemicals for timber preservation.

Arsenic was detected in the Arroyo Well on 2011 at 0.0012 mg/L. This value is well below the MCL but exceeded the PHG. Arroyo Well water is blended with Ventura Well and Well 52 which have non-detect levels of arsenic. Blending reduces the arsenic concentration in the reservoir and distribution system.

The category of health risk associated with arsenic is that people who drink water containing arsenic above the MCL for many years could experience an increased risk of getting cancer. The numerical health risk of ingesting drinking water with arsenic at the PHG is $4X10^{-6}$, or four additional theoretical cancer cases in one million people drinking two liters of water a day for 70 years.

The BAT for arsenic removal is either ion-exchange or reverse osmosis. Ion-exchange technology is more cost effective than reverse osmosis. The estimated cost to install, operate and maintain an ion-exchange system that reduces arsenic levels is $1.84 per 1000 gallons of treated water.

Chromium VI (Cr VI)

The PHG for Cr VI is 0.00002 mg/L. Currently, Cr VI in drinking water is regulated under the state total chromium MCL of 0.05 mg/L. Total chromium comes in the form Cr III and Cr VI. In California, a vast majority of total chromium in drinking water comes in the form of Cr VI. Cr VI is a heavy metal that is commonly found at low levels in drinking water. It is a naturally occurring metal but it can also enter the drinking water sources through historic leaks from industrial plants such as manufacturing of textile dyes, wood preservation, leather tanning, and anti-corrosion coatings.

Between 2010 and 2012, Cr VI was detected at six PWP groundwater wells (Arroyo, Ventura, Bangham, Well 58, Well 59, and Woodbury wells) at concentrations ranging from 0.0022 to 0.0068 mg/L. These wells have exceeded the Cr VI PHG.

Cr VI is known to be a potent carcinogen when inhaled. It was recently found to also cause cancer in laboratory mice and rats when exposed through drinking water. A drinking water sample with a detection of Cr VI above the PHG level does not necessarily represent a public concern. The PHG is set at a health protective level that may result in no more than one case of cancer per one million people who drink 2 liters of water with Cr VI at PHG level every day for 70 years.

The BAT for Cr VI removal is either weak base anion exchange resin or reduction-coagulation-filtration technology. Weak base anion exchange is the more cost effective of these two technologies. The estimated cost to install,

operate and maintain an ion-exchange weak base anion resin system that will reduce Cr VI level to 0.001 mg/L is $6.29 per 1000 gallons of treated water.

Fluoride

The PHG for fluoride is 1.0 mg/L. The federal has a fluoride MCL of 4.0 mg/L while the state maintains a MCL of 2.0 mg/L. It is a naturally occurring element that is used as a water additive to prevent dental caries and promote strong teeth. Fluoride in drinking water is also caused by erosion of natural deposits. Some people who drink water containing fluoride in excess of the federal MCL (4 mg/L) over many years may get bone disease. Children who drink water containing fluoride in excess of the state MCL (2 mg/L) may get mottled teeth.

The City's groundwater wells were found to have naturally occurring fluoride concentration ranging from 0.4 to 1.5 mg/L. In 2007, MWD started fluoridating their water at an average concentration of 0.8 mg/L. Blending of the MWD water with the City's groundwater resulted in a fluoride concentration at a range of 0.40 to 1.58 mg/L in our community drinking water.

The BAT for fluoride removal is ion-exchange, reverse osmosis and activated alumina. Of the three, ion-exchange is the most cost effective. The cost to install, operate, and maintain an ion-exchange treatment system that lowers fluoride levels below PHG is estimated at an annual cost of $38.00 per customer.

Nitrate

The MCL and PHG for nitrate are set at 45 mg/L. Nitrate in drinking water at levels above the MCL is a health risk for infants of less than six months of age. High nitrate levels in drinking water can interfere with the capacity of an infant's blood to carry oxygen, resulting in a serious illness; symptoms include shortness of breath and blueness of the skin. However, drinking water that meets the nitrate MCL/PHG is associated with little to no risk and is considered safe for consumption. Nitrate contamination of the groundwater is a result of agricultural and residential use of fertilizers and septic systems.

Between 2010 and 2012, the City detected nitrate at Ventura, Well 52, Bangham, Copelin, and Sunset wells above the PHG and MCL level. The nitrate levels from these wells ranged from 27.5 to 56.4 mg/L.

Ventura Well had an annual nitrate average of 50.15 mg/L in 2011 and 47.73 mg/L in 2012. Well 52 had a nitrate annual average of 41.77 mg/L in 2011 and 30.04 mg/L in 2012. The water from the Arroyo, Ventura, Well 52, and Windsor wells are blended at the MHTS and Windsor Reservoir. The nitrate level of the blended water is a lot lower than the MCL. The goal of the blending plan is to maintain the concentration of the blended water below 80% of the nitrate MCL.

Bangham Well had a nitrate annual average of 37.32 mg/L in 2010, 37.20 mg/L in 2011, and 37.85 mg/L in 2012. Copelin Well had an annual nitrate average of 40.22 mg/L in 2010, 48.19 mg/L in 2011, and 48.09 mg/L in 2012. Sunset Well had a nitrate annual average of 47.55 mg/L in 2010, 47.52 mg/L in 2011, and 46.33 mg/L in 2012. These wells are blended with MWD water at the Sunset Reservoir before being delivered to the customers. Once blended, the nitrate level is well below the MCL. Compliance is based on a weekly nitrate monitoring at the Sunset Reservoir.

The BAT for nitrate removal is ion-exchange or reverse osmosis. Of the two, ion exchange is the more cost effective. The estimated cost to install, operate, and maintain an ion-exchange treatment system lowers nitrate level is $1.81 per 1,000 gallons of treated water.

Perchlorate

Both the PHG and the California MCL for perchlorate are set at 0.006 mg/L. Perchlorate is an inorganic chemical used in solid rocket propellant, fireworks, explosives, and matches. It gets into the drinking water as a result of environmental contamination from historic aerospace or other industrial operation. Perchlorate's interference with iodide uptake by the thyroid gland can decrease production of thyroid hormones, which are needed for prenatal and postnatal growth and development, as well as for normal metabolism and mental function in adults.

Between 2010 and 2012, the City detected perchlorate in eight groundwater wells ranging from 0.0049 to 0.0432 mg/L. Six of these wells (Arroyo, Well 52, Bangham, Copelin, Garfield, and Sunset) exceeded the perchlorate PHG and MCL.

Arroyo Well had a perchlorate annual average of 0.0067 mg/L in 2011 and 0.0156 mg/L in 2012. Well 52 had a perchlorate annual average of 0.0050 mg/L in 2011 and 0.0048 mg/L in 2012. Both wells are treated at the MHTS using the ion-exchange system. The treatment goal is a non-detect perchlorate at the ion-exchange combined effluent and the Windsor Reservoir.

Bangham Well had a perchlorate annual average of 0.0078 mg/L in 2010, 0.0082 mg/L in 2011, and 0.0084 mg/L in 2012. Copelin Well had a perchlorate annual average of 0.0035 mg/L in 2010, 0.0080 mg/L in 2011, and 0.0093 mg/L in 2012. The annual average perchlorate concentration at Garfield Well in 2012 was 0.0049 mg/L. Sunset Well had a perchlorate annual average of 0.0111 mg/L in 2010, 0.0110 mg/L in 2011, and 0.0115 mg/L in 2012. These wells are blended with MWD water at the Sunset Reservoir, once blended the perchlorate is below the MCL.

The BAT for perchlorate removal is ion-exchange technology. The estimated cost to install and operate an ion-exchange treatment system that lowers perchlorate levels is $ 1.38 per 1,000 gallons of treated water.

Total Coliform Bacteria

Total coliform bacteria are measured at points in the City's distribution system. No more than 5% of all samples collected in a month can be positive for total coliforms. This defines the MCL. The MCLG is zero positive samples. No PHG exists for total coliform bacteria. The reason for the total coliform drinking water standard is to minimize the possibility of the water containing pathogens, which are organisms that cause waterborne disease. Because total coliform analysis 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 total coliforms.

From 2010 to 2012, the City collected between 130 and 168 samples each month for total coliform analysis. Occasionally, a sample was found to be positive for coliform bacteria, but follow-up actions were taken and check samples were negative. A maximum of 2.16% of the samples were positive in any month in 2010; not more than 1.47% of the samples were positive in any month in 2011; and no more than 1.44% of the samples were positive in any month in 2012.

Coliform bacteria are group indicator organisms 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 with follow-up sampling. It is not unusual for a system to have an occasional positive sample. It is difficult to assure that a water system will never have a positive sample.

The City is working closely with our regional water supplier, MWD, and has instituted new disinfection procedures to provide for a slightly higher disinfectant residual. MWD's disinfectant is chloramine, a combination of chlorine and ammonia. The City adds chlorine at our wells and reservoirs to ensure that the water served is microbiologically safe. The careful balance of treatment processes used is essential to continue supplying our customers with safe drinking water.

The City has taken all of the steps described by CDPH as "best available technology" for coliform bacteria in Section 64447, Title 22 of the California Code of Regulations. These include: an effective cross-connection control program to protect our wells and the distribution system from coliform contamination; maintenance of a disinfectant residual throughout our system; an effective monitoring and surveillance program; and maintaining positive pressures in our distribution system.

Lead and Copper

There are no MCLs for lead or copper. Instead, the 90th percentile value of all samples collected by the City from household taps cannot exceed an Action Level of 0.015 mg/L for lead and 1.3 mg/L for copper. The PHG for lead is 0.0002 mg/L. The PHG for copper is 0.30 mg/L. Both lead and copper are a result of internal corrosion of household water plumbing system.

The Lead and Copper Rule (LCR) was conducted by the City during the summer of 2011. Based on extensive sampling of customers' homes identified as high risk (new plumbing installed with lead solder) for plumbing materials leaching into tap water, the City's 90th percentile value for lead was 0.0019 mg/L and 0.22 mg/L for copper.

The City's water system and water sources are in full compliance with the Federal and State Lead and Copper Rule. Therefore, we are deemed by CDPH to have "optimized corrosion control" for our system. An optimized water system is required to monitor the LCR every three years. The next monitoring cycle for the City is in the summer of 2014.

The category of health risk for lead is damage to the kidneys or nervous system of humans. The category of health risk for copper is gastrointestinal irritation. Numerical health risk data on lead and copper have been provided by OEHHA, the State agency responsible for providing that information. OEHHA determined that the numerical cancer risk was "not applicable" (see Attachment Number 2) because the risk is acute, not carcinogenic.

In general, optimizing corrosion control is considered to be the BAT to deal with corrosion issues and with any lead or copper findings. We continue to monitor our water quality parameters that relate to corrosivity, such as the pH, hardness, alkalinity, total dissolved solids, and will take action if necessary to maintain our system in an "optimized corrosion control" condition.

Since we meet the "optimized corrosion control" requirements, it is not necessary or prudent to initiate additional corrosion control treatment as it involves the addition of other chemicals and additional water quality issues could be raised. Therefore, no estimate of cost has been included.

Gross Alpha

Although there is no PHG for gross alpha, the MCLG is zero and the MCL is 15 pCi/L. Gross alpha is a radiological compound that is naturally occurring in the environment. Some people who drink water containing alpha emitters in excess of the MCL over many years may have increased risk of getting cancer.

Between 2010 and 2012, gross alpha was detected in seven groundwater wells (Arroyo Well, Ventura Well, Well 52, Copelin Well, Sunset Well, Twombly Well, and Woodbury Well) ranging from 4.8 to 10 pCi/L. All are below the gross alpha MCL. Gross alpha was also detected at Chapman Well at a level of 17 pCi/L. The MCL compliance for gross alpha is based on evaluating the difference between the gross alpha and uranium. If the difference between the two radionuclides is less than 15 pCi/L [(gross alpha – uranium) < 15 pCi/L], the gross alpha MCL is met. In 2011, gross alpha for Chapman Well was 17 pCi/L while the uranium is 15 pCi/L. The difference between the two contaminants is 2 pCi/L, well below the 15 pCi/L MCL. The City is also building an Eastside Well Collector Pipeline. The pipeline will divert water flows from six eastside wells, including Chapman Well, to Jones Reservoir where the water will be blended before delivery to the customers. Blending will reduce the gross alpha concentration in Jones Reservoir and distribution system.

Gross alpha has been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed to high levels over their lifetimes. Constituents that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed over long periods of time. CDPH has set the drinking water standard for gross alpha at 15 pCi/L to reduce the risk of cancer or other adverse health affects that have been observed in laboratory animals.

The BAT for gross alpha is reverse osmosis and is estimated at an annual cost of $790 per customer.

Uranium

The PHG for uranium is 0.43 picoCuries per liter (pCi/L) and the MCL is 20 pCi/L. Uranium is metallic element which is weakly radioactive and naturally occurring in the environment.

Between 2010 and 2012, uranium was detected at a concentration ranging from 4.2 to 17.0 pCi/L from eight groundwater wells (Arroyo, Ventura, Well 52, Copelin, Sunset, Chapman, Twombly, and Wadsworth). The levels detected were below the MCL at all times, but were over the PHG's.

OEHHA determined that the numerical cancer risk for uranium at the PHG level is $1x10^{-6}$. The CDPH, which sets drinking water standards, has determined that uranium is a health concern at certain levels of exposure. This radiological constituent is a naturally occurring contaminant in some groundwater and surface water supplies. Exposure to uranium in drinking water may result in toxic effects to the kidney. This constituent has also been shown to cause cancer in laboratory animals such as rats and mice when the animals are exposed at high levels over their lifetimes. Constituents that cause cancer in laboratory animals also may increase the risk of cancer in humans who are exposed over long

periods of time. CDPH has set the drinking water standard for uranium at 20 pCi/L to reduce the risk of cancer or other adverse health affects that have been observed in laboratory animals.

The BAT identified to treat radiological contaminants is reverse osmosis. The most effective and economical treatment system is to use reverse osmosis treatment at select plant and surface water connection sites. We have determined that the cost to install and operate an reverse osmosis removal system to treat the wells and surface water connection in order to meet the PHG levels would be approximately $30 million annually which includes construction and annual operational cost. This translates into an annual cost of $790 per customer.

Recommendations for Further Action

The drinking water quality of the City of Pasadena meets all State of California, Department of Public Health and USEPA drinking water standards set to protect public health. To further reduce the levels of the constituents identified in this report that are already significantly below the established health-based MCL's to provide "safe drinking water," additional costly treatment processes would be required. The effectiveness of the treatment processes to provide any significant reductions in constituent 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. Therefore, no action is proposed.

ATTACHMENTS:

Number 1 Excerpt from California Health and Safety Code: Section 116470(b)
Number 2 List of Regulated Constituents with MCLs, PHGs or MCLGs
Number 3 City of Pasadena Water and Power Consumer Confidence Report
Number 4 Cost Estimates for Treatment Technologies
Number 5 Acronyms

VP/hs

Attachment 1

California Health and Safety Code

Health and Safety Code
Section 116470

(a) As a condition of its operating permit, every public water system shall annually prepare a consumer confidence report and mail or deliver a copy of that report to each customer, other than an occupant, as defined in Section 799.28 of the Civil Code, of a recreational vehicle park. A public water system in a recreational vehicle park with occupants as defined in Section 799.28 of the Civil Code shall prominently display on a bulletin board at the entrance to or in the office of the park, and make available upon request, a copy of the report. The report shall include all of the following information:

(1) The source of the water purveyed by the public water system.

(2) A brief and plainly worded definition of the terms "maximum contaminant level," "primary drinking water standard," and "public health goal."

(3) If any regulated contaminant is detected in public drinking water supplied by the system during the past year, the report shall include all of the following information:

(A) The level of the contaminant found in the drinking water, and the corresponding public health goal and primary drinking water standard for that contaminant.

(B) Any violations of the primary drinking water standard that have occurred as a result of the presence of the contaminant in the drinking water and a brief and plainly worded statement of health concerns that resulted in the regulation of that contaminant.

(C) The public water system's address and phone number to enable customers to obtain further information concerning contaminants and potential health effects.

(4) Information on the levels of unregulated contaminants, if any, for which monitoring is required pursuant to state or federal law or regulation.

(5) Disclosure of any variances or exemptions from primary drinking water standards granted to the system and the basis therefor.

(b) On or before July 1, 1998, and every three years thereafter, public water systems serving more than 10,000 service connections that detect one or more contaminants in drinking water that exceed the applicable public health goal, shall prepare a brief written report in plain language that does all of the following:

(1) Identifies each contaminant detected in drinking water that exceeds the applicable public health goal.

(2) Discloses the numerical public health risk, determined by the office, associated with the maximum contaminant level for each contaminant identified in paragraph (1) and the numerical public health risk determined by the office associated with the public health goal for that contaminant.

(3) Identifies the category of risk to public health, including, but not limited to, carcinogenic, mutagenic, teratogenic, and acute toxicity, associated with

exposure to the contaminant in drinking water, and includes a brief plainly worded description of these terms.

(4) Describes the best available technology, if any is then available on a commercial basis, to remove the contaminant or reduce the concentration of the contaminant. The public water system may, solely at its own discretion, briefly describe actions that have been taken on its own, or by other entities, to prevent the introduction of the contaminant into drinking water supplies.

(5) Estimates the aggregate cost and the cost per customer of utilizing the technology described in paragraph (4), if any, to reduce the concentration of that contaminant in drinking water to a level at or below the public health goal.

(6) Briefly describes what action, if any, the local water purveyor intends to take to reduce the concentration of the contaminant in public drinking water supplies and the basis for that decision.

(c) Public water systems required to prepare a report pursuant to subdivision (b) shall hold a public hearing for the purpose of accepting and responding to public comment on the report. Public water systems may hold the public hearing as part of any regularly scheduled meeting.

(d) The department shall not require a public water system to take any action to reduce or eliminate any exceedance of a public health goal.

(e) Enforcement of this section does not require the department to amend a public water system's operating permit.

(f) Pending adoption of a public health goal by the Office of Environmental Health Hazard Assessment pursuant to subdivision (c) of Section 116365, and in lieu thereof, public water systems shall use the national maximum contaminant level goal adopted by the United States Environmental Protection Agency for the corresponding contaminant for purposes of complying with the notice and hearing requirements of this section.

(g) This section is intended to provide an alternative form for the federally required consumer confidence report as authorized by 42 U.S.C. Section 300g-3(c).

Attachment 2

List of Regulated MCLs – DLRs – PHGs

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Health Risk Information for PHG Exceedance Report

MCLs, DLRs, and PHGs for Regulated Drinking Water Contaminants

(Units are in milligrams per liter (mg/L), unless otherwise noted.)

Last Update: January 30, 2013

This table includes:

CDPH's maximum contaminant levels (MCLs)

CDPH's detection limits for purposes of reporting (DLRs)

Public health goals (PHGs) from the Office of Environmental Health Hazard Assessment (OEHHA)

Also, PHGs for NDMA and 1,2,3-Trichloropropane (which are not yet regulated) are included at the bottom of this table.

	MCL	DLR	PHG	Date of PHG
Chemicals with MCLs in 22 CCR §64431—Inorganic Chemicals				
Aluminum	1	0.05	0.6	2001
Antimony	0.006	0.006	0.02	1997
Antimony	--	--	0.0007	2009 draft
Arsenic	0.010	0.002	0.000004	2004
Asbestos (MFL = million fibers per liter; for fibers >10 microns long)	7 MFL	0.2 MFL	7 MFL	2003
Barium	1	0.1	2	2003
Beryllium	0.004	0.001	0.001	2003
Cadmium	0.005	0.001	0.00004	2006
Chromium, Total - OEHHA withdrew the 0.0025-mg/L PHG	0.05	0.01	withdrawn Nov. 2001	1999
Chromium, Hexavalent (Chromium-6) - MCL to be established - currently regulated under the total chromium MCL	--	0.001	0.00002	2011
Cyanide	0.15	0.1	0.15	1997
Fluoride	2	0.1	1	1997
Mercury (inorganic)	0.002	0.001	0.0012	1999 (rev2005)*
Nickel	0.1	0.01	0.012	2001
Nitrate (as NO3)	45	2	45	1997
Nitrite (as N)	1 as N	0.4	1 as N	1997
Nitrate + Nitrite	10 as N	--	10 as N	1997
Perchlorate	0.006	0.004	0.006	2004
Perchlorate	--	--	0.001	2011 draft
Selenium	0.05	0.005	0.03	2010
Thallium	0.002	0.001	0.0001	1999 (rev2004)
Copper and Lead, 22 CCR §64672.3				
Values referred to as MCLs for lead and copper are not actually MCLs; instead, they are called "Action Levels" under the lead and copper rule				
Copper	1.3	0.05	0.3	2008
Lead	0.015	0.005	0.0002	2009

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	MCL	DLR	PHG	Date of PHG
Radionuclides with MCLs in 22 CCR §64441 and §64443—Radioactivity				
[units are picocuries per liter (pCi/L), unless otherwise stated; n/a = not applicable]				
Gross alpha particle activity - OEHHA concluded in 2003 that a PHG was not practical	15	3	none	n/a
Gross beta particle activity - OEHHA concluded in 2003 that a PHG was not practical	4 mrem/yr	4	none	n/a
Radium-226	--	1	0.05	2006
Radium-228	--	1	0.019	2006
Radium-226 + Radium-228	5	--	--	--
Strontium-90	8	2	0.35	2006
Tritium	20,000	1,000	400	2006
Uranium	20	1	0.43	2001
Chemicals with MCLs in 22 CCR §64444—Organic Chemicals				
(a) Volatile Organic Chemicals (VOCs)				
Benzene	0.001	0.0005	0.00015	2001
Carbon tetrachloride	0.0005	0.0005	0.0001	2000
1,2-Dichlorobenzene	0.6	0.0005	0.6	1997 (rev2009)
1,4-Dichlorobenzene (p-DCB)	0.005	0.0005	0.006	1997
1,1-Dichloroethane (1,1-DCA)	0.005	0.0005	0.003	2003
1,2-Dichloroethane (1,2-DCA)	0.0005	0.0005	0.0004	1999 (rev2005)
1,1-Dichloroethylene (1,1-DCE)	0.006	0.0005	0.01	1999
cis-1,2-Dichloroethylene	0.006	0.0005	0.1	2006
trans-1,2-Dichloroethylene	0.01	0.0005	0.06	2006
Dichloromethane (Methylene chloride)	0.005	0.0005	0.004	2000
1,2-Dichloropropane	0.005	0.0005	0.0005	1999
1,3-Dichloropropene	0.0005	0.0005	0.0002	1999 (rev2006)
Ethylbenzene	0.3	0.0005	0.3	1997

MCLs, DLRs, and PHGs for Regulated Drinking Water Contaminants

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Public health goals (PHGs) from the Office of Environmental Health Hazard Assessment (OEHHA)

Also, PHGs for NDMA and 1,2,3-Trichloropropane (which are not yet regulated) are included at the bottom of this table.

	MCL	DLR	PHG	Date of PHG
Methyl tertiary butyl ether (MTBE)	0.013	0.003	0.013	1999
Monochlorobenzene	0.07	0.0005	0.2	2003
Styrene	0.1	0.0005	0.0005	2010
1,1,2,2-Tetrachloroethane	0.001	0.0005	0.0001	2003
Tetrachloroethylene (PCE)	0.005	0.0005	0.00006	2001
Toluene	0.15	0.0005	0.15	1999
1,2,4-Trichlorobenzene	0.005	0.0005	0.005	1999
1,1,1-Trichloroethane (1,1,1-TCA)	0.2	0.0005	1	2006
1,1,2-Trichloroethane (1,1,2-TCA)	0.005	0.0005	0.0003	2006
Trichloroethylene (TCE)	0.005	0.0005	0.0017	2009
Trichlorofluoromethane (Freon 11)	0.15	0.005	0.7	1997
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	1.2	0.01	4	1997 (rev2011)
Vinyl chloride	0.0005	0.0005	0.00005	2000
Xylenes	1.75	0.0005	1.8	1997
(b) Non-Volatile Synthetic Organic Chemicals (SOCs)				
Alachlor	0.002	0.001	0.004	1997
Atrazine	0.001	0.0005	0.00015	1999
Bentazon	0.018	0.002	0.2	1999 (rev2009)
Benzo(a)pyrene	0.0002	0.0001	0.000007	2010
Carbofuran	0.018	0.005	0.0017	2000
Chlordane	0.0001	0.0001	0.00003	1997 (rev2006)
Dalapon	0.2	0.01	0.79	1997 (rev2009)
1,2-Dibromo-3-chloropropane (DBCP)	0.0002	0.00001	0.0000017	1999
2,4-Dichlorophenoxyacetic acid (2,4-D)	0.07	0.01	0.02	2009
Di(2-ethylhexyl)adipate	0.4	0.005	0.2	2003
Di(2-ethylhexyl)phthalate (DEHP)	0.004	0.003	0.012	1997
Dinoseb	0.007	0.002	0.014	1997 (rev2010)
Diquat	0.02	0.004	0.015	2000

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Public health goals (PHGs) from the Office of Environmental Health Hazard Assessment (OEHHA)

Also, PHGs for NDMA and 1,2,3-Trichloropropane (which are not yet regulated) are included at the bottom of this table.

	MCL	DLR	PHG	Date of PHG
Endrin	0.002	0.0001	0.0018	1999 (rev2008)
Endothal	0.1	0.045	0.58	1997
Ethylene dibromide (EDB)	0.00005	0.00002	0.00001	2003
Glyphosate	0.7	0.025	0.9	2007
Heptachlor	0.00001	0.00001	0.000008	1999
Heptachlor epoxide	0.00001	0.00001	0.000006	1999
Hexachlorobenzene	0.001	0.0005	0.00003	2003
Hexachlorocyclopentadiene	0.05	0.001	0.05	1999
Lindane	0.0002	0.0002	0.000032	1999 (rev2005)
Methoxychlor	0.03	0.01	0.00009	2010
Molinate	0.02	0.002	0.001	2008
Oxamyl	0.05	0.02	0.026	2009
Pentachlorophenol	0.001	0.0002	0.0003	2009
Picloram	0.5	0.001	0.5	1997
Polychlorinated biphenyls (PCBs)	0.0005	0.0005	0.00009	2007
Simazine	0.004	0.001	0.004	2001
2,4,5-TP (Silvex)	0.05	0.001	0.025	2003
2,3,7,8-TCDD (dioxin)	$3x10^{-8}$	$5x10^{-9}$	$5x10^{-11}$	2010
Thiobencarb	0.07	0.001	0.07	2000
Toxaphene	0.003	0.001	0.00003	2003
Chemicals with MCLs in 22 CCR §64533—Disinfection Byproducts				
Total Trihalomethanes	0.080	--	0.0008	2010 draft
Bromodichloromethane	--	0.0010	--	--
Bromoform	--	0.0010	--	--
Chloroform	--	0.0010	--	--
Dibromochloromethane	--	0.0010	--	--
Haloacetic Acids (five) (HAA5)	0.060	--	--	--
Monochloroacetic Acid	--	0.0020	--	--
Dichloroacetic Adic	--	0.0010	--	--
Trichloroacetic Acid	--	0.0010	--	--
Monobromoacetic Acid	--	0.0010	--	--
Dibromoacetic Acid	--	0.0010	--	--

MCLs, DLRs, and PHGs for Regulated Drinking Water Contaminants

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	MCL	DLR	PHG	Date of PHG
Bromate	0.010	0.0050**	0.0001	2009
Chlorite	1.0	0.020	0.05	2009
Chemicals with PHGs established in response to CDPH requests. These are not currently regulated drinking water contaminants.				
N-Nitrosodimethylamine (NDMA)	--	--	0.000003	2006
1,2,3-Trichloropropane	--	--	0.0000007	2009

*OEHHA's review of this chemical during the year indicated (rev20XX) resulted in no change in the PHG.

**The DLR for Bromate is 0.0010 mg/L for analysis performed using EPA Method 317.0 Revision 2.0, 321.8, or 326.0.