

**CITY OF LOS BANOS  
HEXAVALENT CHROMIUM**

**2018 PROJECT STATUS UPDATE**



*City of*  
**Los Banos**  
*At the Crossroads of California*

**October 17, 2018**

***Prepared by:***

**EST. 1968**

**PROVOST &  
PRITCHARD**

**CONSULTING GROUP**

*An Employee Owned Company*

**286 W Cromwell Avenue  
Fresno, California**

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## **1 BACKGROUND**

On February 3, 2016 Provost & Pritchard provided the City of Los Banos (City) with a *Hexavalent Chromium White Paper* (White Paper) summarizing the City's response to what at that time was the recently promulgated hexavalent chromium drinking water regulation. The purpose of this memorandum is to provide an update on regulatory developments and the City's responses that have occurred since the White Paper was published.

## **2 REGULATORY STATUS**

Drinking water quality in Los Banos is regulated by the California State Water Resources Control Board – Division of Drinking Water (SWRCB or DDW). DDW 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 1<sup>st</sup> 2014 total chromium (including both hexavalent and trivalent chromium) in drinking water was regulated to a concentration of 100 parts per billion (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 1<sup>st</sup>, 2014.

The City received a Compliance Order from DDW notifying it that it was out of compliance with the new regulation on April 28, 2015. In response to that Compliance Order, the City submitted to DDW a Corrective Action Plan on August 20, 2015. DDW approved the Corrective Action Plan on September 2, 2015. The Corrective Action Plan estimated that it would take until March 31, 2025 for the City to return to compliance with the new standard. On September 4, 2015, shortly after the Corrective Action Plan was submitted, Senate Bill No. 385 (SB385) was signed by the Governor. The primary purpose of SB385 was to provide utilities in violation of the new hexavalent chromium standard more time to come into compliance without being formally deemed in violation of the MCL. The City chose not to invoke SB385, which would have allowed the City to cease public notifications. Instead the City continued its efforts to mitigate the contamination under its existing Compliance Order and continued with public notifications.

On May 31, 2017, the Superior Court of Sacramento County issued a judgement invalidating the hexavalent chromium maximum contaminant level (MCL). The court ordered the State Water Resources Control Board to delete the hexavalent chromium MCL from the California Code of Regulations. Invalidation of the MCL became effective on September 11, 2017. The City received a letter from DDW on October 16, 2017 officially releasing them from their Compliance Order. While it is anticipated that the State Water Resources Control Board will issue a new hexavalent chromium regulation, there is currently no indication of whether the regulation will be less restrictive, at the same 10 ppb level, or more restrictive.

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It is worth noting that the water being served in Los Banos currently meets all drinking water standards established for total and hexavalent chromium everywhere in the World. Provost and Pritchard is unaware of any national or international jurisdiction which regulates total or hexavalent chromium at levels lower than what is present in the City's wells.

### **3 ORIGIN OF HEXAVALENT CHROMIUM**

Geological conditions on the west side of the Central Valley, near the Coast Mountain Range, are known to create the potential for high hexavalent chromium levels in groundwater when water flows underground through minerals that naturally contain chromium. Los Banos is located within this area. Levels of hexavalent chromium above the previous California drinking water limit have been detected along the Coast 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 evidence for the hexavalent chromium in Los Banos' drinking water having a natural origin is extensive. Experts in geochemistry have repeatedly determined that the geologic conditions surrounding Los Banos are conducive to hexavalent chromium entering the groundwater from the minerals present in the aquifer formations. A partial list of relevant studies includes:

- *Cr(VI) occurrence and geochemistry in water from public-supply wells in California* published in Applied Geochemistry (Izbicki et al. 2015)
- *Groundwater-Quality Data in the Western San Joaquin Valley Study Unit, 2010: Results from the California GAMA Program* published by the USGS (Mathany et al. 2013)
- *Genesis of hexavalent chromium from natural sources in soil and groundwater* (Oze, Bird, and Fendorf 2007)

In addition to the literature cited above, Provost & Pritchard has sampled both drinking water and agricultural wells surrounding the City and determined that hexavalent chromium is ubiquitous to the area. There was no indication that the concentrations were substantially higher in any particular area, which would be expected if the source of the hexavalent chromium was anthropogenic.

### **4 CITY RESPONSE TIMELINE**

The City has been proactively responding to the hexavalent chromium issue since the new regulation 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 applied for funding assistance to help cover the high costs of responding to this regulation and was determined to be ineligible for any grant funding

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due to its population exceeding 10,000. The City has also worked with three treatment system suppliers to conduct pilot studies to test the effectiveness of their processes on the City's water.

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 5<sup>th</sup> billing cycle

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- May 6, 2015 – City sends written response to Division of Drinking water Compliance Order
  - May 20, 2015 – Public notification in May 20<sup>th</sup> billing cycle
  - July 5, 2015 – Public notification in July 5<sup>th</sup> billing cycle
  - 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 4, 2015 – Governor approves California Senate Bill 385 delaying the date that utilities would officially be in violation of the new rule**
  - 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
  - October 27, 2016 – City receives results of boron testing (required to assess groundwater exchange alternatives)
  - September 12, 2016 – Provost & Pritchard collects water samples from non-municipal wells surrounding the City
  - November 16, 2016 – Provost & Pritchard and Kenneth D. Schmidt and Associates meet with City to discuss results of Well Replacement Alternatives Evaluation. Evaluation recommends investigation of shallow water quality in Los Banos Creek area and possible deep well injection/treatment project.
  - December 29, 2016 – The City authorizes Provost & Pritchard to begin investigating development of a surface water supply for the City
  - January 10, 2017 - City and Provost & Pritchard met with the Höganäs Board of Directors at the Los Banos Well 14 pilot study trailer
  - February 9, 2017 – City provides California Municipal Utilities Association with estimated remaining cost to implement hexavalent chromium mitigation program. Cost range is \$41 – 92 million.
  - February 10, 2017 – Provost & Pritchard identifies issue with naturally occurring selenium levels in City wells potentially limiting groundwater exchange with CCID
  - February 24, 2017 – Provost & Pritchard requests SWRCB input on proposal to inject high hexavalent chromium water below Corcoran Clay in effort to bind the chromium to reduced aquifer formations.
  - February 27, 2017 – Provost & Pritchard inquires with SWRCB about potential funding for a deep well injection pilot study
  - **May 31, 2017 – Superior Court of Sacramento County issues judgement invalidating California’s hexavalent chromium MCL.**

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- July 12, 2017 – surface water supply alternative is discussed with CCID at SGMA Implementation meeting
  - August 3, 2017 – Höganäs pilot study is successfully completed. The City and Provost & Pritchard met with DDW at the pilot trailer.
  - August 10, 2017 – Discussions begin with Aqua Metrology Systems (AMS) regarding a potential pilot study at Well 14
  - August 30, 2017 – City supplies AMS with samples of Well 14 water for laboratory testing
  - **September 11, 2017 – Invalidation of the MCL becomes effective**
  - **October 16, 2017 – City receives letter from DDW documenting the rescinding of the hexavalent chromium MCL**
  - December 6, 2017 – City Council approves AMS pilot study at Well 14
  - January 20, 2018 – Draft AMS pilot study report received
  - January 29, 2018 – Provost & Pritchard meets with LANXESS corporation to discuss hexavalent chromium treatment technologies for Los Banos groundwater
  - July 3, 2018 – DDW issues final conditional acceptance for Höganäs Cleanit-LC Plus process piloted at Well 14.

## 5 STATUS OF POTENTIAL MITIGATION ALTERNATIVES

The City has now conducted pilot tests of the strong base anion exchange, Cleanit-LC Plus zero valent iron, and the AMS in-situ stannous generation treatment processes. These pilot tests have demonstrated that the City's well water is difficult to treat for hexavalent chromium removal due to high levels of naturally occurring background pH, salinity, sulfate and uranium. Anion exchange is unlikely to be economically feasible given the high level of sulfate interference. The Cleanit-LC Plus process successfully treated the water but would be expensive to implement at all thirteen of the City's wells. Further full-scale testing of the AMS process is required before its feasibility can be assessed.

Remaining alternatives that need to be further explored before an overall mitigation approach can be recommended include:

1. Wellhead treatment with reduction-coagulation-filtration using both stannous and ferrous sulfate reducing agents.
2. Replacing some or all of the City's groundwater supply with surface water. This alternative encompasses several sub-alternatives including:
  - a. Possible exchange of groundwater for CCID surface water;
  - b. Blending high hexavalent chromium groundwater with raw surface water prior to treatment at a surface water treatment plant; and
  - c. Blending of high hexavalent chromium groundwater with treated surface water.

Further study of these mitigation alternatives is complicated by the uncertainty in the presumed future California hexavalent chromium MCL. All treatment technologies must now be tested assuming a range of potential treatment objectives. Furthermore, decision making regarding implementation of any proposed solution(s) is subject to



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great uncertainty – if the MCL is set below the proposed treatment system’s practical capability, the City will have invested in an ineffective solution; whereas if the MCL is set significantly higher than 10 ppb, the City will have have spent significantly more taxpayer money than necessary to mitigate the problem.