



**Town of Hanover**  
**Department of Public Works**  
40 Pond Street  
Hanover, Massachusetts 02339-1693  
Telephone: 781-826-3189 Fax: 781-826-8915  
Email: [office@hanoverdpw.org](mailto:office@hanoverdpw.org)

Victor J. Diniak  
Director of Public Works

Robert Murray, PE  
Facilities Engineering  
Manager

July 31, 2015

James L. McLaughlin, P.E.  
Mass DEP/SERO  
20 Riverside Drive  
Lakeville, MA 02347

Re: ACO-SE-15-5D001  
Hanover PWS Number 4122000  
Requirement 8A, Immediate Action Plan to Reduce TTHM Levels (due 8/1/ 2015)

Dear Mr. McLaughlin:

The Town of Hanover is submitting this letter with the attached letter from Weston & Sampson (with associated figures) as required by Disposition Order III.8A of the above referenced ACO.

Hanover will implement the following short-term recommendations prepared by Weston & Sampson to lower the development of TTHMs in the distribution system:

- The Town will flush distribution piping shown on Figures 2 and 3, monthly from April 1st through October 31st. The first monthly flushing will start on or before August 17, 2015.
- Distribution water chlorine residuals will be measured prior to and after an area has been flushed.
- The Town will cease flushing 15 days prior to the quarterly TTHM sampling date to ensure the system test results are representative of water consumed by the public.
- We expect the flushing program will increase chlorine residuals in the distribution system and we will evaluate chlorine residuals leaving the Pond Street WTP after each flushing cycle and lower the chlorine dosage at the Pond Street WTP, if allowable, using good operating practices.
- The use of the high total organic carbon (TOC) well at Pond Street WTP will be minimized (based on system demands).
- The Town will continue with the water restriction program year round to minimize use of high TOC wells and to offset the increase in water volume used for flushing.

The Town will submit the Engineering Report regarding additional short term action items (including evaluation of installing tank mixing system in Walnut and Union Street tanks and change in coagulation chemistry at Pond Street WTP) as required by Item 8B by October 30, 2015.

If you have any questions concerning this matter, please call or email me at [merritt@hanoverdpw.org](mailto:merritt@hanoverdpw.org).

Sincerely,

Neal Merritt  
Water Superintendent

Attachment: Weston and Sampson Letter Report dated July 30, 2015

July 30, 2015

Mr. Neal Merritt  
Water Superintendent  
40 Pond Street  
Hanover, Massachusetts 02339

Re: ACO-SE-15-5D001  
Hanover Water System ID #4122000  
Action Requirement 8A, Immediate Action Plan to Reduce TTHM Levels (due 8/1/2015)

Dear Mr. Merritt:

As requested by the Town and discussed at the July 2, 2015 meeting with MassDEP we have reviewed current operating data and identified areas for system flushing to reduce TTHM levels at the 70 Ponderosa Drive sample site and at hydraulically similar locations in Hanover's water distribution system.

TTHMs are disinfection byproducts typically formed by the use of chlorine as the primary and/or secondary disinfectant of the drinking water. The most significant variables in the Hanover system relating to TTHM formation are (1) the source water total organic carbon and (2) the age of the water as it flows through the distribution system.

The first task performed by Weston & Sampson was to determine the source water at the Ponderosa Drive site and the second task was to calculate the water age across the distribution system. Weston & Sampson modified the existing hydraulic computer simulation model provided to us by the Town to:

- Develop a source trace map to define the areas of the Hanover's water distribution system that are dominated by water treated by each of the Town's Water Treatment Plants (Pond, Broadway and Beal).
- Calculate the water age throughout the water distribution system.
- Identified area's in the water distribution system that we recommend be periodically flushed to lower TTHM levels at the 70 Ponderosa Drive sample site and at other hydraulically similar locations based on source water, water age and chlorine residual. Several short sections of pipe (Forrest Street and Chestnut Circle) identified as high water age may not require flushing if they are looped. Installed pipe configurations will be verified prior to the Town starting the first flushing cycle.

Attachment 1 to this letter presents a summary of hydraulic conditions and model inputs used in the elapsed time simulations and source trace simulations.

The attached Figure 1 is a map of the water distribution indicating areas of the distribution system that are dominated by the Pond Street WTP, Broadway WTP, Beal WTP and the area where the distribution water is a mix of the three sources.

Figure 2 is a map of the water distribution system with piping color representing the water age and



indicating piping that is hydraulically similar to the Ponderosa Drive TTHM sample site. Figure 3 is a partial water system map with the major distribution piping recommended for flushing to reduce TTHMs in areas with similar or greater water age to the Ponderosa Drive area.

Our analysis of this data indicates the source water in the general area of the Ponderosa Drive TTHM sample site is dominated by water produced at the Pond Street WTP and with a calculated water age that is greater than 3 days. The mode simulations indicate the Walnut Street and Union Street Tanks are currently overturning at a less than desirable rate.

We recommend the following short-term actions be taken by the town to lower the development of TTHMs in the distribution system:

- Distribution piping shown on Figure 3 be flushed by the Town monthly from April 1st through October 31st.
- Distribution water chlorine residuals be measured prior to and after an area has been flushed.
- Flushing should not be scheduled within 15 days of the quarterly TTHM sample dates to ensure the system test results are representative of water consumed by the public.
- We expect the flushing program will increase chlorine residuals in the distribution system and recommend the Town evaluate chlorine residuals leaving the Pond Street WTP after each flushing cycle and lower chlorine dosage at the Pond Street WTP, if allowable using good operating practices.
- The use of the high total organic carbon (TOC) well at Pond Street be minimized (based on system demands).
- Town should continue with the water restriction program year round to minimize use of high TOC wells and to offset the increase in water volume used for flushing.

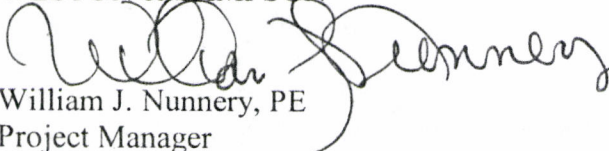
The flushing field work should be conducted in a manner that will result in as close as practicable to a unidirectional flush. We are in the process of marking up the distribution map with suggested flushing sequences. We will also provide guidance regarding flushing velocity and duration for actively flushing each sequence.

We will provide recommendations to the Town regarding additional short term action items in accordance with ACO requirement 8B (such as potentially installing tank mixing systems in the Walnut and Union Street tanks and changing coagulation chemistry at Pond Street WTP).

Please contact me directly by phone at (978) 532-1900 or by e-mail at [nunneryw@wse.com](mailto:nunneryw@wse.com). If you have any question regarding this matter.

Sincerely,

WESTON & SAMPSON

  
William J. Nunnery, PE  
Project Manager

## **Attachment 1**

### **Summary of Hydraulic Conditions and Model Inputs Hanover Elapsed Time Simulation and Source Trace Simulations**

Total system demand modeled = 1,634,000 gallons per day

System Tank Levels: Union St. Tank controls all three WTPs. On at tank level 267.0 and off at tank level 276.9 NGVD.

#### **Elapsed Time Simulation Results:**

- 360-hour (15 days) simulation required to reach equilibrium
- All WTPs run 18.83 hours per day
- WTP production as a percent of total water produced: Pond Street WTP 51 percent, Broadway WTP 23 percent and Beal WTP 26 percent
- WTP Flow rates: Pond Street WTP 1,307 gpm, Broadway WTP 596 GPM and Beal WTP 659 gpm
- At equilibrium the water distribution tanks filled 19 hours per day and drained 5 hours per day
- At equilibrium the Union Street Tanks overturned 8 percent of the combined tank volume and Walnut Street Tank at 12.5 percent of tank volume.



