



TOWN OF SHREWSBURY

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MEMORANDUM

TO: Kevin Mizikar, Town Manager
Board of Selectmen

FROM: Jeffrey Howland, PE – Director of Public Works
Daniel Rowley – Water & Sewer Superintendent

SUBJECT: Hexavalent Chromium Pilot Test Report Abstract Follow-up

DATE: March 2, 2022

On February 23, 2022, Water and Sewer Superintendent, Dan Rowley, Assistant Superintendent of Water Treatment, Rich Fox, and I had a meeting with our water consultant, Tata & Howard and sub consultant AdEdge Water Technologies, who conducted the hexavalent chromium pilot testing for the Town. The purpose of the meeting was to better understand the results of our pilot test and to discuss the limitations of the filtration technologies for hexavalent chromium that are currently available. Since the levels of hexavalent chromium present in Shrewsbury's water are low (between 3-7 parts per billion or ppb), our pilot testing was conducted using water that had been "spiked" with hexavalent chromium to bring the levels to around 100 ppb. The levels needed to be elevated to test the effectiveness of the piloting equipment that has been used in water systems that have levels of hexavalent chromium near or above 100 ppb. This concerns us since the available filtration technologies are somewhat effective at higher levels but might not be able to reduce or eliminate hexavalent chromium at the Town's current levels.

I have read several articles (provided by AdEdge and found on the internet^{1, 2, & 3}) evaluating the effectiveness of different treatment methods for the removal of hexavalent chromium. All of these articles involved using water that had levels of hexavalent chromium above 100 ppb. The most successful treatment methods showed that they were able to lower the hexavalent chromium levels to below 10 ppb (90% or greater removal rates), but I have not been able to find any articles that evaluated low, and in our case, variable levels. I asked the representatives from AdEdge if there are any articles or studies that have been conducted that demonstrate the efficiencies of their filtration systems at low levels. They were not aware of any study that has been conducted on low concentrations (below 10 ppb) and mentioned that the goal of the other studies was to reduce the levels of hexavalent chromium from around 100 ppb to below 10 ppb. As of today, there are no known treatment methods that will achieve a "non-detect" removal level of hexavalent chromium after the water has been filtered. AdEdge stated that the ion exchange treatment method recommended for Shrewsbury would most likely reduce hexavalent chromium by 2-3 ppb depending on the fluctuations in the current levels and that it would not achieve a "non-detect" level. They further explained that there is always some level of hexavalent chromium that will pass through the filter media. AdEdge recommended that we continue to monitor the hexavalent chromium levels in our water

and to revisit the next steps if the levels elevate substantially. We are currently not observing significant fluctuations in the hexavalent chromium levels in our wells.

We have received inquiries on the effectiveness of reverse osmosis (RO) filtration as an option for the Town. While it is true that reverse osmosis treatment is very effective in the removal of hexavalent chromium along with all other contaminants, it also removes all beneficial minerals such as calcium, magnesium, etc. In addition, for every one (1) gallon of water treated, you waste at least six (6) gallons of water through the treatment process. Therefore, to provide 4 million gallons of water to the Town, we would need to pump 24 million gallons of water, sending 20 million gallons to the Upper Blackstone Clean Water treatment facility each day. Therefore, we feel that reverse osmosis is not an economically or environmentally responsible option.

After the extensive research we have conducted and consulting with Tata & Howard and AdEdge, we are recommending to the Board of Selectmen that we continue to monitor the wells and treated water for trends in the levels of hexavalent chromium for the foreseeable future. If the levels begin to elevate towards the maximum contaminant level, we will continue the discussions of adding treatment for hexavalent chromium to our water system with the Board.

1. AdEdge Water Technologies “Chromate Removal Performances using a Weak Base Anion Resin to Treat Groundwater at a Texas Remediation Site”, undated.
2. AWWA Research Foundation “Low-Level Hexavalent Chromium Treatment Options: Bench-Scale Evaluation”, 2004.
3. U.S. Department of the Interior, Bureau of Reclamation Research and Development Office “Hexavalent Chromium Treatment Technology”, October 1, 2018.