Stantec

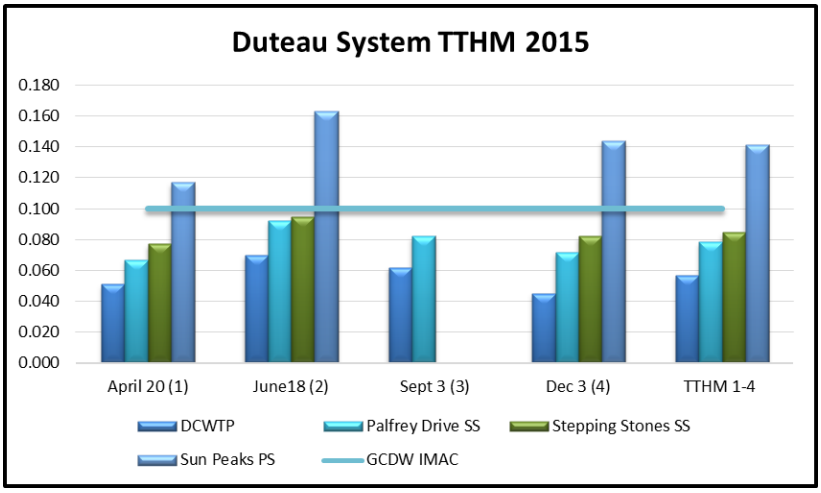
Memo

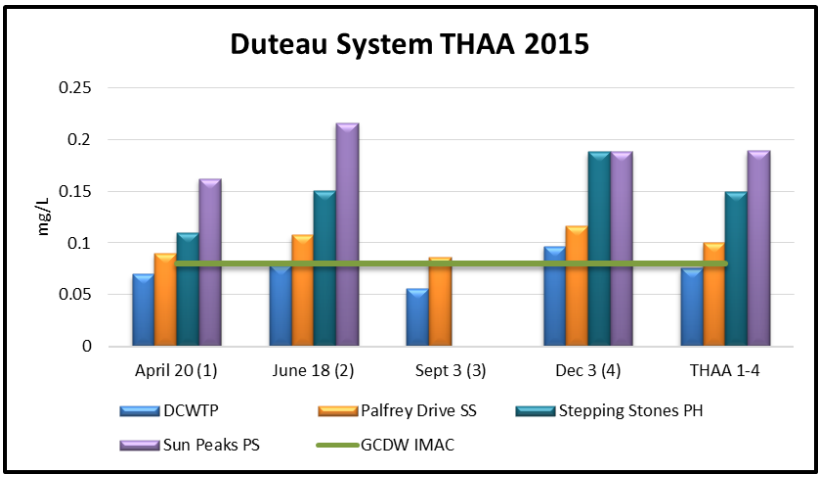
To:	Dale McTaggart, P. Eng. Regional District of North Okanagan	From:	Miles Yi Stantec
File:	111700554	Date:	December 22, 2016

Reference: Duteau Creek WTP DBP Aeration and Chlorination Testing Plan

Background

The Duteau distribution system 2015 DBP results are shown in the figures below. For both THMs and HAAs, the levels in DCWTP finished water are below or at borderline (in a few HAAs results) of the Canadian Drinking Water Guidelines. However, the samples from far end of the distribution system have seen DBPs levels exceeding guidelines.





The previous study suggested aeration or air stripping to reduce chloroforms (the main compounds of the THMs) in order to control the THMs at the WTP effluent and thus at the system far end (with 5

days of water age). The chloroform is a volatile compound and could be effectively stripped off from the effluent water. However, the study did not report the aeration / air stripping effect on the HAAs. Di-chloroacetic acid and tri-chloroacetic acid are the two main forms of HAAs in the DCWTP treated effluent. They are typically in either acid or salt form, thus the effect of air stripping is unknown.

Bench Scale Testing of Aeration and Chlorine Dosage to the DBPs formation

Aeration Testing: Prior to pilot testing of air stripping, bench aeration will be conducted at the DCWTP lab to evaluate the aeration / air stripping effect on the HAAs.

The test could be conducted with typically WTP jar test apparatus with aeration diffuser, or other appropriate equipment.

Treated water from DCWTP reservoir outlet will be used for the test. Air to water ratios are to the set at 0, 10, 20, 30, 40, 50.

After aeration and initial sampling, the water is to be incubated for 5 days, and sampled daily for testing of chlorine residual, THMs and HAAs. This is to simulate the effect of water age on the DBPs formation in the distribution system.

Previous report by AECOM suggested 1.35 times increase in THMs after 5 days incubation. In the actual distribution system samples, it was observed that approximately 1.7 to 2.2 times increase in THM. This indicates other effects in the existing system that contributed to the DBP increase. However, the incubation will still provide an indication of effect of water age to DBPs growth in the system. A safety factor could be used to account for the other effects and uncertainties in the distribution system.

Chorine dosage test: Concurrently with the bench scale aeration test on HAAs, the chlorine dosage test will be conducted to evaluate the DBPs levels with reduced chlorine dosage at the DCWTP reservoir.

The current chlorination practice at the DCWTP reservoir serves two purposes, for CT disinfection for 3-log of Giardia (and 4 logs of virus), and for maintaining chlorine residual for the system. If UV disinfection is implemented for 3-logs of Giardia and Cryptosporidium inactivation, the chlorine dosage level could be reduced substantially for 4-log virus CT. For example, on June 22nd, 2015, the CT required for 3 log Giardia is around 80 mg-min/L, and the corresponding CT required for 4 log of virus is 4 mg-min/L. With reduced chlorine dosage and implementation of booster chlorination, the DBPs level could be reduced system wide.

Chlorine dosage level for the test will be at with 0.25 mg/L increments, from 0 to 2.0 mg/L. Similar to aeration testing, the chlorinated water (after initial sampling) will be incubated for 5 days and sampled daily to record the chlorine residual and DBPs levels.

Distribution System Programs

Booster Chlorination and Water Age Control: With reduced chlorine dosage at the DCWTP reservoir, booster chlorination is required. The District will be conducting system modeling and monitoring, to identify chlorination booster station locations. The hydraulic modeling will also aim for possible water age control.

Distribution System Flushing Program: Currently, the district is implementing system flushing program at a number of areas. Spot flushing and routine flushing will be used to removal and clean any

sediment, chlorine demand and DBP potential / precursor. Both of these two programs are to be addressed separately.

We trust the above provides you with our review comments and recommendations for District's consideration. If you have any questions or require further clarifications, please do not hesitate to contact the undersigned.

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