Supplement to the Treatment Subcommittee MCL Support Document for 1,2,3-Trichloropropane: Evaluation and Assessment of Removal Technology for Specific Organic Contaminants in NJ Drinking Water (2009)

New Jersey Drinking Water Quality Institute Treatment Subcommittee
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Introduction

The New Jersey Drinking Water Quality Institute (DWQI) Treatment Subcommittee evaluated treatment removal techniques for a number of organic contaminants, including 1,2,3-trichloropropane (1,2,3-TCP), in 2009. The Subcommittee engaged Black and Veatch, contracted through the New Jersey Corporation for Advanced Technology, to assist with this evaluation. Black and Veatch reported that the best available treatment for removal of 1,2,3-TCP from drinking water is activated carbon (DWQI, 2009a). In March 2009, the DWQI recommended an maximum contaminant level (MCL) for 1,2,3-TCP of 30 ng/L based on a Health-based MCL of 1.3 ng/L, an analytical Practical Quantitation Level (PQL) of 30 ng/L and the ability of treatment removal technology to achieve this level (DWQI, 2009b).

In September 2015, Commissioner Bob Martin of the New Jersey Department of Environmental Protection requested that the DWQI review the basis for the 2009 recommended MCL for 1,2,3-TCP. In order to fulfill this request, the Subcommittee reviewed the 2009 recommendation, as well as the available relevant literature, and contacted various water experts across the country to inquire about treatment options for removal of 1,2,3-TCP. The purpose of this document is to report, in light of the information reviewed, whether treatment to the recommended MCL is feasible and whether the conclusions put forth regarding best available technologies remain the same.

Review of New Available Technical Information

The Subcommittee found that, while methods for 1,2,3-TCP removal other than granular activated carbon (GAC) are still being researched, these do not appear to be regularly employed for removal of 1,2,3-TCP at this time (USEPA, 2014) where as GAC was found to be the most commonly used treatment process for the removal of 1, 2,3-TCP. In its review, the Subcommittee attempted to identify full-scale GAC installations and/or literature to assess the ability to remove 1,2,3-TCP to levels below 30 ng/L. As discussed below, full-scale GAC installations were identified in California, Hawaii and New York and full-scale GAC installations for two (2) sites were identified in New Jersey

The Subcommittee spoke to Kevin Berryhill, P.E., member of the California-Nevada Section of the American Water Works Association (CA-NV AWWA) Research Committee. Mr. Berryhill stated that GAC is a common form of treatment for the removal of 1,2,3-TCP and further added that a 10 - 15 minute empty bed contact time was typical on installation and that a lead/lag operating strategy would produce the most efficient carbon usage rates. He also noted that the removal efficiencies of 1,2,3-TCP would be affected based on the natural background matrix. He indicated that the recently published Water Research Foundation study "Evaluation of Available Scale-Up Approaches for the Design of GAC Contactors (Summers and Kennedy, 2014) demonstrated that the rapid small-scale column test may over predict VOC contaminant carbon usage rates where pilot-scale testing may provide for more accurate usage rates. In a presentation posted by the CA-NV AWWA, Mr. Berryhill cites ten existing treatment plants in California and Hawaii that are currently successfully employing GAC for 1,2,3-TCP removal (Berryhill). Personal communications with representatives from the City of Alhambra and Shafter confirmed removal of 1,2,3-TCP with GAC to target effluent concentrations of less than 5 ng/L.

A report to the Hawaii Department of Health confirmed that GAC appears to be an effective removal method for this compound; however, the MDL utilized in this study was 40 ng/L (TetraTech, 2012). This conclusion is further supported by a presentation made at the 2015 Pacific Water Conference that indicated that GAC can be successfully used to meet a possible new MCL for Hawaii of 5 ng/L and that testing at the bench-scale level can aid in identifying the most efficient GAC; however, this study was conducted utilizing a revised research analytical method with a MDL of 1 ng/L (Babcock, 2015). In personal communication with Dr. Babcock, he stated that there are approximately 120 GAC contactor installations, operating since about 1985, in Hawaii for removal of 1,2,3-TCP.

In New Jersey, treatment of private wells to levels below 30 ng/L have been demonstrated to be effective for removal of 1,2,3-TCP utilizing two (2) GAC contactors (1.5 cu ft each) operated in series at maximum flowrates of 5 gpm (NJDEP, 2016). Full scale installation in Maple Shade and Moorestown are in the process of being designed. Bench-scale RSSCT studies conducted for Moorestown indicate the ability to achieve less than a 5 ng/L target effluent concentration.

Treatment plants in Suffolk County, NY are also removing 1,2,3-TCP using GAC. In a pilot study of these plants, Suffolk County found 1,2,3-TCP to be adsorbable, with no detectable breakthrough after 30,000 bed volumes (Roccaro, 2014); however, the MDL was not defined.

Several Water Research Foundation (WaterRF) projects have been completed and/or are in progressThe State of the Science Report, published in March 2016, summarized the findings of recently funded projects regarding treatment for 1,2,3-TCP where GAC was defined as the only currently viable technology option for 1,2,3-TCP removal (Ozekin, 2016). WaterRF 4453 reported bed volumes of greater than 45,000 or higher for the removal of 1,2,3-TCP to levels less than 30 ng/L (Chowdhury, 2016).

Conclusions

The DWQI Treatment Subcommittee has reviewed the March 2009 Treatment Subcommittee support document (DWQI, 2009a), as well as more recent technical information and case studies, to determine whether the 2009 recommendations for treatment methods continue to be valid. At this time, the Subcommittee finds no reason to amend or expand the findings or recommendations in the 2009 document. More recent information reviewed by the Subcommittee indicates that the GAC continues to be the best available treatment for the removal of 1,2,3-TCP from drinking water. Design of a GAC treatment facility will require study in order to maximize efficiency. Such studies will aid in defining the most efficient GAC product, appropriate empty-bed contact time based on source water quality, the configuration necessary for the most efficient carbon usage rate, ability for continuous operation during change out, and options for disposal/regeneration of the GAC. These studies will also aid in the development of treatment costs, which will most likely be driven by the carbon usage rate. A conceptual design project would be required to develop reasonable cost estimates for construction and long-term operation and maintenance costs. Finally, the background matrix of the water being treated should be carefully considered as pre-treatment for other contaminants that will compete with 1,2,3-TCP may be necessary to optimize the removal of 1,2,3-TCP. In conclusion, the Subcommittee has determined that GAC continues to be the most commonly used and best available treatment method for the removal of 1,2,3-TCP from drinking water at this time. The Subcommittee further concludes that it has been demonstrated that 1,2,3, TCP can be reliably and feasibly removed by carefully designed GAC treatment below the Practical Quantitation Limit of 30 ng/L recommended by the DWQI Testing Subcommittee.

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