



MEMORANDUM

TO: David Smyth, P.E., Town of Mount Pleasant
FROM: Steven Robbins, P.E.
DATE: April 9, 2019
RE: System Assessment for HAA formation

The Town of Mount Pleasant (the Town) detected haloacetic acids (HAAs) at levels exceeding the maximum contaminant level (MCL) for the Locational Running Annual Average (LRAA, the average of results from the last 4 quarters) in its drinking water distribution system during the 4th Quarter of 2018. In response, the Town retained Woodard & Curran to review its drinking water systems and provide recommendations for next steps. This assessment includes the following sections:

1. Properties of HAAs
2. Description of the Town's Drinking Water Distribution System and Recent Exceedances
3. Recommended Next Steps
 - a. Sampling to Profile HAA Formation
 - b. Preliminary Corrective Measures

Properties of HAAs

HAAs are a byproduct of water disinfection, formed when chlorinated disinfectants, such as sodium hypochlorite or gaseous chlorine, are added to water that has organic carbon content. HAAs have a relatively long reaction time to form after chlorination. HAAs are often detected in systems where chlorination occurs prior to removal of organics, and in systems with areas of high water age.

The Environmental Protection Agency (EPA) mandates quarterly sampling for HAAs. EPA identifies six HAAs to sample—bromochloroacetic acid, dibromoacetic acid, dichloroacetic acid, monobromoacetic acid, monochloroacetic acid, and trichloroacetic acid. The MCL is based on the total concentration of 5 of these (bromochloroacetic acid is not included), is 60 µg/L. The sum of these 5 haloacetic acids is referred to as "HAA5."

Description of the Town's Drinking Water Distribution System and Recent Exceedances

Out of the Town's ten water districts, the Kensico and Pocantico Water Districts have exceeded their HAA MCL's in past sampling. Each district has a separate source, separate treatment, and serves separate customers. Both districts exceeded the HAA MCL in their most recent sampling.

Kensico District

The Kensico District's public water system ID is NY5930082. It sources water from the Kensico reservoir. Operators reported that the Kensico District has a maximum day demand of approximately 5.5 MGD and a minimum winter-season demand of approximately 1.2 MGD. The New York City Department of Environmental Protection (NYCDEP) operates a treatment plant at its Kensico reservoir, but the Kensico District is fed from the reservoir via a pipe that branches off upstream of the treatment plant, so water



entering the Kensico District is untreated. The raw water flows to the Commerce Street pump station, where it is disinfected with ultraviolet light and dosed with sodium hypochlorite to achieve a concentration between 2 and 2.5 mg/L. The dosed water runs through a 24" main for approximately 60 minutes, meeting disinfectant contact time requirements. System operators have observed that the disinfectant residual drops by about 1 mg/L across this 24" main. Water then flows to two elevated storage tanks, each with a capacity of 2 million gallons. These tanks have a 7-foot normal operating range. Tank investigations performed in May 2015 show that one tank has approximately 1.5 feet of sediment building and the other has approximately 0.3 feet. Operators report that chlorine residual downstream of the tanks is approximately 1 mg/L. There is an additional sodium hypochlorite feed system downstream of the tanks that is currently not used. There are also corrosion inhibitor and caustic soda feeds, which are currently in use. Operators report a chlorine residual of approximately 0.5 mg/L in the distribution system.

The Town samples the Kensico district for HAAs at five locations—115 Wall Street, 225 Memorial Drive, 600 Linda Avenue, 142 Arnold Place, and the storage tank at 121 Lozza Drive. As of the 4th Quarter of 2018, one of these sites, the hydrant at 142 Arnold Place, had exceeded the HAA5 LRAA MCL. HAA5 levels at this site for the prior 4 quarters are shown in the Table 1.

Table 1 – Kensico District HAA5 Sampling Results at 142 Arnold Place

	Q1 2018	Q2 2018	Q3 2018	Q4 2018	LRAA
HAA5 Concentration (µg/L)	54.2	70.0	80.2	67.8	68.1

Pocantico District

The Pocantico District's public water system ID is NY5903472. It sources its water from the Pocantico reservoirs. Operators reported that the Pocantico District has a maximum day demand of approximately 0.5 MGD and a minimum winter-season demand of approximately 0.06 MGD. Raw water is drawn from the Pocantico Lake No. 3 through the Pocantico Hills Water Filtration Plant at 591 Bedford Road. The Pocantico reservoirs have historically experienced algal blooms during the summer that may also impact water quality. After coarse screening, the raw water is dosed with sodium hypochlorite and polyaluminum chloride (PAC). The water then flows through two parallel filter trains to remove suspended solids. Sodium hypochlorite is then dosed again following filtration. This second sodium hypochlorite feed is flow-paced and targets a concentration of 2.5 mg/L in the water. The chlorinated water travels to a 50,000-gallon effluent clearwell. The clearwell was cleaned in January 2019. Two 30 HP pumps with a 350 gpm design flow feed the distribution system. A corrosion inhibitor and a caustic soda are added, then the water is piped to a 311,000-gallon underground storage tank. The distribution system draws water from this tank to meet demand. The storage tank was cleaned approximately 10 years ago.

The Town samples the Pocantico district for HAAs at two locations—200 Lake Road and the Pocantico storage tank in the Rockefeller Estate. HAA5 levels at these locations exceeded the LRAA MCL during 4th Quarter of 2018, as detailed in Tables 2 and 3.



Table 2 – Pocantico District HAA5 Sampling Results – Storage Tank

	Q1 2018	Q2 2018	Q3 2018	Q4 2018	LRAA
HAA5 Concentration (µg/L)	35.9	55.1	112.1	130	83.3

Table 3 – Pocantico District HAA5 Sampling Results – 200 Lake Road

	Q1 2018	Q2 2018	Q3 2018	Q4 2018	LRAA
HAA5 Concentration (µg/L)	32.8	43.8	66.1	128.5	67.8

Recommended Next Steps

A. Sampling to Identify HAA Formation Locations

Profiling the formation of HAAs across the systems will help identify HAA precursors, opportunities to modify operations to reduce HAA formation, track the performance of corrective measures, and inform subsequent sampling and options analysis. We recommend sampling to measure the following parameters:

- Total organic carbon (TOC);
- Dissolved organic carbon (DOC);
- UV254;
- Aquatic Humic Substances;
- Turbidity,
- Free chlorine;
- Total HAA;
- pH;
- Alkalinity; and
- Temperature.

These parameters should be measured at the following process points:

Kensico District

1. Prior to UV disinfection at the Commerce Street pump station.



2. Immediately downstream of the first sodium hypochlorite injection point.
3. At the end of the 24" main (prior to the tanks).
4. At the outlet of each of the two 2-million-gallon storage tanks.
5. 115 Wall Street.
6. 225 Memorial Drive.
7. 600 Linda Avenue.
8. 142 Arnold Place.

Pocantico District

1. Raw water feed pipe into the Pocantico Hills Water Filtration Plant.
2. Immediately downstream of the first sodium hypochlorite injection point.
3. Immediately downstream of each suspended solids filter.
4. Immediately downstream of the second sodium hypochlorite injection point.
5. Immediately downstream of the clearwell
6. At the 311,000-gallon tank inlet/outlet under tank filling conditions.
7. At the 311,000-gallon tank inlet/outlet under tank draining conditions.
8. 200 Lake Street

The sampling is planned to occur during the second or third week in April, to define existing conditions, and then monthly during the same week for a minimum period of 12 months. This will establish an annual profile of how HAA precursors and HAA compounds change through the treatment, storage, and distribution system over time. Continuation of sampling beyond the 12-month period will be determined based on a review of sample results, effectiveness of corrective measures, and information needs for subsequent evaluations and corrective measure implementation.

Following any corrective measures, such as tank cleaning, samples will be taken prior to the corrective action being completed, followed by a flush of the system and a minimum 2-week normalization period before samples are taken again.

B. Preliminary Corrective Measures

Based on the existing known information about the water quality, operational parameters, and system conditions, corrective actions have been identified that will result in immediate reductions to HAA formation potential and gather information to allow for optimized long-term reductions in HAAs in the distribution system.

Kensico District

1. Implement the recommended sampling plan;



2. Clean the elevated water storage tanks to remove accumulated sediment;
3. Add mixers to the storage tanks;
4. Activate the post-storage booster chlorination system to reduce the amount of chlorine required to be fed at the Commerce Street Booster Station. This will require communication and controls upgrades;
5. Evaluate water storage requirements and distribution system hydraulics to identify ways to reduce water age;
6. Review and evaluate historic water quality data to look for trends in HAA formation potential;
7. Identify treatment options for raw water at the Commerce Street Pumping Station for further evaluation; and
8. Begin feasibility analysis of treatment options.

Pocantico District

1. Implement the recommended sampling plan;
2. Clean the storage tank to remove accumulated sediment;
3. Establish a program for re-lining the distribution system mains;
4. Implement improved process control for post-filtration chlorination, to include a compound loop for tighter control of chlorine dosing;
5. Evaluate water storage requirements and distribution system hydraulics to identify ways to reduce water age;
6. Identify treatment options for modifications to the water filtration plant for further evaluation; and
7. Begin feasibility analysis of treatment options.

