CITY OF LOS BANOS
HEXAVALENT CHROMIUM
WHITE PAPER

City of Los Banos
At the Crossroads of California

February 18, 2016

Prepared by:

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PROVOST& PRITCHARD
CONSULTING GROUP
An Employee Owned Company
286 W Cromwell Avenue
Fresno, California

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TABLE OF CONTENTS

1 BACKGROUND

The purpose of this document is to provide information to help City of Los Banos water customers understand the new California hexavalent chromium drinking water regulation and how it affects them.

The State of California proposed a new drinking water regulation limiting the amount of hexavalent chromium in drinking water on August 23rd, 2013. The regulation went into effect July 1st 2014. The new regulation limits hexavalent chromium in drinking water to 10 parts per billion (ppb). One part per billion is approximately equivalent to one drop in an Olympic-size swimming pool.

The City of Los Banos is impacted by this new regulation because the level of hexavalent chromium in all of the City's wells exceeds 10 ppb. The City has been proactively working to find a solution to the problem since the draft regulation was first announced. The following paper will more clearly describe the issue and the steps the City is taking to comply with this new regulation.

2 WHAT IS HEXAVALENT CHROMIUM?

Chromium is a metallic element found in rocks, soils, plants, and animals. It is the 21st most abundant element in the Earth's crust. Naturally occurring chromium occurs extensively. It also has industrial uses in steel making, metal plating, leather tanning, corrosion inhibitors, paints, dyes, and wood preservatives.

Chromium exists in several forms including trivalent, hexavalent, and metallic forms. Trivalent chromium is considered an essential nutrient. The State of California has identified hexavalent chromium as a carcinogen when ingested. Hexavalent chromium occurs in groundwater contaminated by natural sources as well as from man-made contamination. Chromium can be naturally converted back and forth between the trivalent and hexavalent forms under certain conditions.

Hexavalent chromium is referred to using many formal and informal terms. The terms hexavalent chromium, chrome six, Cr(VI), and Cr +6 all refer to the same substance and are used interchangeably.

Most political, media, and research attention has focused on hexavalent chromium pollution from industrial activities. Man-made contamination at the California community of Hinkley was the basis for the 2000 movie *Erin Brockovich*, which heightened public awareness of hexavalent chromium. It should be noted that the hexavalent chromium levels detected at Hinkley were as high as 7,800 ppb as compared to the approximately 20 – 40 ppb range detected in the City's wells. As will be discussed below, the hexavalent chromium in the City of Los Banos' wells also differs from Hinkley in that it is most likely naturally occurring, not man-made.

3 HOW IS CHROMIUM REGULATED?

Drinking water quality in Los Banos is regulated by the California State Water Resources Control Board – Division of Drinking Water (formerly the California Department of Public Health Drinking Water Program). The Division of Drinking Water is required to set and enforce drinking water standards that are at least as stringent as those set by the US EPA, but may also set more stringent standards that apply to California only. Prior to July 1st 2014 total chromium (including both hexavalent and trivalent chromium) in drinking water was regulated to a concentration of 100 ppb at the national level and to a more stringent 50 ppb level in California. The City of Los Banos was in compliance with the more stringent California regulation at all times. On August 23, 2013, the Division of Drinking Water proposed a new regulation to limit hexavalent chromium to 10 ppb. That regulation went into effect on July 1st, 2014. The City of Los Banos was officially notified that it was out of compliance with the new regulation on April 28, 2015.

It is worth noting that the water being served in Los Banos would meet all drinking water standards anywhere else in the World except for California. The other 49 states only limit total chromium levels to 50 ppb and in many cases to 100 ppb and do not specifically regulate the hexavalent form. The World Health Organization also recommends a maximum total chromium level of 50 ppb.

4 WHAT ARE THE HEALTH EFFECTS?

The City of Los Banos cannot comment on the effects of hexavalent chromium consumption on human health except to refer citizens to the California's published Public Health Goal, which is 0.02 ppb. The Public Health Goal is the level of hexavalent chromium in drinking water that would cause less than a one-in-one million risk of cancer in adults who drink two liters (approximately ½ gallon) of that water every day for 70 years. Hexavalent chromium has not been established as an ingested carcinogen at the national level.

California drinking water regulations require that the City notify all consumers of the hexavalent chromium violation four times per year and that the notification include the following health effects language:

> "Some people who drink water containing hexavalent chromium in excess of the MCL over many years may have an increased risk of getting cancer."

Further questions regarding health effects should be addressed to Kassy Chauhan, Merced District Engineer with the California State Water Resources Control Board – Division of Drinking Water:

(559) 447- 3316
265 W. Bullard Avenue, Suite 101
Fresno, CA 93704

Specific medial concerns should be discussed with a licensed medical professional.

5 WHERE DID THE HEXAVALENT CHROMIUM COME FROM?

Geological conditions on the west side of the Central Valley, near the Coastal Mountain Range, are known to create the potential for hexavalent chromium contamination of groundwater when water flows underground through minerals that naturally contain chromium. Los Banos is located within this area. Levels of hexavalent chromium above the drinking water limit have been detected along the Coastal Range from Los Banos to at least as far north as Patterson. Such a large area of contamination is more likely to be naturally occurring than man-made.

The City has hired a consultant to study the hexavalent chromium levels in the vicinity of Los Banos to determine if there are any obvious signs of man-made hexavalent chromium contamination. The study has so far found strong evidence for the hexavalent chromium in Los Banos' water being naturally occurring and no evidence of any man-made contamination. The City is committed to continuing this investigation and pursuing any scientific evidence of man-made contamination.

At the time the regulation went into effect, the State anticipated that at least 128 water systems in California would be affected by the regulation; however, that number is likely low since it did not include small water systems. Other areas of California that are most significantly impacted by what appears to be naturally occurring hexavalent chromium contamination are the Coachella Valley and the area around the cities of Woodland and Davis. Areas with significant man-made Hexavalent chromium contamination include the Hinkley and Topock PG&E gas compressor station sites in Southern California and the San Fernando Valley Superfund Site north of Los Angeles. The City of Los Banos is perhaps the City most greatly impacted by the new regulation since all of the City's wells are over the new limit. The other regions listed above have alternative sources of drinking water that do comply with the regulation and/or responsible parties that are assisting in the cleanup of man-made contamination.

6 WHAT HAS THE CITY ALREADY DONE?

The City has been proactively responding to the new regulation since it was announced on August 23, 2013. Prior to August 23, 2013 the City did not know what the new limit would be or if the City's water system would comply with the new limit. Within one month of the state publishing the draft regulation, the City retained an engineering consultant to evaluate the probable source of the hexavalent chromium in the City's water supply and to evaluate the potential impact to the City's water system. The City has already applied for funding assistance to help cover the high costs of responding to this regulation and has already worked with two treatment system suppliers to test the effectiveness of their processes. An extensive treatment pilot study of one process is planned for March of this year.

A timeline of key activities related to the issue is presented below.

Timeline:

- **August 23, 2013 – State proposes limiting hexavalent chromium in drinking water to 10 ppb**
- September 12, 2013 – City retains Provost & Pritchard Consulting Group to aid in assessing the problem and finding a solution
- October 3, 2013 – City staff meet with Assemblyman Adam Gray to discuss the impact of the new standard on the City
- October 24, 2013 – Provost & Pritchard submits an initial evaluation report to the City
- October 31, 2013 – City staff meet with Assemblyman Adam Gray to discuss the findings of the initial evaluation report
- December 5, 2013 – City staff meet with Assemblyman Adam Gray, Division of Drinking Water and California Regional Water Quality Control Board
- January 13, 2014 – City staff meet with Division of Drinking Water to discuss the City's response and possible funding assistance
- April 17, 2014 – City submits request for funding assistance to State
- June 5, 2014 through January 9, 2015 – IONEX (a treatment system supplier) conducts pilot testing at three City wells
- **July 1, 2014 – New hexavalent chromium limit of 10 ppb becomes effective**
- July 14, 2014 – City staff meet with Division of Drinking Water
- December 11, 2014 – City collects the first set of water samples to determine compliance with the new regulation.
- January 2015 – City submits preliminary funding application to Safe Drinking Water State Revolving Fund program
- February 10, 2015 – City staff meet with Central California Irrigation District to discuss water quality issues in their wells
- March 12, 2015 – City submits hexavalent chromium public notification draft to Division of Drinking Water
- March 18, 2015 – City collects second set of quarterly samples for all city wells
- April 1, 2015 – City begins special water quality testing as requested by consultant to help in evaluating treatment processes
- April 3, 2015 – City staff meet with Evoqua (a treatment system supplier) to discuss hexavalent chromium treatment options
- April 21, 2015 – City staff meet with Tonka Water (a treatment system supplier) to discuss hexavalent chromium treatment options
- **April 28, 2015 – City receives Compliance Order No. 03-11-15R-003 from Division of Drinking Water notifying the City that it is out of compliance with the new rule**
- May 5, 2015 – Public notification in May 5th billing cycle
- May 6, 2015 – City sends written response to Division of Drinking water Compliance Order
- May 20, 2015 – Public notification in May 20th billing cycle
- July 5, 2015 and July 20, 2015 – Public notification in July billing cycles

- July 20, 2015 – Discussions with North American Höganäs regarding newly developed hexavalent chromium removal treatment process begin
- July 29, 2015 - Consultant meets with North American Höganäs at their facility in Pennsylvania
- July 31, 2015 – City ships water samples to North American Höganäs for testing
- August 20, 2015 – City submits Corrective Action Plan to Division of Drinking Water
- September 2, 2015 – Division of Drinking Water approves City's Corrective Action Plan
- September 2015 – City negotiates a no-cost pilot study agreement with North American Höganäs
- September 29, 2015 – City ships two 180-gallon samples of well water to North American Höganäs for testing in their facility
- October 7, 2015 – State funding resolution approved by City Council
- October 22, 2015 – State funding application submitted

7 WHAT SOLUTIONS ARE BEING CONSIDERED?

Three possible solutions to the problem are being considered:

1. Construct new water supply wells that produce water that is under the hexavalent chromium limit;
2. Obtain rights to surface water and construct a surface water treatment plant; and
3. Treat the City's existing water supply wells to remove hexavalent chromium.

8 WHAT IS THE CITY'S PLAN TO RESOLVE THE PROBLEM?

An important element of the City's response is to seek out and obtain any available funding assistance. Preliminary cost estimates to treat the City's wells to remove hexavalent chromium predicted construction costs of between 41 million and 92 million dollars. The estimated cost to operate treatment plants at the City's wells is between 1.7 million and 5.1 million dollars annually. This compares to a current annual City water fund of less than 4 million dollars. Because of the tremendous financial challenge that this new regulation creates, the City is applying for Safe Drinking Water State Revolving Fund (SRF) grants and loans to help pay for engineering studies, testing, design, and construction of the required water system improvements. There are no federal or state programs to assist with operating costs once the facilities are constructed.

The City has developed a Corrective Action Plan that has been submitted to and approved by the State Division of Drinking Water. That plan is structured to balance the desire for a quick solution to the problem with the City's fiscal responsibility to keep water rates down. The Corrective Action Plan is broken out into five phases:

1. Phase 1 of the plan will evaluate replacing the City's drinking water wells with new wells that produce water with hexavalent chromium below the new limit. Phase 1 will also evaluate obtaining rights to surface water and constructing a surface water treatment plant.

2. Phase 2 will involve evaluating technologies for treating the City's existing wells to remove hexavalent chromium from the water. The City has already started some Phase 2 activities.
3. Phase 3 will involve preparing a water supply master plan to select the best solution, or combination of solutions to the problem.
4. Phase 4 will involve a study of water rates to pay for the recommended solution; obtaining environmental approvals for the project; and designing the new facilities.
5. Phase 5 will consist of constructing all new facilities required to bring the water system into compliance with the new regulation.

Completing these steps will take time. The total duration necessary to solve the problem will depend on whether new wells meeting the regulation can be drilled. If drilling new wells is not possible due to the extent of the contamination, and treatment is required, it may take as long as 10 years to bring the system into compliance. The State Division of Drinking Water has approved the City's Corrective Action plan which incorporates a compliance deadline of March 31, 2025.

Further questions regarding the hexavalent chromium issue in Los Banos should be addressed to Mark Fachin, P.E., Public Works Director/City Engineer for the City of Los Banos:

(209) 827-7056
411 Madison Avenue
Los Banos, CA 93635