

Massachusetts Department of Environmental Protection - Drinking Water Program
Stage 2 Disinfection By-Products Rule (DBPR) Quarterly Compliance Worksheet

PWSID: 1113003	PWS Name: Housatonic Water Works Company	City/Town: Great Barrington
<input checked="" type="radio"/> COM <input type="radio"/> NTNC	Monitoring Frequency: <input checked="" type="radio"/> Quarterly <input type="radio"/> Annual or less	Monitoring Type: <input checked="" type="radio"/> Routine <input type="radio"/> Reduced <input type="radio"/> Increased

CERTIFICATION: I certify under penalties of law that I am the person authorized to fill out this form and the information contained herein is true, accurate and complete to the best extent of my

YEAR: 2021 QUARTER: ☐ Q1: Jan-Mar ☐ Q2: Apr-Jun ☒ Q3: Jul-Sep ☐ Q4: Oct-Dec
 Primary Operator Signature: *James M. M...* Date: February 7, 2022

SYSTEMS USING CHLORINATION or CHLORAMINATION - COMPLETE TABLES A, B & C

A. CHLORINE RESIDUAL COMPLIANCE

	Month	Year	# Samples	Monthly Avg (ppm)
Q1	January	2021	2	0.89
	February	2021	2	0.92
	March	2021	2	1.10
Q2	April	2021	2	1.04
	May	2021	2	1.02
	June	2021	2	0.69
Q3	July	2021	2	0.78
	August	2021	2	0.62
	September	2020	2	0.30
Q4	October	2020	2	0.30
	November	2020	2	0.28
	December	2020	2	0.91

Chlorine Running Annual Average (RAA): (Average of 12 Monthly Averages)	0.74
Chlorine MRDL (ppm):	4.0
Was Chlorine MRDL exceeded? If Yes, then MRDL violation for period.	NO

*Note that you are required to notify MassDEP within 10 days of the end of the quarter of any DBPR MCL or MRDL violation. Tier 2 (30 day) Public Notification must also be

B. TTHM COMPLIANCE

Sample Location	Q1 (Jan - Mar)		Q2 (Apr - Jun)		Q3 (Jul - Sep)		Q4 (Oct - Dec)		OEL ¹ Q3	LRAA
	Date	ppb	Date	ppb	Date	ppb	Date	ppb		
10 Depot Rd.	2/9/2021	56	5/10/2021	39	8/9/2021	98	11/9/2020	41	73	59
MCL = 80 (ppb)		Was OEL exceeded?		NO		Was MCL exceeded?		NO		

C. HAA5 COMPLIANCE

Sample Location	Q1 (Jan - Mar)		Q2 (Apr - Jun)		Q3 (Jul - Sep)		Q4 (Oct - Dec)		OEL ¹ Q3	LRAA
	Date	ppb	Date	ppb	Date	ppb	Date	ppb		
10 Depot Rd.	2/9/2021	56	5/10/2021	58	8/9/2021	100	11/9/2020	44	79	65
MCL = 60 (ppb)		Was OEL exceeded?		YES		Was MCL exceeded?		YES		

D. IMPORTANT COMPLIANCE NOTES

- ☐ PWS has exceeded the OEL for TTHM and/OR HAA5 but is authorized to limit the scope of the OEL evaluation to reporting only. (Refer to letter regarding seasonal OEL exceedances)
- ☒ PWS has exceeded the OEL for TTHM and/OR HAA5 and must **complete and submit an Operational Evaluation Report** within 90 days of receipt of the analytical results (systems sampling quarterly only).
- ☐ PWS continues to qualify for reduced monitoring based on LRAAs of TTHM and HAA5 (and TOC if applicable)
- ☐ PWS **NO LONGER QUALIFIES** for reduced monitoring based on average concentrations of TTHM, HAA5 and/or TOC. (Refer to quarterly monitoring criteria on "Instructions" Tab)
- ☐ PWS has exceeded the MCL for TTHM or HAA5 during ANNUAL monitoring and therefore will be subject to **INCREASED monitoring** (quarterly dual sample sets at each location) until further notice.

²OELs apply to systems sampling quarterly only.

Massachusetts Department of Environmental Protection - Drinking Water Program
Stage 2 Disinfection By-Products Rule (DBPR) Quarterly Compliance Worksheet

PWSID: 1113003

PWS Name: Housatonic Water Works Company

City/Town: Great Barrington

SURFACE OR GWUDI SYSTEMS >499 SEEKING OR ON REDUCED TTHM/HAA5 MONITORING - COMPLETE TABLE E

E. Plant Name:			Plant 1		Plant 2		Plant 3		Plant 4	
TOC (raw water)	MONTH	YEAR	Monthly Avg (ppm)	Quarterly Avg (ppm)	Monthly Avg (ppm)	Quarterly Avg (ppm)	Monthly Avg (ppm)	Quarterly Avg (ppm)	Monthly Avg (ppm)	Quarterly Avg (ppm)
	Q1	January								
		February								
		March								
	Q2	April								
		May								
		June								
	Q3	July								
		August								
		September								
	Q4	October								
		November								
		December								
	Running Annual Average: (Average of last 4 quarterly averages)									

SYSTEMS USING OZONATION - COMPLETE TABLE F

F. Plant Name:			Plant 1	Plant 2	Plant 3	Plant 4
BROMATE (finished water)	MONTH	YEAR	Monthly Avg (ppm)	Monthly Avg (ppm)	Monthly Avg (ppm)	Monthly Avg (ppm)
	Q1	January				
		February				
		March				
	Q2	April				
		May				
		June				
	Q3	July				
		August				
		September				
	Q4	October				
		November				
		December				
	Running Annual Average: (Average of last 12 monthly averages)					
	Was Bromate MCL Exceeded? ¹ (MCL = 0.010 ppm)					
	Qualify for Reduced Bromate Monitoring? (RAA < 0.0025 ppm)					

DEFINITIONS

Monthly Average:	Average of all results within the current month.
Quarterly Average:	Average of three monthly averages.
Running Annual Average (RAA):	Average of one year of consecutive compliance periods, including the current one. 4 quarters (TTHM/HAA5 and TOC) or 12 months (Cl and Bromate).
Total # of Samples:	Total number of samples collected during the monitoring period.
Locational Running Annual Average (LRAA):	RAA from the <u>same</u> sample location. Average of this quarter and three prior consecutive quarterly averages at the same location.
Operational Evaluation Level (OEL):	Average of the two previous quarter's results and twice the current quarter's results

Note: Record and calculate all ND or < MDL results as the number 0 (zero).

COMMENTS:

**Massachusetts Department of Environmental Protection - Drinking Water Program
Stage 2 Disinfection By-Product Rule Operational Evaluation Report**

For use with the DBPR Quarterly Compliance Worksheet

I. GENERAL INFORMATION

PWSID: **1113003**

PWS Name: **Housatonic Water Works Company**

Town: **Great Barrington**

CERTIFICATION: I certify under penalties of law that I am the person authorized to fill out this form and the information contained herein is true, accurate and complete to the best extent of my knowledge.

Monitoring Period:

Year: **2021**

Quarter: **3 - Jul-Sep**

Primary Operator Signature: 

Date: **February 9, 2022**

II. MONITORING RESULTS

Refer to Stage 2 DBPR Quarterly Compliance Worksheet for complete results summary.

Location #
Enter Sample Location Code(s) where OELs were exceeded:
Has an OEL exceedance occurred at this location in the past?
If YES, when did the exceedance occur? (Year/Quarter)
Was the cause determined for the previous exceedance?
Are the previous evaluations applicable to the current OEL exceedance?

1	2	3	4
10003			
No			

Notes:

The August 2021 HAA5 result was atypical in that it is much higher than any of the other 31 quarterly samples obtained since the start of Stage 2 D/DBPR monitoring. Previously, only two of the 31 quarterly samples had been above 60 ug/L, and the previous highest LRAA for HAA5 was 53 ug/L. The August 2021 TTHM result was also atypically high. See attached plots for HAA5 and TTHM.

III. OPERATIONAL EVALUATION FINDINGS

A. seasonal exemption indicated on Section D of the Quarterly Compliance Worksheet?

If NO proceed to Item B. If YES, attach a copy of written approval from MassDEP including approved scope.

☐ Yes ☒ No

B. Did you confirm that proper Data Collection and Analysis Protocols Were Followed?

Refer to Page 2-6 in the OEL Guidance Manual for more information on evaluating these protocols.

☒ Yes ☐ No

C. Did the distribution system cause or contribute to your OEL exceedance(s)?

If YES or POSSIBLY explain (expand cell or attach additional pages if necessary)

☐ Yes ☐ No

☒ Possibly

A lot of flushing was conducted in summer and early fall 2021 due to the colored water issues caused by spikes in source water manganese levels. There were also pipe and hydrant repairs that were conducted. Distribution system chlorine residuals were slightly higher during 2021 than previously. See attached plots for chlorine residual data.

D. Did the treatment system cause or contribute to your OEL exceedance(s)?

If YES or POSSIBLY explain (expand cell or attach additional pages if necessary)

☐ Yes ☒ No

☐ Possibly

There were no large variations in treatment plant performance, though chlorine residuals were at times slightly higher than recently. See attached plots for chlorine residual data.

There is no treatment system for removing natural organic matter from the raw water, other than the slow sand filtration process which can be expected to provide about 15% TOC removal, though recent TOC results suggest even greater TOC removal by the filters (~55%).

E. Did **source water quality** cause or contribute to your OEL exceedance(s)?

☒ Yes ☐ No

If YES or POSSIBLY explain (expand cell or attach additional pages if necessary)

☐ Possibly

Probably, given the large amount of rain before the 3rd and 4th quarter sampling events. July was by far the wettest July in recorded history in the area, and there was also heavy rain in late October (samples were collected on 8/9/21 and 11/10/21). So that may have affected the amount and/or type of organic matter in the Long Pond source water.

No TOC data are available from August or November 2021. TOC monitoring on September 7th and 20th both indicated raw water TOC levels of ~3.8 mg/L compared to a filter effluent result of ~1.7 mg/L TOC. This suggests the slow sand filters are removing about 55% of the TOC, and down to a level (1.7 mg/L) that typically would not cause problems with formation of excessive DBPs. Note also the raw water had atypically high levels of manganese in August 2021, and so perhaps some other unknown water quality factor also impacted DBP formation.

F. Attach all supporting operational or other data that support the determination of the cause(s) of your OEL exceedance(s).

G. If you are unable to determine the cause(s) of the OEL exceedance(s), list the steps that you can use to better identify the cause(s) in the future. *(attach additional pages if necessary)*

HWWC has reduced the chlorine residual levels. HWWC will also monitor raw water and finished water for TOC quarterly for the next year, on the same days as the compliance DBP samples are collected.

H. List steps that could be considered to minimize future OEL exceedances *(attach additional pages if necessary)*

1. While chlorine levels have been conventional (i.e., no sudden increase in dose), in response to the large change in HAA5 experienced in 2021 HWWC has reduced chlorine dosing while maintaining sufficient levels for disinfection
2. Monitor quarterly for TOC

I. Total Number of Pages Submitted, including attachments and checklists:

17

Massachusetts Department of Environmental Protection - Drinking Water Program
Stage 2 Disinfection By-Products Rule (DBPR) Quarterly Compliance Worksheet

PWSID: 1113003	PWS Name: Housatonic Water Works Company	City/Town: Great Barrington
<input checked="" type="radio"/> COM <input type="radio"/> NTNC	Monitoring Frequency: <input checked="" type="radio"/> Quarterly <input type="radio"/> Annual or less	Monitoring Type: <input checked="" type="radio"/> Routine <input type="radio"/> Reduced <input type="radio"/> Increased

CERTIFICATION: I certify under penalties of law that I am the person authorized to fill out this form and the information contained herein is true, accurate and complete to the best extent of my knowledge.

YEAR: 2021 QUARTER: ☐ Q1: Jan-Mar ☐ Q2: Apr-Jun ☐ Q3: Jul-Sep ☒ Q4: Oct-Dec

Primary Operator Signature: *[Signature]* Date: February 7, 2022

SYSTEMS USING CHLORINATION or CHLORAMINATION - COMPLETE TABLES A, B & C

A. CHLORINE RESIDUAL COMPLIANCE

	Month	Year	# Samples	Monthly Avg (ppm)
Q1	January	2021	2	0.89
	February	2021	2	0.92
	March	2021	2	1.10
Q2	April	2021	2	1.04
	May	2021	2	1.02
	June	2021	2	0.69
Q3	July	2021	2	0.78
	August	2021	2	0.62
	September	2021	2	0.94
Q4	October	2021	2	0.46
	November	2021	2	0.48
	December	2020	2	0.91

Chlorine Running Annual Average (RAA): (Average of 12 Monthly Averages)	0.82
Chlorine MRDL (ppm):	4.0
Was Chlorine MRDL exceeded? If Yes, then MRDL violation for period.	NO

¹Note that you are required to notify MassDEP within 10 days of the end of the quarter of any DBPR MCL or MRDL violation. Tier 2 (30 day) Public Notification must also be

B. TTHM COMPLIANCE

Sample Location	Q1 (Jan - Mar)		Q2 (Apr - Jun)		Q3 (Jul - Sep)		Q4 (Oct - Dec)		OEL ¹ Q4	LRAA
	Date	ppb	Date	ppb	Date	ppb	Date	ppb		
10 Depot Rd.	2/9/2021	56	5/10/2021	39	8/9/2021	98	11/10/2021	73	71	67
MCL = 80 (ppb)		Was OEL exceeded?		NO		Was MCL exceeded?		NO		

C. HAA5 COMPLIANCE

Sample Location	Q1 (Jan - Mar)		Q2 (Apr - Jun)		Q3 (Jul - Sep)		Q4 (Oct - Dec)		OEL ¹ Q4	LRAA
	Date	ppb	Date	ppb	Date	ppb	Date	ppb		
10 Depot Rd.	2/9/2021	56	5/10/2021	58	8/9/2021	100	11/10/2021	77	78	73
MCL = 60 (ppb)		Was OEL exceeded?		YES		Was MCL exceeded?		YES		

D. IMPORTANT COMPLIANCE NOTES

- ☐ PWS has exceeded the OEL for TTHM and/OR HAA5 but is authorized to limit the scope of the OEL evaluation to reporting only. (Refer to letter regarding seasonal OEL exceedances)
- ☒ PWS has exceeded the OEL for TTHM and/OR HAA5 and must **complete and submit an Operational Evaluation Report** within 90 days of receipt of the analytical results (systems sampling quarterly only).
- ☐ PWS continues to qualify for reduced monitoring based on LRAAs of TTHM and HAA5 (and TOC if applicable)
- ☐ PWS **NO LONGER QUALIFIES** for reduced monitoring based on average concentrations of TTHM, HAA5 and/or TOC. (Refer to quarterly monitoring criteria on "Instructions" Tab)
- ☐ PWS has exceeded the MCL for TTHM or HAA5 during ANNUAL monitoring and therefore will be subject to **INCREASED monitoring** (quarterly dual sample sets at each location) until further notice.

²OELs apply to systems sampling quarterly only.

Massachusetts Department of Environmental Protection - Drinking Water Program
Stage 2 Disinfection By-Products Rule (DBPR) Quarterly Compliance Worksheet

1113003

Housatonic Water Works Company

Great Barrington

PWSID:

PWS Name:

City/Town:

SURFACE OR GWUDI SYSTEMS >499 SEEKING OR ON REDUCED TTHM/HAA5 MONITORING - COMPLETE TABLE E

Plant Name:			Plant 1		Plant 2		Plant 3		Plant 4	
MONTH	YEAR	Monthly Avg (ppm)	Quarterly Avg (ppm)	Monthly Avg (ppm)	Quarterly Avg (ppm)	Monthly Avg (ppm)	Quarterly Avg (ppm)	Monthly Avg (ppm)	Quarterly Avg (ppm)	
Q1	January									
	February									
	March									
Q2	April									
	May									
	June									
Q3	July									
	August									
	September									
Q4	October									
	November									
	December									
Running Annual Average:										
(Average of last 4 quarterly averages)										

SYSTEMS USING OZONATION - COMPLETE TABLE F

Plant Name:			Plant 1	Plant 2	Plant 3	Plant 4
MONTH			Monthly Avg (ppm)	Monthly Avg (ppm)	Monthly Avg (ppm)	Monthly Avg (ppm)
BROMATE (finished water)	Q1	January				
		February				
		March				
	Q2	April				
		May				
		June				
	Q3	July				
		August				
		September				
	Q4	October				
		November				
		December				
Running Annual Average: (Average of last 12 monthly averages)						
Was Bromate MCL Exceeded? ¹ (MCL = 0.010 ppm)						
Qualify for Reduced Bromate Monitoring? (RAA<0.0025 ppm)						

DEFINITIONS

Monthly Average:	Average of all results within the current month.
Quarterly Average:	Average of three monthly averages.
Running Annual Average (RAA):	Average of one year of consecutive compliance periods, including the current one. 4 quarters (TTHM/HAA5 and TOC) or 12 months (Cl and Bromate).
Total # of Samples:	Total number of samples collected during the monitoring period.
Locational Running Annual Average (LRAA):	RAA from the <u>same</u> sample location. Average of this quarter and three prior consecutive quarterly averages at the same location.
Operational Evaluation Level (OEL):	Average of the two previous quarter's results and twice the current quarter's results

Note: Record and calculate all ND or < MDL results as the number 0 (zero).

COMMENTS:

**Massachusetts Department of Environmental Protection - Drinking Water Program
Stage 2 Disinfection By-Product Rule Operational Evaluation Report**

For use with the DBPR Quarterly Compliance Worksheet

I. GENERAL INFORMATION

PWSID: 1113003

PWS Name: Housatonic Water Works Company

Town: Great Barrington

CERTIFICATION: I certify under penalties of law that I am the person authorized to fill out this form and the information contained herein is true, accurate and complete to the best extent of my knowledge.

Monitoring Period:

Year: 2021

Quarter: 4 - Oct-Dec

Primary Operator Signature:

Date:

II. MONITORING RESULTS

Refer to Stage 2 DBPR Quarterly Compliance Worksheet for complete results summary.

Enter Sample Location Code(s) where OELs were exceeded:
Has an OEL exceedance occurred at this location in the past?
If YES, when did the exceedance occur? (Year/Quarter)
Was the cause determined for the previous exceedance?
Are the previous evaluations applicable to the current OEL exceedance?

Location #	1	2	3	4
10003				
Yes				
2021Q3				
Yes				
Yes				

Notes:

The August and November 2021 HAA5 results were atypically high. Previously, since the start of Stage 2 D/DBPR monitoring only two of the 31 quarterly samples had been above 60 ug/L, and the previous highest LRAA for HAA5 was 53 ug/L. The August and November 2021 TTHM results were also atypically high. See attached plots for HAA5 and TTHM.

III. OPERATIONAL EVALUATION FINDINGS

A. seasonal exemption indicated on Section D of the Quarterly Compliance Worksheet?

☐ Yes ☒ No

If NO proceed to Item B. If YES, attach a copy of written approval from MassDEP including approved scope.

B. Did you confirm that proper Data Collection and Analysis Protocols Were Followed?

☒ Yes ☐ No

Refer to Page 2-6 in the OEL Guidance Manual for more information on evaluating these protocols.

C. Did the **distribution system** cause or contribute to your OEL exceedance(s)?

☐ Yes ☐ No

If YES or POSSIBLY explain (expand cell or attach additional pages if necessary)

☒ Possibly

A lot of flushing was conducted in summer and early fall 2021 due to the colored water issues caused by spikes in source water manganese levels. There were also pipe and hydrant repairs that were conducted. Distribution system chlorine residuals were slightly higher during 2021 than previously. See attached plots for chlorine residual data.

D. Did the **treatment system** cause or contribute to your OEL exceedance(s)?

☐ Yes ☒ No

If YES or POSSIBLY explain (expand cell or attach additional pages if necessary)

☐ Possibly

There were no large variations in treatment plant performance, though chlorine residuals were at times slightly higher than recently. See attached plots for chlorine residual data.

There is no treatment system for removing natural organic matter from the raw water, other than the slow sand filtration process which can be expected to provide about 15% TOC removal, though recent TOC results suggest even greater TOC removal by the filters (~55%).

E. Did **source water quality** cause or contribute to your OEL exceedance(s)?

☒ Yes ☐ No

If YES or POSSIBLY explain (expand cell or attach additional pages if necessary)

☐ Possibly

Probably, given the large amount of rain before the 3rd and 4th quarter sampling events. July was by far the wettest July in recorded history in the area, and there was also heavy rain in late October (samples were collected on 8/9/21 and 11/10/21). So that may have affected the amount and/or type of organic matter in the Long Pond source water.

No TOC data are available from August or November 2021. TOC monitoring on September 7th and 20th both indicated raw water TOC levels of ~3.8 mg/L compared to a filter effluent result of ~1.7 mg/L TOC. This suggests the slow sand filters are removing about 55% of the TOC, and down to a level (1.7 mg/L) that typically would not cause problems with formation of excessive DBPs. Note also the raw water had atypically high levels of manganese in August 2021, and so perhaps some other unknown water quality factor also impacted DBP formation.

F. Attach all supporting operational or other data that support the determination of the cause(s) of your OEL exceedance(s).

G. If you are unable to determine the cause(s) of the OEL exceedance(s), list the steps that you can use to better identify the cause(s) in the future. *(attach additional pages if necessary)*

HWWC will monitor raw water and finished water for TOC quarterly for the next year, on the same days as the compliance DBP samples are collected.

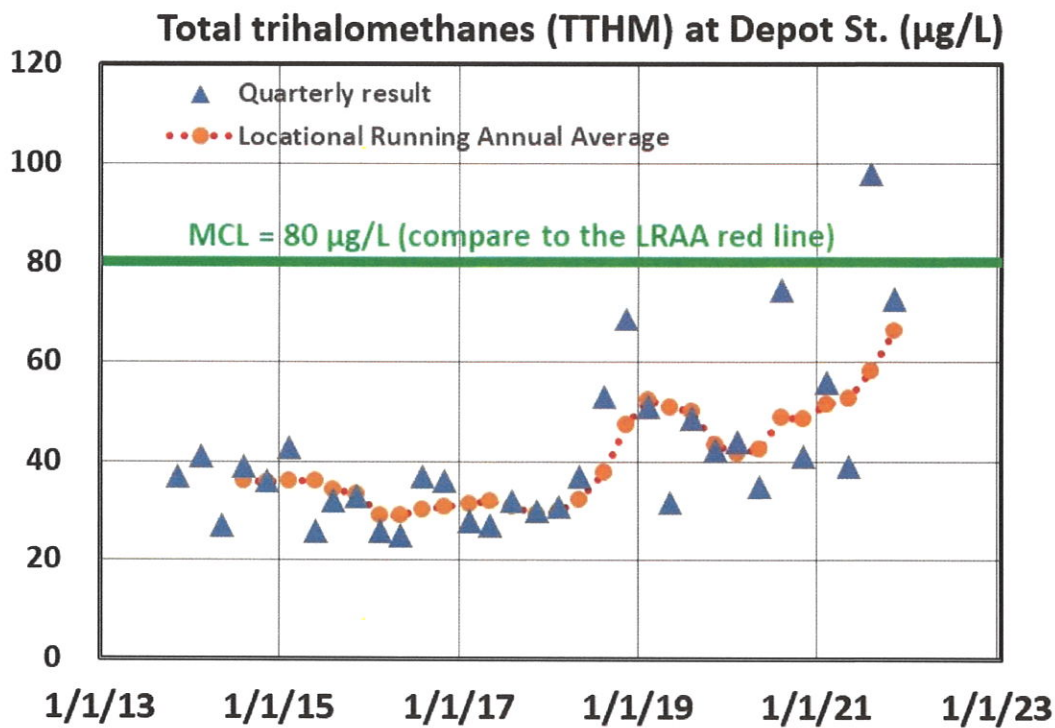
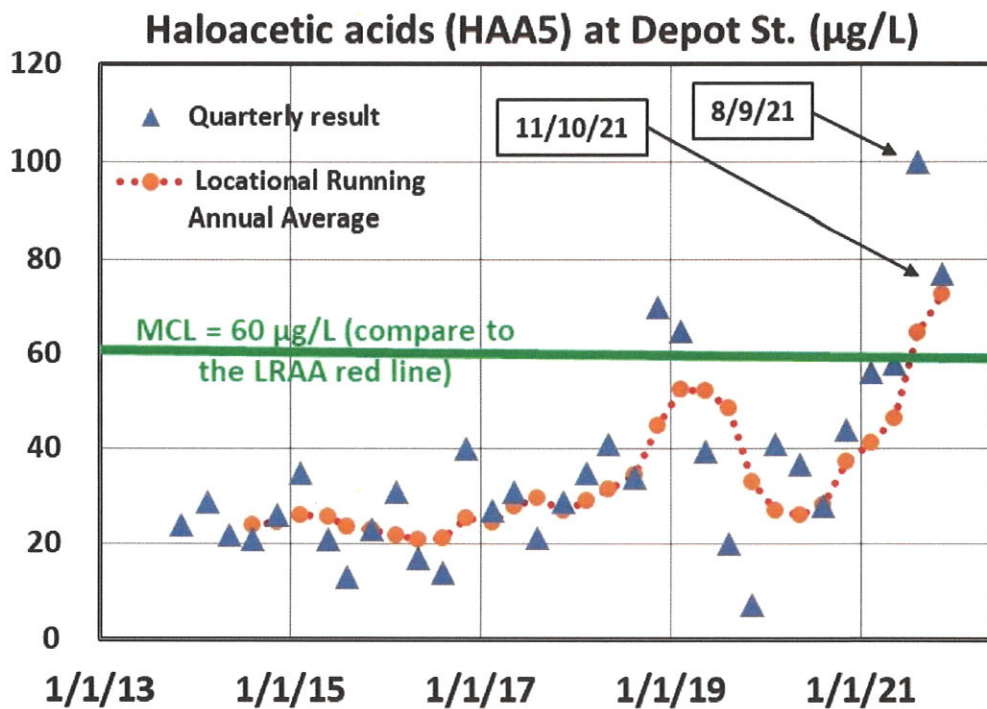
H. List steps that could be considered to minimize future OEL exceedances *(attach additional pages if necessary)*

1. While chlorine levels have been conventional (i.e., no sudden increase in dose), in response to the large change in HAA5 experienced in 2021 HWWC has reduced chlorine dosing while maintaining sufficient levels for disinfection
2. Monitor quarterly for TOC

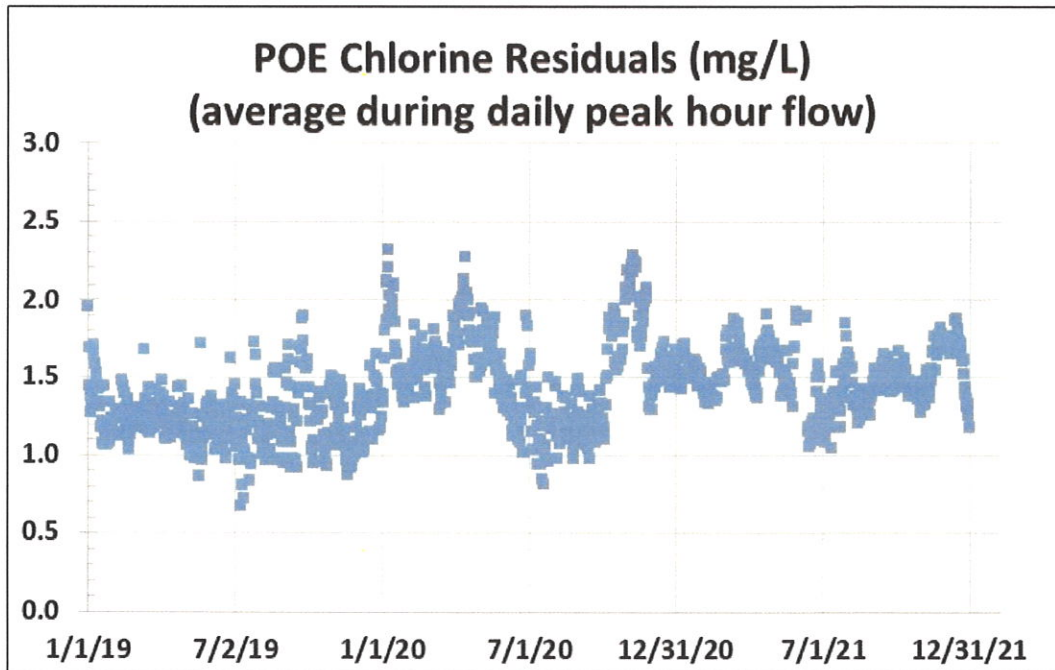
I. Total Number of Pages Submitted, including attachments and checklists:

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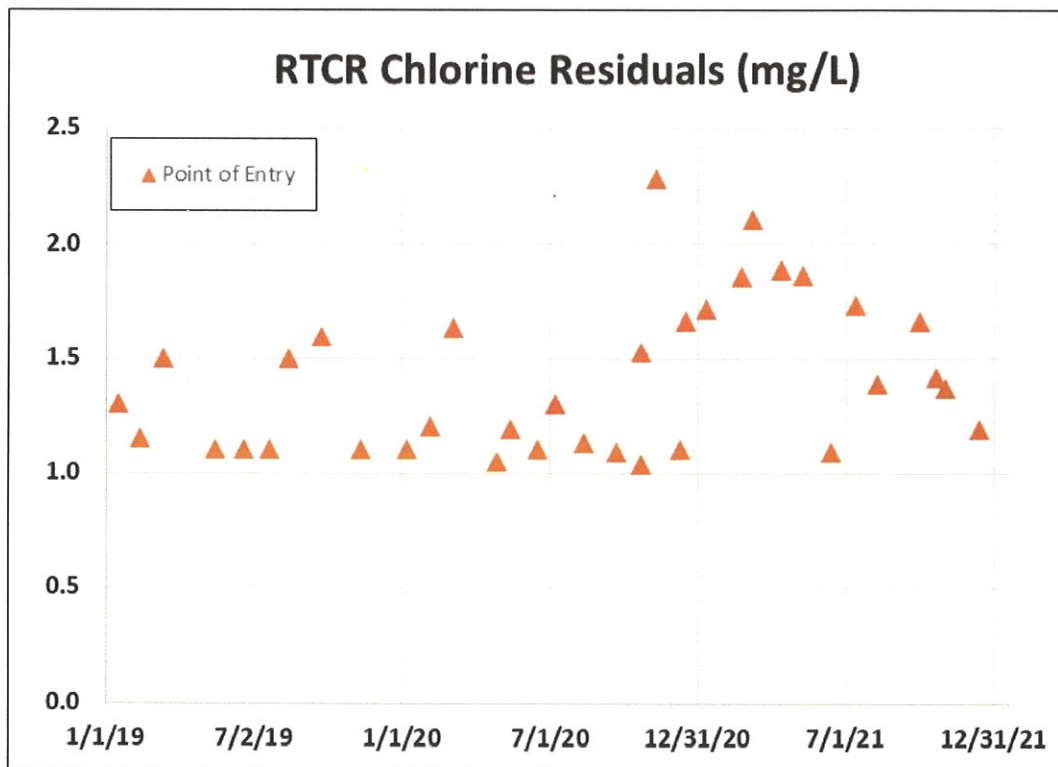
Quarterly Disinfection Byproduct results and Locational Running Annual Average (LRAA)
for the Housatonic Water Works Company during the Stage 2 D/DBPR



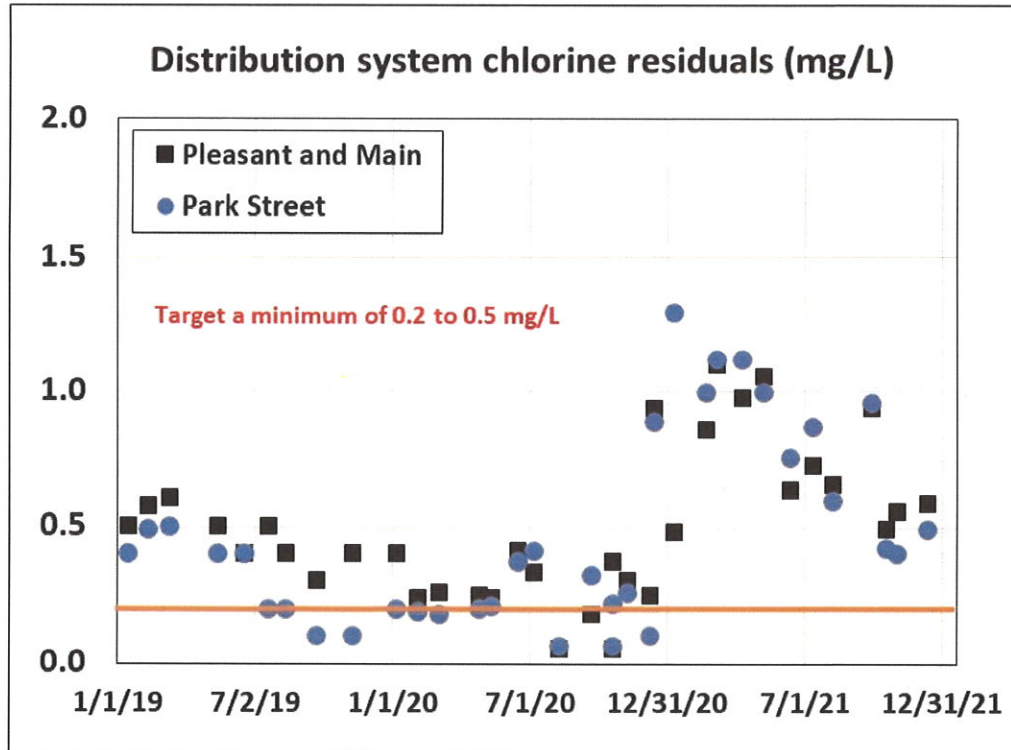
Point of Entry chlorine residuals levels for HWWC in 2019 – 2021



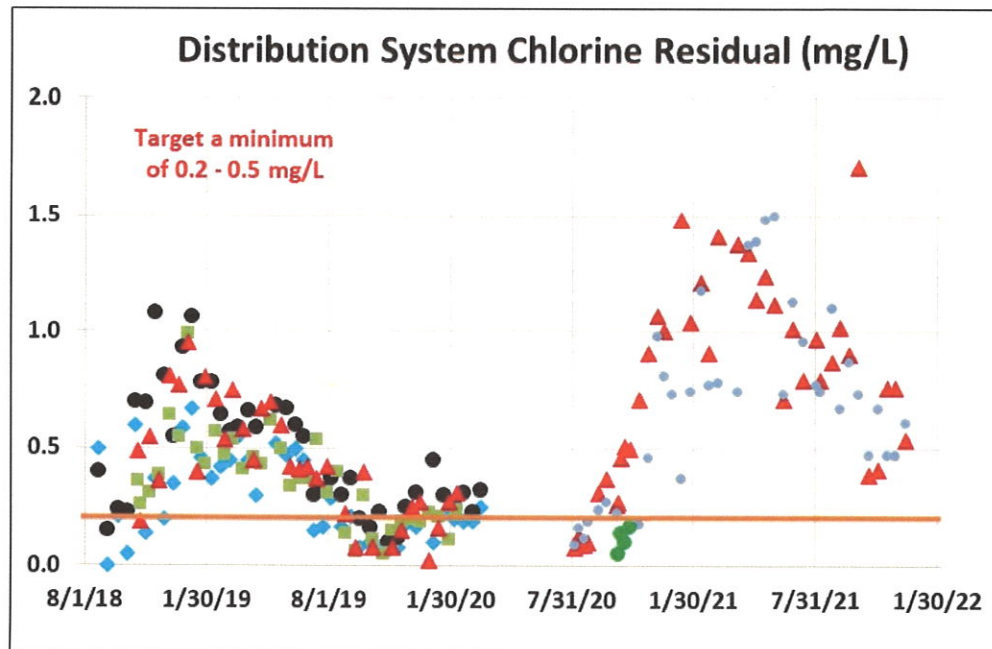
Point of Entry chlorine residuals levels for HWWC in 2019 – 2021,
sampled for the Revised Total Coliform Rule



Distribution System chlorine residual levels for HWWC in 2019 – 2021,
sampled for the Revised Total Coliform Rule



Distribution System chlorine residuals levels for HWWC in 2018 – 2021,
sampled as part of the “special” required distribution system monitoring program



* For both 8/9/2001 and 11/10/2001 DBP sampling

TTHM and HAA5 Sample Collection and Handling Checklist

Page 1 of 2

Facility Name: Housatonic Water Works

Checklist Completed by: Nick Bruzzi

Date: January 26, 2022

Yes	No	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Did you obtain appropriate sample collection vials provided from the laboratory?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Did the sample vials contain the proper preservative and dechlorinating agents?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Was each vial labeled using waterproof labels and indelible ink?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Did each vial contain the following information on the label?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Unique sample ID
<input checked="" type="checkbox"/>	<input type="checkbox"/>	System name
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample location
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sample date and time
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Analysis required, if not already on label
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Did you remove the aerator from the tap if there was one present?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Did you open the water tap and allow the system to flush until the water temperature had stabilized (usually about 3-5 minutes)?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Did you adjust the flow so that no air bubbles were visually detected in the flowing stream?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Did you slowly fill the sample vial almost to the top without overflowing?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Were you careful not to rinse out any of the preservative/dechlorinating agent during this process?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	After the bottle was filled, did you invert it three or four times to mix the sample with the preservative and dechlorinating agents?
<input type="checkbox"/>	<input type="checkbox"/>	If you collected a TTHM sample that requires acidification, did you: - N/A
<input type="checkbox"/>	<input type="checkbox"/>	Let the sample set for about 1 minute, allowing the dechlorinating chemical to take effect? - N/A
<input type="checkbox"/>	<input type="checkbox"/>	Carefully open the vial and adjust the pH of the TTHM sample to < 2 by adding approximately 4 drops of hydrochloric acid for every 40 mL of sample (amount of acid needed will depend on buffering capacity of sample)? - N/A
<input type="checkbox"/>	<input type="checkbox"/>	Recap the vial, and invert three or four times? - N/A

Page 2 of 2

Notes/Comments

* For both 8/9/2021 and 11/10/2021 DBP sampling

Source Water Evaluation Checklist		Page 1 of 2
<input type="checkbox"/> NO DATA AVAILABLE System Name: <u>Housatonic Water Works Company</u> Checklist Completed by: <u>Richard Gullick (WCS, LLC)</u> Date: <u>1/31/2022</u>		
<p>A. Do you have source water temperature data? <i>not directly, but at two locations in plant</i> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>If NO, proceed to item B. If YES, was the source water temperature high? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>If NO, proceed to item B. If YES, answer the following questions for the time period prior to the OEL exceedance.</p> <p>Yes No</p>	<p><input type="checkbox"/> Was the raw water storage time longer than usual?</p> <p><input type="checkbox"/> Did you place another water source on-line?</p> <p><input type="checkbox"/> Were river/reservoir flow rates lower than usual? If yes, indicate the location of lower flow rates and the anticipated impact on the OEL exceedance.</p> <p><input checked="" type="checkbox"/> Did point or non-point sources in the watershed contribute to the OEL exceedance? <i>There are no point sources, but watershed contributes natural organic matter</i></p>	
<p>B. Do you have data that characterizes organic matter in your source water (e.g., TOC, DOC, SUVA, color, THM formation potential)? <i>TOC data for 9/7/21</i> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>If NO, proceed to item C. If YES, were these values higher than + 9/2021 normal? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>If NO, proceed to item C. If YES, answer the following questions for the time period prior to the OEL exceedance.</p> <p>Yes No</p>	<p><input checked="" type="checkbox"/> Did heavy rainfall or snowmelt occur in the watershed? <i>July 2021 was the wettest in recorded history, shortly before sampling 8/9/21. Also had heavy rains in October, before 11/10/21 sampling.</i></p> <p><input type="checkbox"/> Did you place another water source on-line?</p> <p><input type="checkbox"/> Did lake or reservoir turnover occur? <i>not for Aug., and should be before November</i></p> <p><input checked="" type="checkbox"/> Did point or non-point sources in the watershed contribute to the OEL exceedance? <i>natural sources</i></p> <p><input type="checkbox"/> Did an algal bloom occur in the source water?</p> <p><input type="checkbox"/> If algal blooms were present, were appropriate algae control measures employed (e.g., addition of copper sulfate)?</p> <p><input type="checkbox"/> Did a taste and odor incident occur?</p>	<p><i>TOC in Sept. 2021 ~ 3.8 mg/L average, and in Sept. 2020 averaged ~ 3.3 mg/L, so not a very large difference.</i></p>
<p>C. Do you have source water bromide data? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>If NO, proceed to item D. If YES, were the bromide levels higher or lower than normal? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>If NO, proceed to item D. If YES, answer the following questions for the time period prior to the OEL exceedance.</p> <p>Yes No</p>	<p><input type="checkbox"/> Has saltwater intrusion occurred?</p> <p><input type="checkbox"/> Are you experiencing a long-term drought?</p> <p><input type="checkbox"/> Did heavy rainfall or snowmelt occur in the watershed?</p> <p><input type="checkbox"/> Did you place another water source on-line?</p> <p><input type="checkbox"/> Are you aware of any industrial spills in the watershed?</p>	

Source Water Evaluation Checklist

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D. Do you have source water turbidity or particle count data? ☒ Yes ☐ No

If NO, proceed to item E. If YES, were the turbidity values or particle counts higher than normal? ☐ Yes ☒ No

If NO, proceed to item E. If YES, answer the following questions for the time period prior to the OEL exceedance.

Yes No

☐ ☒ Did lake or reservoir turnover occur?

☒ ☐ Did heavy rainfall or snowmelt occur in the watershed? - record rains in July 2021

☐ ☒ Did logging, fires, or landslides occur in the watershed?

☐ ☒ Were river/reservoir flow rates higher than normal?

E. Do you have source water pH or alkalinity data? - both ☒ Yes ☐ No

If NO, proceed to item F. If YES, was the pH or alkalinity different from normal values? ☐ Yes ☒ No

If NO, proceed to item F. If YES, answer the following questions for the time period prior to the OEL exceedance.

Yes No

☐ ☒ Was there an algal bloom in the source water?

☐ ☐ If algal blooms were present, were algae control measures employed? - NA

☒ ☐ Did heavy rainfall or snowmelt occur in the watershed?

☐ ☒ Has the PWS experienced diurnal pH changes in source water?

F. Conclusion

Did source water quality factors contribute to your OEL exceedance?

☒ Yes ☐ No

☐ Possibly

If YES or POSSIBLY, explain below.

The most likely cause of the large increase in HAA5 observed in August and November 2021 is a change in the natural organic matter in the Long Pond source water due to the record-breaking precipitation in July.

* For both 8/9/2021 and 11/10/2021 DBP sampling

Treatment Process Evaluation Checklist		Page 1 of 4
<input type="checkbox"/> NO DATA AVAILABLE		
Facility Name: <i>Housatonic Water Works Company</i> Checklist Completed by: <i>Richard Gullick (WCS, LLC)</i> Date: <i>1/31/2022</i>		
A. Review finished water data for the time period prior to the OEL exceedance(s) and compare to historical finished water data using the following questions:		
Were DBP precursors (TOC, DOC, SUVA, bromide, etc.) higher than normal? <i>→ No data for Aug. or Nov., but Sept. 2021 TOC data</i>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No <i>unknown</i>
Was finished water pH higher or lower than normal? <i>were similar to 2020 data</i>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Was the finished water temperature higher than normal?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Was finished water turbidity higher than normal?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Was the disinfectant concentration leaving the plant(s) higher than normal?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Were finished water TTHM/HAA5 levels higher than normal? <i>- not analyzed</i>	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Were operational and water quality data available to the system operator for effective decision making?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
B. Does the treatment process include predisinfection? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
If NO, proceed to item C. If YES, answer the following questions for the period in which an OEL exceedance occurred:		
Yes No		
<input type="checkbox"/>	<input type="checkbox"/>	Was disinfected raw water stored for an unusually long time?
<input type="checkbox"/>	<input type="checkbox"/>	Were treatment plant flows lower than normal?
<input type="checkbox"/>	<input type="checkbox"/>	Were treatment plant flows equally distributed among different trains?
<input type="checkbox"/>	<input type="checkbox"/>	Were water temperatures high or warmer than usual?
<input type="checkbox"/>	<input type="checkbox"/>	Were chlorine feed rates outside the normal range?
<input type="checkbox"/>	<input type="checkbox"/>	Was a disinfectant residual present in the treatment train following predisinfection?
<input type="checkbox"/>	<input type="checkbox"/>	Were online instruments utilized for process control?
<input type="checkbox"/>	<input type="checkbox"/>	Did you switch to free chlorine as the oxidant?
<input type="checkbox"/>	<input type="checkbox"/>	Was there a recent change (or addition) of pre-oxidant?
<input type="checkbox"/>	<input type="checkbox"/>	Did you change the location of the predisinfection application?
C. Does your treatment process include presedimentation? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
If NO, proceed to item D. If YES, answer the following questions for the period in which an OEL exceedance occurred:		
Yes No		
<input type="checkbox"/>	<input type="checkbox"/>	Were flows low?
<input type="checkbox"/>	<input type="checkbox"/>	Were flows high?
<input type="checkbox"/>	<input type="checkbox"/>	Were online instruments utilized for process control?
<input type="checkbox"/>	<input type="checkbox"/>	Was sludge removed from the presedimentation basin?
<input type="checkbox"/>	<input type="checkbox"/>	Was sludge allowed to accumulate for an excessively long time?
<input type="checkbox"/>	<input type="checkbox"/>	Do you add a coagulant to your presedimentation basin?
<input type="checkbox"/>	<input type="checkbox"/>	Was there a problem with the coagulant feed?

Treatment Process Evaluation Checklist

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D. Does your treatment process include coagulation and/or flocculation?

☐ Yes ☒ No

If NO, proceed to item E. If YES, answer the following questions for the period in which an OEL exceedance occurred:

Yes No

- | | | |
|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | Were there any feed pump failures or were feed pumps operating at improper feed rates? |
| <input type="checkbox"/> | <input type="checkbox"/> | Were chemical feed systems controlled by flow pacing? |
| <input type="checkbox"/> | <input type="checkbox"/> | Were there changes in coagulation practices or the feed point? |
| <input type="checkbox"/> | <input type="checkbox"/> | Did you change the type or manufacturer of the coagulant? |
| <input type="checkbox"/> | <input type="checkbox"/> | Do you suspect that the coagulant in use at the time of the OEL exceedance did not meet industry standards? |
| <input type="checkbox"/> | <input type="checkbox"/> | Did the pH or alkalinity change at the point of coagulant addition? |
| <input type="checkbox"/> | <input type="checkbox"/> | Were there broken or plugged mixers? |
| <input type="checkbox"/> | <input type="checkbox"/> | Were flow rates above the design rate or was there short-circuiting? |

E. Does your treatment process include sedimentation or clarification?

☐ Yes ☒ No

If NO, proceed to item F. If YES, answer the following questions for the period in which an OEL exceedance occurred:

Yes No

- | | | |
|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | Were there changes in plant flow rate that may have resulted in a decrease in settling time or carry-over of process solids? |
| <input type="checkbox"/> | <input type="checkbox"/> | Were settled water turbidities higher than normal? |
| <input type="checkbox"/> | <input type="checkbox"/> | Was there any disruption in the sludge blanket that may have resulted in carryover to the point of disinfection? |
| <input type="checkbox"/> | <input type="checkbox"/> | Was there any maintenance in the basin that may have stirred sludge from the bottom of the basin and caused it to carry over to the point of disinfectant addition? |
| <input type="checkbox"/> | <input type="checkbox"/> | Was sludge allowed to accumulate for an excessively long time or was there a malfunction in the sludge removal equipment? |

Treatment Process Evaluation Checklist

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F. Does your treatment process include filtration? *- two slow sand filters* ☒ Yes ☐ No

If NO, proceed to item G. If YES, answer the following questions for the period in which an OEL exceedance occurred:

Yes No

- ☐ ☒ Was there an increase in individual or combined filter effluent turbidity or particle counts?
- ☐ ☒ Was there an increase in turbidity or particle loading onto the filters? *no indication*
- ☐ ☒ Was there an increase in flow onto the filters or malfunction of the rate of flow controllers?
- ☐ ☒ Were any filters taken off-line for an extended period of time that caused the other filters to operate near maximum design capacity and created the conditions for possible breakthrough?
- ☐ ☒ Were any filters operated beyond their normal filter run time?
- ☐ ☒ Were there any unusual spikes in individual filter effluent turbidity (which may indicate particulate or colloidal TOC breakthrough) in the days leading to the excursion?
- ☐ ☒ Were all filters run in a filter-to-waste mode during initial filter ripening?
- ☐ ☐ If GAC filters are used, is it possible the adsorptive capacity of the GAC bed was reached before reactivation occurred (leave blank if not applicable)? *- NA*
- ☐ ☐ If biological filtration is used, were there any process upsets that may have resulted in the breakthrough of TOC (leave blank if not applicable)? *- NA*

G. Does your treatment process include primary disinfection by injecting chlorine prior to a clearwell? ☒ Yes ☐ No

If NO, proceed to item H. If YES, answer the following questions for the period in which an OEL exceedance occurred:

Yes No

- ☐ ☒ Was there a sudden increase in the amount of chlorine fed or an increase in the chlorine residual?
- ☐ ☒ Was there an increase in clearwell holding time?
- ☐ ☒ Was the plant shut down or were plant flows low?
- ☐ ☒ Was there an increase in clearwell water temperature?
- ☐ ☒ Did you switch to free chlorine recently as the primary disinfectant?
- ☐ ☒ Was the inactivation of *Giardia* and/or viruses exceptionally high?
- ☐ ☒ Was there a change in the mixing strategy (i.e., mixers not used, adjustment of tank level)?

H. Does your plant recycle spent filter backwash or other streams? ☐ Yes ☒ No

If NO, proceed to item I. If YES, answer the following questions for the period in which an OEL exceedance occurred:

Yes No

- ☐ ☐ Did a change in the recycle stream quality contribute to increased DBP precursor loading that was not addressed by treatment plant processes?
- ☐ ☐ Did a recycle event result in flows in excess of typical or design flows?

Treatment Process Evaluation Checklist

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- I. Do you inject a disinfectant after your clearwell to maintain a distribution system residual? ☐ Yes ☒ No

If NO, proceed to item J. If YES, answer the following questions for the period in which an OEL exceedance occurred:

Yes No

- ☐ ☐ Was there a sudden increase in the amount of chlorine fed?
- ☐ ☐ Was there a switch from chloramines to free chlorine for a burnout period?
- ☐ ☐ If using chloramines, was the chlorine to ammonia ratio in the proper range?
- ☐ ☐ Was there a problem with either chlorine or ammonia mixing?

- J. Did concern about complying with a rule other than Stage 2 DBPR, such as the Lead and Copper rule, the LT2ESWTR, or any other rule constrain your options to reduce the DBP levels at this site? For example, are you limited by other treatment targets/requirements in your ability to control precursors in coagulation/flocculation? ☐ Yes ☒ No

If NO, proceed to item K. If YES, explain below and consult EPA's *Simultaneous Compliance Guidance Manual* for alternative compliance approaches.

There is of course a balance - more chlorine for SWTR and TCR, and less chlorine for DBPR and LCR.

K. Conclusion

Did treatment factors and/or variations in the plant performance contribute to the OEL exceedance(s)?

☐ Yes ☒ No

☐ Possibly

If YES or POSSIBLY, explain below.

There were no significant variations in treatment plant performance.

As one factor that can be controlled, the chlorine dosing and residual concentration have been reduced, while maintaining more than enough chlorine to exceed all disinfection requirements.

* For both 8/9/2021 and 11/10/2021 DBP sampling

Distribution System Evaluation Checklist		Page 1 of 2
System Name: <u>Housatonic Water Works Company</u> Checklist Completed by: <u>Richard Gullick (Water Compliance Solutions, Inc.)</u> Date: <u>1/31/2022</u>		
A. Do you have disinfectant residual or temperature data for the monitoring location where you experienced the OEL exceedance? If NO, proceed to item B. If YES, answer the following questions for the period in which an OEL exceedance occurred: Yes No <input type="checkbox"/> <input checked="" type="checkbox"/> Was the water temperature higher than normal for that time of the year at that location? <input type="checkbox"/> <input checked="" type="checkbox"/> Was the disinfectant residual lower than normal for that time of the year at that location? <input checked="" type="checkbox"/> <input type="checkbox"/> Was the disinfectant residual higher than normal for that time of the year at that location?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <i>not exactly there, but data available for nearby</i> <i>Slightly so for August - see attached plot</i>	
B. Do you have maintenance records available for the time period just prior to the OEL exceedance? If NO, proceed to item C. If YES, answer the following questions: Yes No <input type="checkbox"/> <input checked="" type="checkbox"/> Did any line breaks or replacements occur in the vicinity of the exceedance? <input type="checkbox"/> <input checked="" type="checkbox"/> Were any storage tanks or reservoirs taken off-line and cleaned? <input checked="" type="checkbox"/> <input type="checkbox"/> Did flushing or other hydraulic disturbances (e.g., fires) occur in the vicinity of the exceedance? <input checked="" type="checkbox"/> <input type="checkbox"/> Were any valves operated in the vicinity of the OEL exceedances?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
C. If your system is metered, do you have access to historical records showing water use at individual service connections? If NO, proceed to item D. If YES, was overall water use in your system unusually low, indicating higher than normal water age?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
D. Do you have high-volume customers in your system (e.g., an industrial processing plant)? If NO, proceed to item E. If YES, was there a change in water use by a high-volume customer?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No	
E. Is there a finished water storage facility hydraulically upstream from the monitoring location where you experienced the OEL exceedance? If NO, proceed to item F. If YES, review storage facility operations and water quality data to answer the following questions for the period in which the OEL exceedance occurred: Yes No <input checked="" type="checkbox"/> <input type="checkbox"/> Was a disinfectant residual detected in the stored water or at the tank outlet? <input type="checkbox"/> <input checked="" type="checkbox"/> Do you know of any mixing problems with the tank or reservoir? <i>(no mixer)</i> <input type="checkbox"/> <input checked="" type="checkbox"/> Does the facility operate in "last in-first out" mode? <i>- In at top, out at bottom</i> <input type="checkbox"/> <input checked="" type="checkbox"/> Was the tank or reservoir drawn down more than usual prior to OEL exceedance, indicating a possible discharge of stagnant water? <input type="checkbox"/> <input checked="" type="checkbox"/> Was there a change in water level fluctuations that would have resulted in increased water age within the tank or reservoir?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

Distribution System Evaluation Checklist

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F. Does your system practice booster chlorination? ☐ Yes ☒ No

If NO, proceed to item G. If YES, was there an increase in booster chlorination feed rates?

☐ Yes ☐ No

G. Did you have customer complaints in the vicinity of the OEL exceedance? ☒ Yes ☐ No

If NO, proceed to item H. If YES, explain.

Complaints were received related to colored water in summer and early fall 2021, caused by high manganese. Raw water manganese levels were high in August, then low in November.

H. Did concern about complying with a rule other than Stage 2 DBPR, such as the Lead and Copper rule, the TCR, or any other rule constrain your options to reduce the DBP levels at this site? For example, are you limited by the need to maintain a detectable disinfectant residual in your ability to control DBP levels in the distribution system? ☐ Yes ☒ No

If NO, proceed to item I. If YES, explain below and consult EPA's *Simultaneous Compliance Guidance Manual* for alternative compliance approaches.

There is of course a balance - more chlorine for SWTR and TCR, and less chlorine for DBPR and LCR.

I. Conclusion

Did the distribution system cause or contribute to the OEL exceedance(s)?

☐ Yes ☐ No

☒ Possibly

If NO, proceed to evaluations of treatment systems and source water. If YES or POSSIBLY, explain below.

There was a lot of flushing distribution system pipes due to the colored water in summer and fall 2021. Distribution system chlorine residuals were slightly higher than in recent history. Though these two factors may have contributed, it does

not seem likely that they would cause such an atypical increase in HAA5.