STATE OF NEW HAMPSHIRE

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June 7, 2021

Debra A. Howland, Executive Director
New Hampshire Public Utilities Commission
21 South Fruit Street, Suite 10
Concord, New Hampshire 03301-2429

Re: DW 21-072, Aquarion Water Company of New Hampshire, Inc.
Petition for Approval of Financing for a Long-Term Loan from the PFAS Remediation Loan Fund
Commission Staff Recommendation

Dear Ms. Howland:

On March 31, 2021, Aquarion Water Company of New Hampshire, Inc. (Aquarion or the Company) filed a Petition (Petition), pursuant to RSA 369:1 and Puc 609.03, for approval of financing for a $1,284,750 long-term loan from the New Hampshire Department of Environmental Services (DES) PFAS Remediation Loan Fund (PFAS RLF). [1] In combination with a grant of $428,250 from the DES administered Drinking Water and Groundwater Trust Fund, Aquarion plans to implement a solution to address PFAS concerns at its Mill Road well field (Mill Road).[2]

The Petition contained four requests: (1) find that the proposed loan of $1,284,750 is consistent with the public good; (2) approve the requested financing in the amount of $1,284,750 by issuing an order *nisi*, effective no later than June 30, 20201; (3) authorize the Company to do all things, take all steps, and execute and deliver all documents necessary or desirable to implement and carry out the proposed financing; and (4) approve any and all other relief as may be just and reasonable under these circumstances.

After review, Commission Staff (Staff) recommends that the Commission approve Aquarion's financing request of a long-term loan from the PFAS RLF of up to $1,284,750, at the terms described, or materially similar, in order to finance a solution to PFAS concerns at Mill Road.

As this is a financing request and the underlying project to be financed is not complete at the time of this recommendation, Staff, additionally, recommends that the Commission rule that approval

[1] "Per- and polyfluoroalkyl substances (PFAS) are a group of man-made chemicals that includes PFOA, PFOS, GenX, and many other chemicals." https://www.epa.gov/pfas/basic-information-pfas. "PFOA and PFOS… are very persistent in the environment and in the human body – meaning they don't break down and they can accumulate over time. There is evidence exposure to PFAS can lead to adverse human health effects." *Id.*

[2] As a grant is not considered a financing, grants do not normally require Commission approval per RSA 369:1-4.

of this financing does not limit or preclude the Commission from reviewing in a future rate case, directly, the prudence, use, and usefulness of any specific project funded with the subject financing proceeds. RSA 378:28; *Public Service Company of New Hampshire d/b/a Eversource Energy*, Order No. 26,483 at 5 (May 14, 2021).

Staff, lastly, recommends and respectfully requests that a Commission order be issued for an effective date no later than June 30, 2021 to allow the Company the opportunity to close on the loan by August 5, 2021, at which time thereafter the interest rate may potentially change.

I. Background and Petitioner's Positions

A. Request

On March 31, 2021, Aquarion requested authorization to secure a long-term loan of up to $1,284,750 from the PFAS RLF. Petition at 9. The Company intends to use the loan proceeds in conjunction with a DES grant in the amount of $428,250, in its efforts to implement a treatment solution to PFAS concerns at Mill Road. Petition at 9-15.

The Company stated that the funds would be used for a proposed project that includes "Granular Activated Carbon (GAC) treatment for Well 6, which is the well with the highest PFAS concentrations." Petition at 10.[3] "The project includes a new raw water main to isolate Well 6 water for treatment, GAC pressure vessels for PFAS removal, and building improvements for an existing garage," where the GAC vessels will be located. *Id.* According to an attached memorandum titled Conceptual Evaluation of GAC PFAS Treatment for Well 6, "[i]nstalling GAC treatment in the existing garage is the recommended approach to meet the goal of having treatment online by June 2021…[i]n addition, construction within the existing garage allows for future expansion to treat the additional wells, if required in the future." Petition at 21.

The finance request is inclusive of $161,432 already spent (related to planning and design and a deposit on the first pair of GAC vessels) and the remaining costs of the project. Petition at 2 and Staff 2-1. According to the Company's pre-filed testimony, the loan is consistent with the public good as it will enable the Company to continue to provide safe, adequate, and reliable water service to its customers. Petition at 19. The Company also submitted documentation of loan approval from the DES in the same amount. Petition at 36.

B. PFAS Concerns

The Company explained that since discovering relatively high PFAS measurements in Well 6 at Mill Road in 2017, the Company has been communicating regularly with local officials about the issue. Petition at 11 and Staff 1-9, Attachment 1. Since that time, the presence of PFAS at the Well Field has increased. *Id* at 25-26. Aquarion's mitigation efforts to date include reducing the output of

[3] Aquarion's engineering consultant, Tighe & Bond, presented four alternatives to address PFAS treatment for Well 6. Petition at 21, 28 and Staff 1-5, Attachment 1. According to the Company, the project selected, provides the most expedient solution, avoids the potential for failure to meet water demand this summer, maintains PFOA compliance, and allows for expansion to treat other wells in the future. Staff 1-5 and Staff 1-5, Attachment 1. The project selected, however, is also the greatest in terms of cost.

Well 6 and the blending of the water from Well 6 with other surrounding Company wells to reduce the concentration of PFAS introduced into the general water supply. *Id* at 11. The concentration of PFAS, however, has risen in the unblended water sourced from at least two other wells, 9 and 11, which are both down gradient from Well 6. *Id* at 11, 25-26. Aquarion explained that due to this down gradient, if Well 6 is not used or is relocated, "it can be expected that the "plume" [of PFAS] would simply progress towards Wells 11 and 9. *Id* at 21 and Staff 1-10. Further, the Company hopes the remediation efforts at Well 6 will lessen the PFAS impact on Well 9 and 11. *Id* at 11 and Staff 1-10.

The Company indicates that absent the treatment to remove PFAS, there will be a substantial loss of production capacity in just a few years. Petition at 10. Aquarion further contended that loss of production from these wells would be significant as Mill Road provided 48 percent of the Company's water production from 2017-2020. *Id*. The Company further stated that Well 6 alone provided 5 to 10 percent of total production during the high-demand months of June to August, and up to 10 to 15 percent of daily system production. *Id*.

According to the reasons and timeline stated above, the Company clarified through discovery that their goal is to have treatment online by June 2021, or at least for the 2021 peak water demand season to minimize operating risk (i.e. risk of not being able to meet water demands…). Staff 1-5. Completion of the project might not take place until approximately October or November of 2021. Staff 1-6.

The Company also submitted a letter from Mr. Randal Suozzo, P.E., from the DES Drinking Water & Groundwater Bureau. Petition at 45. The letter specifically mentioned the importance of Well 6, treatment of that well, and that the DES is "…in support of and recommend system modifications which will maintain the required supply of safe drinking water and reduce the risk to public health." *Id*. at 45.

C. Loan Terms

The requested financing is for a term of 25 years with an annual interest rate of 1.55 percent, if issued by August 5, 2021. Petition at 12-13. If the loan is not issued by that date, the rate may fluctuate. *Id* at 13. On August 5, 2021, the DES will establish a new interest rate, pursuant to its Env-Dw 1400 rules, based on the 11-Bond Index, published the last week of July in the Bond Buyer, provided by the New Hampshire treasury department. Staff 1-4.

Additional loan terms include; principal and interest payments to begin within one year of substantial project completion or the scheduled completion date; no prepayment penalty; and interest accrues for disbursed amounts on work already completed at 1 percent during the construction period, which can be paid separately or added to the loan balance, as long as the new balance does not exceed the DES approved limit of $1,284,750. Staff 1-3.

The Company also stated that one of the loan terms was possible principal reimbursement, up to 50 percent. Petition at 13-14. Reimbursement, however, is primarily contingent upon "judgments or settlements received by the state resulting from lawsuits against the manufacturers of PFAS." *Id*. at 14. Aquarion, lastly, stated if "insufficient funds are received by the state to cover 50 percent of the principal, the reimbursement shall be prorated." *Id*.

The Company requested an order *nisi* effective June 30, 2021. Petition at 5. The Company contends that would allow them to proceed to Governor and Executive Council (G&C) approval at its July 2021 meeting, which is required before the loan is executed. *Id* at 13. The projected timeline of necessary financing approvals from the DES, PUC, and G&C, would allow Aquarion, furthermore, to set the financing at the 1.55 percent interest rate before it is subject to potential change on August 5, 2021. *Id.*

The Company discussed other sources of financing, but argued that the terms offered by the PFAS RLF are the best as no other lender is currently able to match the 1.55 percent interest rate or the possible contingent principal reimbursement. Petition at 13-14. Therefore, the Company concluded that a loan from the PFAS RLF was the most attractive option. *Id.* In further support, Aquarion submitted financing approval from its Board of Directors. *Id*. at 43-44.

D. Rate Impact

The Company provided an estimate of the rate impact of the requested financing, as well as the impact of the other three potential PFAS solutions. Staff 1-1. According to the Company, the potential rate impact to an average, single-family, residential user would be an increase of $1.82 per month for the proposed project.[4] *Id*. The impacts of the remaining three scenarios, as presented to Aquarion by Tighe & Bond, on the monthly bill of an average, single-family, residential user, are $1.06, $1.14, and $1.39. *Id.*

E. Public Good

The Company contends that the loan is consistent with the public good as it will enable Aquarion to continue to provide safe, adequate and reliable water service to its customers. Petition at 19. The Company further stated that the water treatment project and its proposed financing through the PFAS RLF will provide the most cost-effective solution in support of the PFAS remediation. *Id*. Aquarion also argued that the terms of the financing through the RLF are very favorable compared to other alternatives. *Id*. The Company also stated that the possibility of up to 50 percent contingent reimbursement of the loan principal, resulted in lower financing costs than would be available through other current debt financing options. Aquarion, lastly, stated that the proposed debt financing will support moving toward a balanced capitalization ratio for the Company, which ultimately is favorable to customers as a less expensive option to an equity infusion. *Id*. at 19-20.

II. Staff Analysis

Pursuant to RSA 369:1, public utilities engaged in business in this state may issue evidence of indebtedness payable more than 12 months after the date thereof only if the Commission finds the proposed issuance to be "consistent with the public good." Analysis of the public good involves looking beyond the actual terms of the proposed financing to the use of the funds and the effect on rates to ensure the public good is protected. *Appeal of Easton*, 125 N.H. 205, 211 (1984). "[C]ertain financing related circumstances are routine, calling for more limited Commission review of the purposes and impacts of the financing, while other requests may be at the opposite end of the

[4] See Staff 1-1 The Company indicated an average, single-family, residential user having a typical 5/8" meter uses approximately 6 ccf of water per month.

spectrum, calling for vastly greater exploration of the intended uses and impacts of the proposed financing." *Lakes Region Water Company, Inc*., Order No. 25,753 (January 13, 2015) at 4-5, citing *Public Service Company of NH*, Order No. 25,050, 94 NH PUC 691, 699 (2009).

The Commission engages in a more limited review for routine financing requests. *Pennichuck Water Works, Inc.*, Order No. 26,247 at 4 (May 3, 2019). A routine request is one that "will have no discernable impact on rates or deleterious effect on capitalization, [and] in which the funds are to enable … investments appropriate in the ordinary course of utility operations." *Id*.

Staff examined the filing and recommends Commission approval as a routine financing. Staff contends that the Company has shown that the purpose of the funds, to treat water for PFAS chemicals, is a necessary investment in the ordinary course of utility operations as it is meant to enable the Company to provide safe, adequate and reliable water service to its customers. Petition at 2, 4. Further, the requested finance amount does not present a deleterious impact to the Company's capitalization; rather, the request moves the Company's capitalization closer to a 50:50 debt to equity ratio. Petition at 41. Lastly, Staff does not believe the potential increase of $1.82 per month to the average, single-family, residential customer disqualifies the Petition as a routine financing. Staff 1-1. As such, Staff supports a Commission analysis of the Petition as a routine financing.

Staff recognizes many factors the Company considered in requesting this financing; the importance of Mill Road in water production and meeting peak demands; the emergence of the PFAS "plume" since specific measurements began in 2017; the increased presence of those contaminants; and the temporary nature of past mitigation efforts, including reduced output and blending from Well 6. Petition at 10-11. Staff is also aware of the support from DES to find and implement a long-term solution to the PFAS concerns at Mill Road. *Id*. at 45.

Lastly, Staff agrees with the Company that the terms of the financing from the PFAS RLF are the most economically attractive terms. The other financing options discussed were not as favorable, from both an interest rate and from the possibility of the contingent principal reimbursement perspective. Staff agrees that any other financing option would only increase the resulting rate impact to the customers. Additionally, there is no evidence that such an increase in financing costs would provide any additional benefits to the customers. Petition at 12-14.

Staff, however, does not make its recommendation based upon the possibility of principal reimbursement as it is too remote and intangible for Staff to consider in its analysis. As the Company explained, there are several requirements that must be met and steps taken before this loan is eligible and receives such a reimbursement. Petition at 14. Further, such reimbursement may be any amount between 0 and 50 percent of the remaining principal balance, if a reimbursement is ever awarded, and would only result in a decrease to the rate impact. *Id.* Lastly, as this request is only for the financing, the issue of principal reimbursement should not be considered a factor as it is more appropriately reviewed when the Company petitions for recovery of the final costs through customer rates.

For these reasons, Staff concludes that Aquarion has demonstrated that the proposed use of funds is appropriate, and that the financing is consistent with the public good and should be authorized, pursuant to RSA 369:1 and RSA 369:4. Furthermore, Staff concludes that the financing is consistent with Aquarion's duty to provide safe and adequate water service, per RSA 374:1, and that

the financing, inclusive of amounts already spent, allows the Company to continue making investments in the ordinary course of utility service. As such, Staff recommends Commission approval of the financing.

As this is a financing request and the underlying project to be financed is not complete at the time of this recommendation, Staff, additionally, recommends that the Commission rule that approval of this financing does not limit or preclude the Commission from reviewing in a future rate case, directly, the prudence, use, and usefulness of any specific project funded with the subject financing proceeds. RSA 378:28; *Public Service Company of New Hampshire d/b/a Eversource Energy*, Order No. 26,483 at 5 (May 14, 2021).

III. Summary

Staff supports Commission approval of the Company's financing request for the above-mentioned reasons and with Staff's additions.

Finally, Staff respectfully requests that a Commission order in this docket be issued with an effective date no later than June 30, 2021 to afford the Company the opportunity to obtain the loan terms discussed.

Thank you for your attention and assistance with this matter. If you have any further questions, please do not hesitate to contact me.

Sincerely,

/s/ *Anthony J. Leone*

Anthony J. Leone
Utility Analyst

cc: Service List

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 1

Data Request Received: April 14, 2021 Date of Response: April 26, 2021
Request No.: Staff 1-1 Witness: J. Walsh / D. Smiarowski

REQUEST: **Petition and Bates number 21**
Please provide, and explain, the monthly bill impact to an average residential customer of the Company for all of the options presented to the Company by Tighe & Bond (Bates number 21) clearly indicating which option the Company chose. Please provide the figures exclusive of the possibility of the contingent principal reimbursement.

RESPONSE: The monthly bill impact to an average residential customer using a 5/8" meter and consuming 6 CCF per month is summarized in the table below. Refer to Staff 1-1 Attachment 1 for supporting calculations.

		Existing Garage		**New Garage**	
		8' 1 pair	**8' 2 pair**	**8' 1 pair**	**8' 2 pair**
			Chosen Option		
Service charge	$ 15.60	$ 15.60	$ 15.60	$ 15.60	$ 15.60
Rate per CCF	$ 4.536	$ 27.22	$ 27.22	$ 27.22	$ 27.22
WICA	7.50%	$ 3.21	$ 3.21	$ 3.21	$ 3.21
Mthly bill @ current authorized rates		$ 46.03	$ 46.03	$ 46.03	$ 46.03
Rate impact of project		3.01%	3.98%	2.31%	2.48%
Proforma monthly bill		$ 47.41	$ 47.85	$ 47.09	$ 47.17
Monthly bill impact		$ 1.39	$ 1.82	$ 1.06	$ 1.14

Aquarion Water Company of New Hampshire
Staff 1-1 Attachment 1
DW 21-072

MONTHLY BILL IMPACT - OPTION EXISTING GARAGE - 8' VESSELS (1 PAIR)

Line No.	Account Description	Project Impact	UOI Impact	Proforma
1				
2	PFAS Treatment	$ 1,200,000		
3	Grant / loan reimbursement			
4	Net Plant Investment	1,200,000		
5				
6	Authorized weighted cost of debt	3.58%		
7	Authorized Return on Rate Base	7.49%		
8	Revenue conversion factor	1.3714		
9				
10	Operating Revenues	$ -	$ 230,271	$ 230,271
11	Operating expenses	60,250		60,250
12	Depreciation	37,920		37,920
13	Property tax	24,816		24,816
14	Income Taxes	(44,956)	62,364	17,408
15	Total Operating Expense	$ 78,030	$ 62,364	$ 140,394
16				
17	Utility Operating Income	$ (78,030)	$ 167,907	$ 89,877
18				
19				
20				
21	**Tax Calculation**			
22	Income before Income Taxes	$ (122,986)		$ 107,285
23	Interest Expense @ cost of total debt	(43,008)		(43,008)
24	State Taxable Income bef loan grant	$ (165,994)		$ 64,277
25	Loan grant/reimbursement	-		-
26	State Taxable Income	$ (165,994)		$ 64,277
27	State Income Tax at 7.7%	(12,782)		4,949
28				
29	Federal Taxable Income	(153,213)		59,328
30	Federal Income Tax at 21%	(32,175)		12,459
31				
32	Total Income Taxes	$ (44,956)		$ 17,408
33				
34				
35				
36	Total authorized revenue			$ 7,650,000
37	PFAS project without grant and reimbursement [line 10 / line 36]			3.01%
38				
39	**Typical Bill for a residential customer with 5/8" and monthly consumption of 6 ccf**			
40	Service charge	$ 15.60		$ 15.60
41	Rate per CCF	$ 4.536		$ 27.22
42	WICA	7.50%		$ 3.21
43	At current authorized rates			$ 46.03
44	Rate impact of project [line 37]			3.01%
45	Proforma monthly bill			$ 47.41
46	Monthly bill impact [line 45- line 43]			$ 1.39

MONTHLY BILL IMPACT - OPTION EXISTING GARAGE - 8' VESSELS (2 PAIR)

SELECTED OPTION

Line No.	Account Description	Project Impact	UOI Impact	Proforma
1				
2	PFAS Treatment	$ 1,713,000		
3	Grant / loan reimbursement			
4	Net Plant Investment	1,713,000		
5				
6	Authorized weighted cost of debt	3.58%		
7	Authorized Return on Rate Base	7.49%		
8	Revenue conversion factor	1.3714		
9				
10	Operating Revenues	$ -	$ 302,956	$ 302,956
11	Operating expenses	60,250		60,250
12	Depreciation	54,131		54,131
13	Property tax	35,425		35,425
14	Income Taxes	(57,199)	82,050	24,850
15	Total Operating Expense	$ 92,607	$ 82,050	$ 174,656
16				
17	Utility Operating Income	$ (92,607)	$ 220,907	$ 128,300
18				
19				
20				
21	**Tax Calculation**			
22	Income before Income Taxes	$ (149,806)		$ 153,150
23	Interest Expense @ cost of total debt	(61,394)		(61,394)
24	State Taxable Income bef loan grant	$ (211,200)		$ 91,756
25	Loan grant/reimbursement	-		-
26	State Taxable Income	$ (211,200)		$ 91,756
27	State Income Tax at 7.7%	(16,262)		7,065
28				
29	Federal Taxable Income	(194,938)		84,691
30	Federal Income Tax at 21%	(40,937)		17,785
31				
32	Total Income Taxes	$ (57,199)		$ 24,850
33				
34				
35				
36	Total authorized revenue			$ 7,650,000
37	PFAS project without grant and reimbursement [line 10 / line 36]			3.96%
38				
39	**Typical Bill for a residential customer with 5/8" and monthly consumption of 6 ccf**			
40	Service charge	$ 15.60		$ 15.60
41	Rate per CCF	$ 4.536		$ 27.22
42	WICA	7.50%		$ 3.21
43	At current authorized rates			$ 46.03
44	Rate impact of project [line 37]			3.96%
45	Proforma monthly bill			$ 47.85
46	Monthly bill impact [line 45- line 43]			$ 1.82

Aquarion Water Company of New Hampshire
Staff 1-1 Attachment 1
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MONTHLY BILL IMPACT - OPTION NEW GARAGE - 8' VESSELS (1 PAIR)

Line No.	Account Description	Project Impact	UOI Impact	Proforma
1				
2	PFAS Treatment	$ 920,588		
3	Grant / loan reimbursement			
4	Net Plant Investment	920,588		
5				
6	Authorized weighted cost of debt	3.58%		
7	Authorized Return on Rate Base	7.49%		
8	Revenue conversion factor	1.3714		
9				
10	Operating Revenues	$ -	$ 176,713	$ 176,713
11	Operating expenses	46,279		46,279
12	Depreciation	29,091		29,091
13	Property tax	19,038		19,038
14	Income Taxes	(34,504)	47,859	13,355
15	Total Operating Expense	$ 59,904	$ 47,859	$ 107,763
16				
17	Utility Operating Income	$ (59,904)	$ 128,853	$ 68,950
18				
19				
20				
21	**Tax Calculation**			
22	Income before Income Taxes	$ (94,408)		$ 82,305
23	Interest Expense @ cost of total debt	(32,994)		(32,994)
24	State Taxable Income bef loan grant	$ (127,402)		$ 49,311
25	Loan grant/reimbursement	-		-
26	State Taxable Income	$ (127,402)		$ 49,311
27	State Income Tax at 7.7%	(9,810)		3,797
28				
29	Federal Taxable Income	(117,592)		45,514
30	Federal Income Tax at 21%	(24,694)		9,558
31				
32	Total Income Taxes	$ (34,504)		$ 13,355
33				
34				
35				
36	Total authorized revenue			$ 7,650,000
37	PFAS project without grant and reimbursement [line 10 / line 36]			2.31%
38				
39	**Typical Bill for a residential customer with 5/8" and monthly consumption of 6 ccf**			
40	Service charge	$ 15.60		$ 15.60
41	Rate per CCF	$ 4.536		$ 27.22
42	WICA	7.50%		$ 3.21
43	At current authorized rates			$ 46.03
44	Rate impact of project [line 37]			2.31%
45	Proforma monthly bill			$ 47.09
46	Monthly bill impact [line 45- line 43]			$ 1.06

Aquarion Water Company of New Hampshire
Staff 1-1 Attachment 1
DW 21-072

MONTHLY BILL IMPACT - OPTION NEW GARAGE - 8' VESSELS (2 PAIR)

Line No.	Account Description	Project Impact	UOI Impact	Proforma
1				
2	PFAS Treatment	$ 1,011,264		
3	Grant / loan reimbursement			
4	Net Plant Investment	1,011,264		
5				
6	Authorized weighted cost of debt	3.58%		
7	Authorized Return on Rate Base	7.49%		
8	Revenue conversion factor	1.3714		
9				
10	Operating Revenues	$ -	$ 189,560	$ 189,560
11	Operating expenses	46,279		46,279
12	Depreciation	31,956		31,956
13	Property tax	20,913		20,913
14	Income Taxes	(36,668)	51,338	14,670
15	Total Operating Expense	$ 62,480	$ 51,338	$ 113,818
16				
17	Utility Operating Income	$ (62,480)	$ 138,221	$ 75,741
18				
19				
20				
21	**Tax Calculation**			
22	Income before Income Taxes	$ (99,148)		$ 90,412
23	Interest Expense @ cost of total debt	(36,244)		(36,244)
24	State Taxable Income bef loan grant	$ (135,392)		$ 54,168
25	Loan grant/reimbursement	-		-
26	State Taxable Income	$ (135,392)		$ 54,168
27	State Income Tax at 7.7%	(10,425)		4,171
28				
29	Federal Taxable Income	(124,967)		49,997
30	Federal Income Tax at 21%	(26,243)		10,499
31				
32	Total Income Taxes	$ (36,668)		$ 14,670
33				
34				
35				
36	Total authorized revenue			$ 7,650,000
37	PFAS project without grant and reimbursement [line 10 / line 36]			2.48%
38				
39	**Typical Bill for a residential customer with 5/8" and monthly consumption of 6 ccf**			
40	Service charge	$ 15.60		$ 15.60
41	Rate per CCF	$ 4.536		$ 27.22
42	WICA	7.50%		$ 3.21
43	At current authorized rates			$ 46.03
44	Rate impact of project [line 37]			2.48%
45	Proforma monthly bill			$ 47.17
46	Monthly bill impact [line 45- line 43]			$ 1.14

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 1

Data Request Received: April 14, 2021 Date of Response: April 26, 2021
Request No.: Staff 1-2 Witness: J. Walsh / D. Smiarowski

REQUEST: **Petition at 1 and Testimony of John Walsh and Donald Smiarowski (Bates number 13, 14)**
The Company's petition describes the possibility of "up to 50 percent contingent reimbursement of the loan." Bates number 1. Please explain further the following questions and the effect on the Company and rate-payers if the Company was awarded principal reimbursement:

a) The effect, if any, on the loan terms and monthly repayment amount; and
b) The effect, if any, on the monthly bill impact of an average residential customer; and
c) The effect, if any, on the Company's Net Utility Plant, CIAC, and associated depreciation; and
d) The effect, if any, on the taxes of the Company.

RESPONSE:

a) Any contingent reimbursement amounts will decrease the principal amount owed.At the time of award, if the remaining principal is less than the award amount then the difference shall be reimbursed. However, if the remaining principal is larger than the reimbursement, then the monthly payments would remain the same but the loan term would be decreased. The loan may be repaid in whole or in part prior to the stipulated date with no repayment penalty.

b) Customer rates would not be changed outside of a general rate proceeding. The Company has prepared Staff 1-2 Attachment to demonstrate the proforma impact of a 50 percent reimbursement of the loan. As stated in response d.) below, a contingent reimbursement will result in an increase to the Company's federal taxes. In the pro-forma demonstration, the Company has included an assumption that the financial impact of the increased taxes would be amortized over a period of 5 years to reflect a more reasonable effective tax rate. The resulting monthly bill impact is an increase of $1.28, a $0.54 reduction to the $1.82 bill impact increase reported in Staff 1-1, which did not assume any loan reimbursement

c) Any contingent reimbursement of the loan will result in a reduction of the Company's Net Utility Plant, as the reimbursement will be recorded as CIAC, and depreciation expense.

Data Request Received: April 14, 2021 Date of Response: April 26, 2021
Request No.: Staff 1-2 Witness: J. Walsh / D. Smiarowski

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d) Any contingent reimbursement of the loan will be taxable income to the Company in accordance with IRS Section 118 and will result in an increase to the Company's federal tax expense.

PROFORMA MONTHLY BILL IMPACT - OPTION EXISTING GARAGE - 8' VESSELS (2 PAIR)

with 50% loan reimbursement

Line No.	Account Description		Project Impact	UOI Impact	Proforma
1					
2	PFAS Treatment	$	1,713,000		
3	Grant / loan reimbursement		(1,070,625)		
4	Net Plant Investment		642,375		
5					
6	Authorized weighted cost of debt		3.58%		
7	Authorized Return on Rate Base		7.49%		
8	Revenue conversion factor		1.3714		
9					
10	Operating Revenues	$	-	$ 212,931	$ 212,931
11	Operating expenses		60,250		60,250
12	Depreciation		20,299		20,299
13	Property tax		13,284		13,284
14	Income Taxes		13,318	57,668	70,986
15	Total Operating Expense	$	107,151	$ 57,668	$ 164,819
16					
17	Utility Operating Income	$	(107,151)	$ 155,263	$ 48,111
18					
19					
20					
21	**Tax Calculation**				
22	Income before Income Taxes	$	(93,833)		$ 119,098
23	Interest Expense @ cost of total debt		(23,023)		(23,023)
24	State Taxable Income	$	(116,856)		$ 96,075
25	State Income Tax at 7.7%		(8,998)		7,398
26	Federal Taxable Income		(107,858)		88,676.92
27	Loan grant/reimbursement		1,070,625		1,070,625
28	Amortize recovery from rate payer	5	214,125		214,125
29					
30	Federal Taxable Income after CIAC [Line 26+ Line 28]		106,267		302,802
31	Federal Income Tax at 21%		22,316		63,588
32	Total Income Taxes	$	13,318		$ 70,986
33					
34					
35					
36	Total authorized revenue				$ 7,650,000
37	PFAS project without grant and reimbursement [line 10 / line 36]				2.78%
38					
39	**Typical Bill for a residential customer with 5/8" and monthly consumption of 6 ccf**				
40	Service charge	$	15.60		$ 15.60
41	Rate per CCF	$	4.536		$ 27.22
42	WICA		7.50%		$ 3.21
43	At current authorized rates				$ 46.03
44	Rate impact of project [line 37]				2.78%
45	Proforma monthly bill				$ 47.31
46	Monthly bill impact [line 45- line 43]				$ 1.28

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 1

Data Request Received: April 14, 2021 Date of Response: April 26, 2021
Request No.: Staff 1-3 Witness: J. Walsh / D. Smiarowski

REQUEST: **Petition at 1**
Please verify the terms of the loan, including:
a) When loan repayment commences;
b) If interest accrues during the project construction period, and at what interest rate;
c) If interest accrues, how is the accrued interest accounted for; and
d) If available, how excess loan proceeds will be accounted for if the cost of the project is lower than expected.

RESPONSE:

a.) Principal and interest payments will begin within one year of substantial project completion or the scheduled completion date. The loan may be repaid in whole or in part prior to the stipulated date with no repayment penalty.

b.) Interest accrues only for the amount disbursed for work already completed at a rate of 1% during the project construction period. Disbursement requests can be made monthly. The interest accrued during the construction period can be paid prior to the beginning of repayment, at the time of the first payment and/or be added to the outstanding principal (as long as balance does not exceed $1,284,750).

c.) The interest would be accounted for as interest expense. As stated above, the interest during construction can be paid prior to the beginning of repayment, at the time of the first payment, and/or be added to the outstanding principal (as long as the balance does not exceed the approved amount of the loan ($1,284,750). Any amounts above the approved loan amount will be borne by the Company.

d.) The loan repayment schedule will be based on the final project cost. Excess loan proceeds, if any, will go back into the PFAS RLF.

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 1

Data Request Received: April 14, 2021 Date of Response: April 26, 2021
Request No.: Staff 1-4 Witness: J. Walsh / D. Smiarowski

REQUEST: **Petition at 1 and Testimony of John Walsh and Donald Smiarowski (Bates number 13)** Relative to the 1.55% interest rate:

a) Please explain how DES established the current 1.55% interest rate; and
b) Please explain how DES will establish an interest rate subsequent to August 5, 2021.

RESPONSE:

a.) DES establishes the interest rates for all loans annually on the first Thursday in August based on the 11-Bond Index ("BB11") published the last week of July in The Bond Buyer, as provided by the New Hampshire treasury department. The Bond Buyer is a daily finance newspaper that covers the municipal bond market and tracks 40 highly-rated, long-term municipal bonds. The Bond Buyer publishes the BB11 for use as a benchmark in tracking municipal bond yields. This is how the current rate was established on August 6, 2020.

b.) The new rate will be established using the same methodology by DES on August 5, 2021. and every subsequent first Thurday in August.

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 1

Data Request Received: April 14, 2021 Date of Response: April 26, 2021
Request No.: Staff 1-5 Witness: John Walsh

REQUEST: **Petition at 3, 5, 10**
The Company requests approval of the financing by Order *Nisi* effective no later than June 30, 2021. Bates number 5. Aquarion also states that the proposed financing "will finance the project at a favorable interest rate of 1.55 percent if issued by August 5." Bates number 3. In pre-filed testimony, the Company further claims that "[a]bsent treatment to remove PFAS, the practical effect will be a substantial loss of production capacity in just a few **years**." Bates number 10. (Emphasis Added)

Given the timeframe related to the loss in production capacity stated above of "years," please provide and discuss all reasons for the necessity of an Order *Nisi*, effective June 30, 2021, aside from the possible change in the interest rate on August 5, 2021.

RESPONSE:

Please refer to Staff 1-5 Attachment 1 for Tighe and Bond's Addendum to the *Conceptual Evaluation of GAC PFAS Treatment for Well 6 dated February 2021,* and the Company's petition in this matter, Exhibit JPW-1 (Bates pages 21- 33). As described in section 1.3 of Staff 1-5 Attachment 1, the goal is to have PFAS treatment for Well 6 online for the 2021 peak water demand season to minimize operating risk (i.e. risk of not being able to meet water demands and risk of non-compliance in 2021 with PFOA MCL) resulting from the reduced production from Well 6, as well as currently increasing PFAS concentrations in Wells 6 and 11.

Well 6 production capacity has already been reduced in order to comply with the PFOA MCL. If PFOA concentrations continue to increase, additional reductions in production will be required to maintain compliance with the PFOA MCL. Under current supply conditions (i.e. see Available Water By Source in Staff 1-5 Attachament 1, Table 1-2), the system does not have adequate supply to meet maxium day demands with the largest well out-of-service, as suggested by the "Ten States" Recommended Standards for Water Works, used as a guideline by DES. Thus, loss of a well during a peak demand period this year could result in the Company not being able to meet water demands without risking non-compliance with the PFOA MCL. Having PFAS treatment in operation for Well 6 will allow the Company to use this well at its full capacity, which will mitigate the risk of not being able to meet water demands this summer.

The goal of having treatment online by June 2021 does not correspond to the timeline for the loan, as construction is expected to commence prior to loan approval and construction costs prior to loan approval will remain eligible for reimbursement under the loan program.

MEMORANDUM

Tighe&Bond

Conceptual Evaluation of GAC PFAS Treatment for Well 6 - Addendum

TO: Mark Fois, Aquarion Water Company

FROM: James Collins, Tighe and Bond

COPY: Carl McMorran , Aquarion Water Company; Peter Galant, Tighe and Bond

DATE: April 21, 2021

This memorandum is an addendum to the *Conceptual Evaluation of GAC PFAS Treatment for Well 6* (Tighe and Bond, February 2021) to provide additional information and clarification of the recommended alternative.

1.1 History

Aquarion Water Company has been monitoring per- and poly-fluoroalkyl substances (PFAS) in the Hampton system since 2014. During sampling in 2016 and 2017, PFAS were detected in 15 of the 16 production wells. In 2017 Aquarion retained the services of Tighe and Bond to assist with evaluating PFAS management strategies. An initial feasibility study was conducted in 2017 to evaluate PFAS blending and treatment alternatives [*Mill Rd PFC Treatment Analysis* (Tighe and Bond, November 2017)]. Based on that evaluation, granular activated carbon (GAC) and ion exchange (IX) were identified as recommended treatment technologies. In 2018, bench-scale testing of GAC and IX was performed and a preliminary design was prepared to better define treatment costs for PFAS [*Mill Rd PFAS Preliminary Treatment Analysis: Results from Bench-Scale Testing* (Tighe and Bond, July 2018)]. The preliminary design evaluated options for treating Well 6 with expansion to include the other Mill Road wells. Bench-scale testing confirmed that GAC can effectively treat the Mill Road wells, but the IX results were not consistent with other available data. Pilot-scale testing was then completed from August 2018 to October 2019 to further refine GAC replacement frequencies and evaluate IX treatment performance [*Mill Rd PFAS Preliminary Treatment Analysis: Results from Bench-Scale and Pilot-scale Testing* (Tighe and Bond, September 2019)]. The pilot-scale testing results showed that GAC was the most effective treatment technology for removing all PFAS compounds present in the Mill Road wells.

While conducting treatment evaluations, Aquarion maximized non-treatment alternatives to provide the highest quality water to its customers while minimizing capital investments. In 2018, Aquarion moved forward with the design and construction of raw water mains to enable the blending of the water from all the Mill Road wells before the water entered the distribution system. Previously, the well field had four separate points of entry (POEs) to the distribution system. With the new piping, all six wells were combined to provide blending of the higher PFAS wells with water from wells with lower concentrations prior to the distribution system. Operations of Well 6 was also updated to be the last well turned on and first well turned off, based on demand, to reduce PFAS concentrations in the distribution system.

In 2019, the New Hampshire Department of Environmental Services (NHDES) adopted enforceable drinking water regulations for four PFAS with an effective date of September 30, 2019. However, in December 31, 2019, a court ruling barred enforcement of these regulations. While being reviewed by the courts, legislation was signed in July 2020 that established enforceable PFAS Maximum Contaminant Levels (MCLs) in New Hampshire.

Based on testing in January 2020 at the POE for the Mill Road well field, the PFOA concentration (one of the four regulated PFAS) was higher than the New Hampshire MCL and complying with the MCL could not be achieved by blending without also reducing the production of Well 6. MCL compliance is based on a running annual average an a single sample does not represent an MCL violation. With reducing the Well 6 capacity to 200 gpm, the PFOA concentrations were below the MCL in subsequent quarterly samples allowing the running annual average to remain below the MCL.

In the summer of 2020, Tighe and Bond evaluated temporary PFAS treatment systems for Well 6 [*Mill Rd Temporary PFAS Treatment* (Tighe and Bond, August 2020)] to provide treatment while a permanent WTP was designed and constructed per the preliminary design [*Mill Rd PFAS Preliminary Treatment Analysis: Results from Bench-Scale and Pilot-scale Testing* (Tighe and Bond, September 2019)]. The rental system costs were estimated to be between approximately $200,000 and $600,000 depending on the need for winterization and the overall duration of the rental for up to 2 years of rental fees. Temporary treatment would result in high operational costs on an annual basis and was not selected in leu of a more permanent solution. Tighe and Bond then evaluated the options that would provide simplified designs and reduce construction schedules and costs, when compared to the preliminary design approach, with the goal of having treatment online by June for the 2021 peak demand season [*Conceptual Evaluation of GAC PFAS Treatment for Well 6* (Tighe and Bond, February 2021)]. Planning also considered future flexibility for expansion to include Wells 9 and 11 based on increasing PFAS trends. Section 1.3 provides additional information regarding the construction schedule.

1.2 PFAS Concentrations

Figures 1-1 through 1-5 and Table 1-1 present updated NH regulated PFAS concentrations in the Mill Road production wells and combined entry point to the distribution system (Mill Road WTP) including samples collected in December 2020 through March 2021 that were not available when the February 8, 2021 memo was written. Well 6 continues to have the highest measured concentration of individual compounds as well as total concentrations. In addition, Well 11 PFOA concentrations have increased and were higher than the PFOA MCL in March 2021.

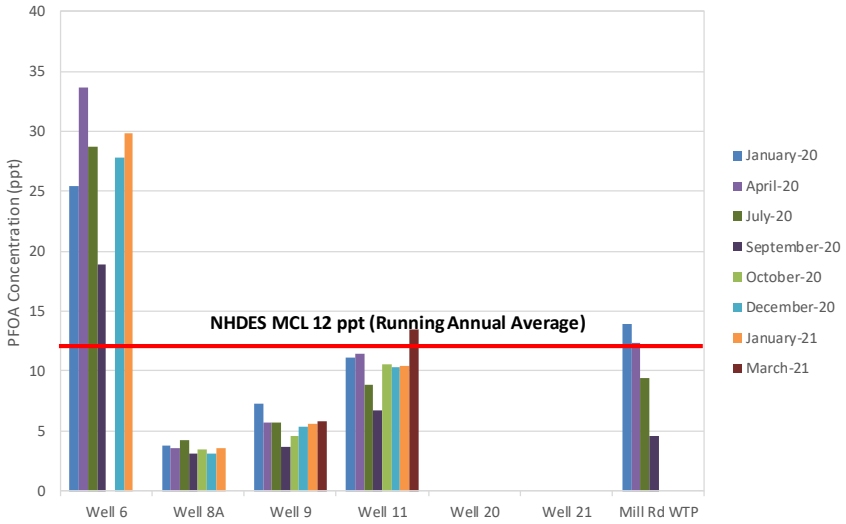

Figure 1-1: PFOA: Mill Road Wells 2020-2021 (Note: Samples with non-detect PFAS concentrations are not included on the Figure. Not all locations were sampled for all dates.)

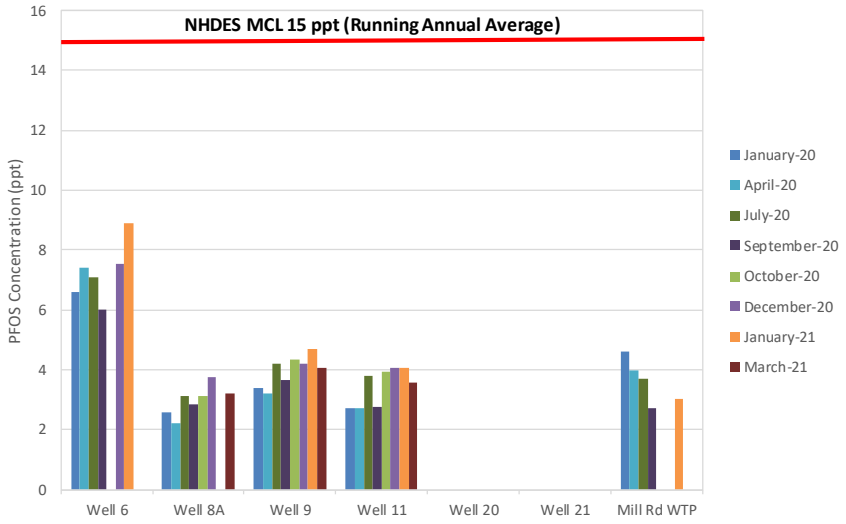

Figure 1-2: PFOS Mill Road Wells 2020-2021 (Note: Samples with non-detect PFAS concentrations are not included on the Figure. Not all locations were sampled for all dates.)

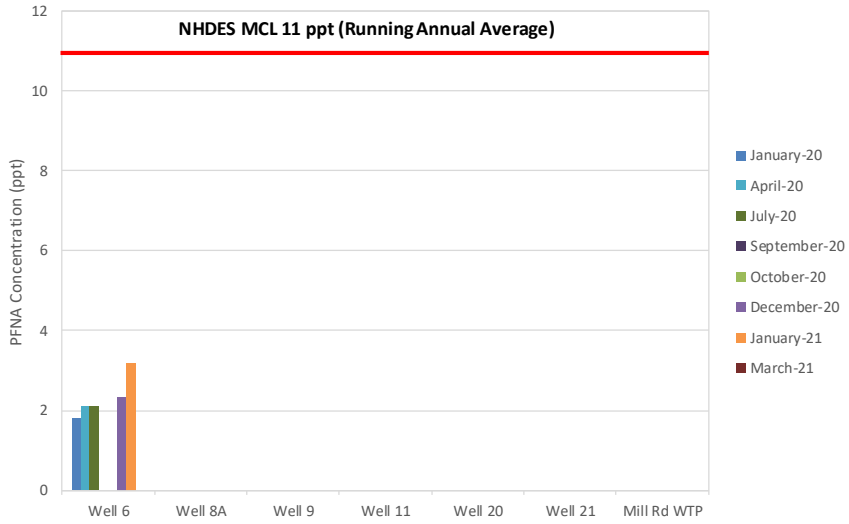

Figure 1-3: PFNA Mill Road Wells 2020-2021 (Note: Samples with non-detect PFAS concentrations are not included on the Figure. Not all locations were sampled for all dates.)

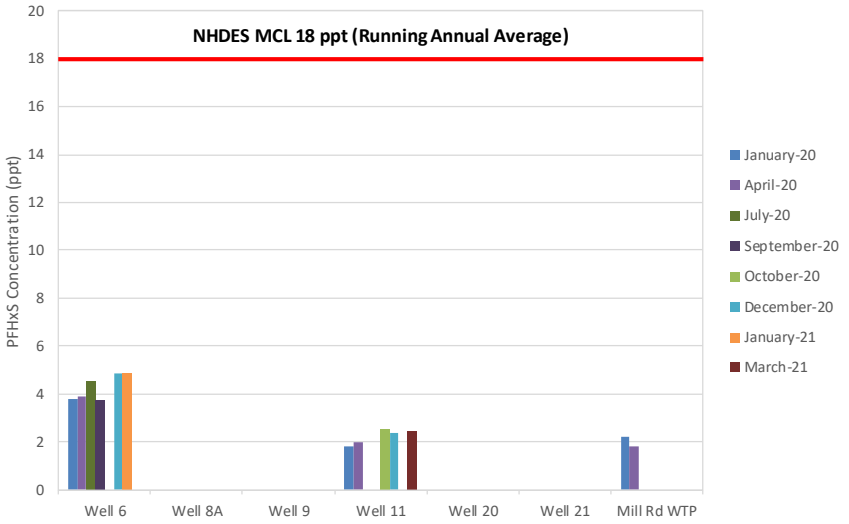

Figure 1-4: PFHxS Mill Road Wells 2020-2021 (Note: Note: Samples with non-detect PFAS concentrations are not included on the Figure. Not all locations were sampled for all dates.)

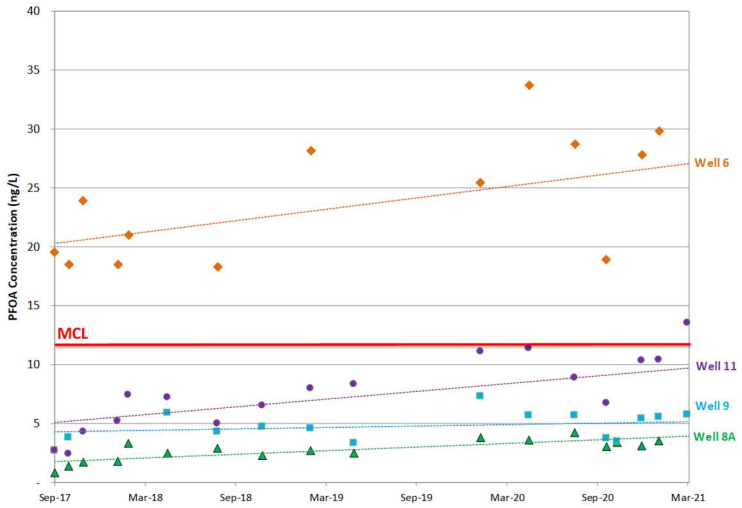

Figure 1-5: Increasing PFOA Trends in Mill Road Wells (2017 – 2021)

TABLE 1-1
Mill Road Well Field PFOA Concentrations

	PFOA Concentrations (ppt)[1]			
Date	**Well 6**	**Well 8A**	**Well 9**	**Well 11**
9/19/2017	19.5	0.8	2.7	2.7
10/17/2017	18.5	1.4	3.8	2.4
11/15/2017	23.9	1.7	no data	4.3
1/23/2018	18.5	1.8	no data	5.2
2/13/2018	21.0	3.3	no data	7.4
5/2/2018	no data	2.5	5.9	7.2
8/9/2018	18.3	2.9	4.3	5.0
11/7/2018	no data	2.3	4.7	6.5
2/11/2019	28.1	2.7	4.6	8.0
5/7/2019	no data	2.5	3.3	8.3
1/14/2020	25.4	3.8	7.3	11.1
4/20/2020	33.7	3.6	5.7	11.4
7/20/2020	28.7	4.2	5.7	8.9
9/21/2020	18.9	3.1	3.7	6.7
10/12/2020	no data	3.4	3.5	no data
12/1/2020	27.8	no data	no data	10.3
12/07/2020	no data	no data	5.4	no data
1/4/2021	no data	3.1	5.6	10.4
1/29/2021	29.8	no data	no data	no data
3/2/2021	no data	3.6	5.8	13.5

[1] MCL = 12 ppt

1.3 Urgency of Treatment

The Aquarion system is supplied by 17 wells. In early 2020, PFOA concentrations at the Mill Road well field POE exceeded the newly promulgated NHDES MCL and production from Well 6 had to be reduced to maintain a blended concentration below the MCL at the POE. In addition, Well 14 is currently out of service and, similar to Well 6, production from Well 22 is limited in order to provide a blended arsenic concentration at the distribution system POE below the NH MCL. These constraints limit the system's total production capacity with all wells running 24 hours per day to 4.57 mgd compared to a maximum day demand of 3.9 – 4.0 mgd (Table 1-2).

TABLE 1-2
Summary of Available Water by Source

	Available Water (mgd)			
Source	**2020**	**2021**	**2022**	**2023**
Well 5A	0.14	0.14	0.14	0.14
Well 6	0.29	0.43	0.43	0.43
Well 7	0.69	0.69	0.69	0.69
Well 8A	0.23	0.23	0.23	0.23
Well 9	0.60	0.60	0.60	0.60
Well 10	0.50	0.50	0.50	0.50
Well 11	0.72	0.72	0.72	0.72
Well 12	0.24	0.24	0.24	0.24
Well 13B	0.10	0.10	0.10	0.10
Well 14A	0.00	0.00	0.11	0.11
Well 16	0.14	0.14	0.14	0.14
Well 17, 18, & 19	0.22	0.22	0.22	0.22
Well 20 & 21	0.24	0.24	0.24	0.24
Well 22	0.46	0.46	0.46	1.07
Average Day[1]	3.43	3.53	3.61	4.07
Maximum Day	4.57	4.71	4.82	5.43

[1] Average day available water is based on 18 hours of pumping in a 24-hour period

The "Ten States" Recommended Standards for Water Works, used as a design guideline by NHDES, states that a system's total production capacity should equal or exceed its maximum day demand with the largest production well out of service. If Aquarion's largest well (Well 11) is out-of-service for any reason, the 24-hour production capacity of the remaining wells would be reduced to 3.85 mgd, less than the maximum daily demand. Loss of the second largest well (Well 7) would similarly reduce 24-hour production capacity to less than the maximum day demand. Loss of supply due to mechanical failure, such as resulting from lightning strikes, is not an uncommon occurrence. The full production capacity of Well 6 is therefore essential to providing adequate supply reliability for Aquarion's system. This supply risk will be exacerbated as PFAS concentrations in Well 6 continue to increase, requiring its production capacity to be further decreased.

In addition, PFOA concentrations have also been increasing in the last several years in Wells 9 and 11 (Figure 1-5). As illustrated in Figure 1-6 and 1-7, the groundwater flow direction at the well field is generally from Well 6 towards Wells 9 and 11, which explains the

increasing PFOA concentrations in Wells 9 and 11. The most recent PFOA sample for Well 11 in March 2021 was higher than the NH MCL. Increasing PFOA concentrations in Wells 9 and 11 will require further reductions in production from Well 6 to achieve the same blended PFOA concentration entering the distribution system. Production from Well 11 is also projected to be reduced to maintain PFOA compliance at the POE, further increasing the system's supply risk. These recent PFOA results were received after the February 8, 2021 Technical Memorandum that suggested that substantial production loss might occur over years and demonstrates that increased impacts are already occurring.

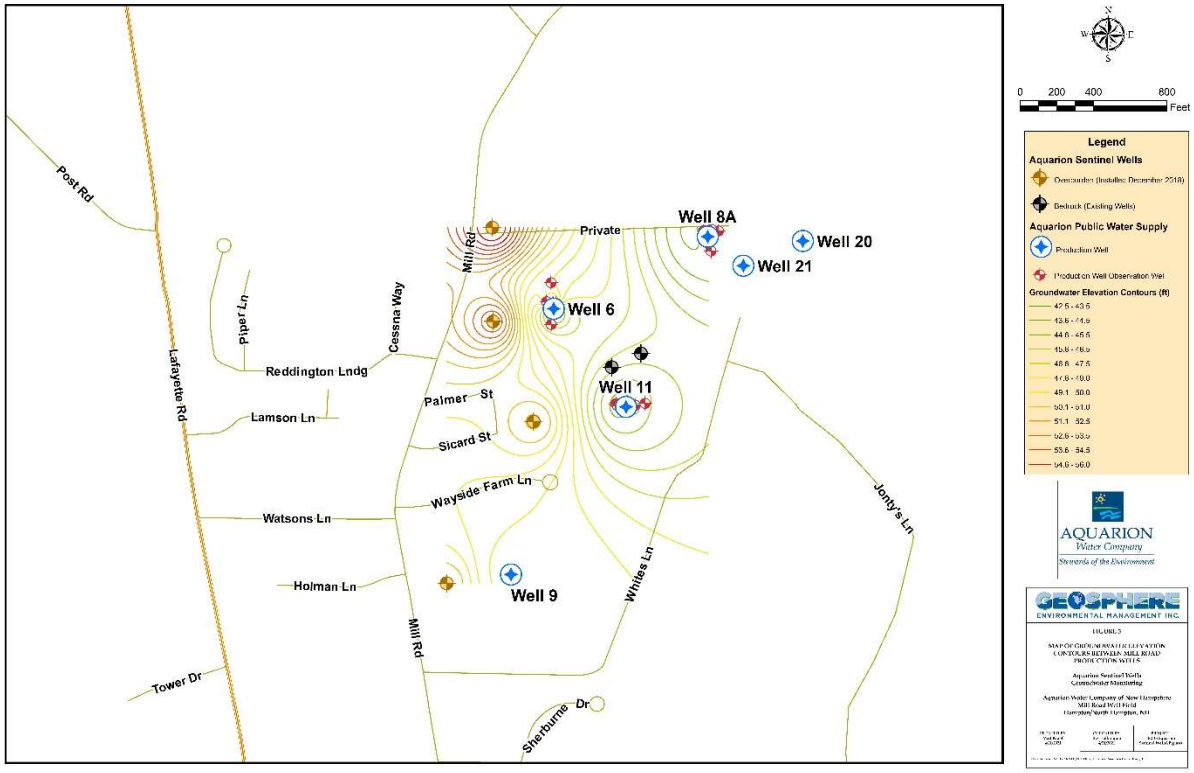

Figure 1-6: Map of Groundwater Elevation Contours Between Mill Road Production Wells

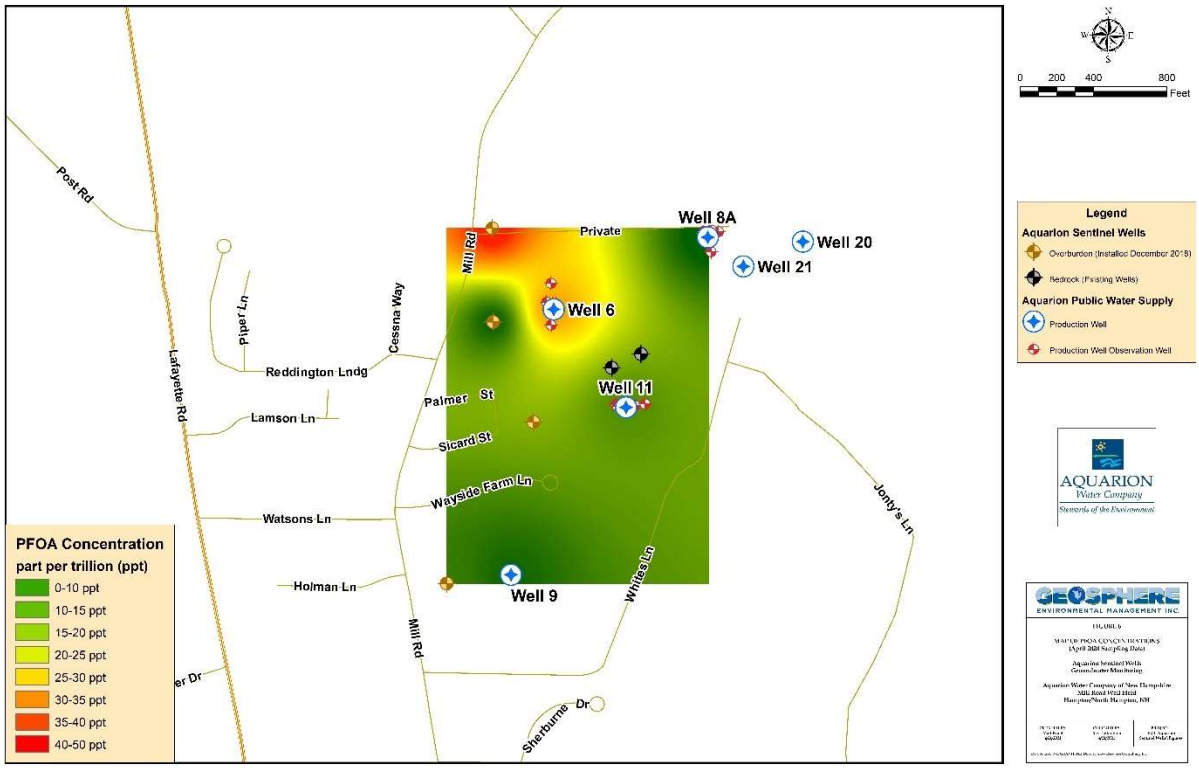

Figure 1-7: Map of PFAS Concentrations

It is therefore essential to install PFAS treatment at Well 6 as soon as possible, preferably prior to the 2021 peak demand season, to minimize risks related to both exceeding the PFOA MCL and having inadequate supply to meet summer demands. The February 8, 2021 evaluation focused on treatment of Well 6 but selection of the recommended alternative included consideration for future expansion to include treatment of Wells 9 and 11 based on groundwater flow direction and increasing PFAS concentrations.

1.4 Alternative Evaluation and Basis of Design

The *Conceptual Evaluation of GAC PFAS Treatment for Well 6* (Tighe and Bond, February 2021) compared four alternatives for installing PFAS treatment for Well 6 as expeditiously as possible:

1. One pair of 8' diameter GAC vessels in the existing garage.
2. Two pairs of 8' diameter GAC vessels in the existing garage.
3. One pair of 8' diameter GAC vessels in a new building.
4. One 12' diameter GAC vessel in a new building.

The evaluated options all provide a minimal level of treatment but are not equivalent with regards to treatment reliability and flexibility for future expansion to treat additional wells.

1.4.1 Vessel Configuration

GAC vessels can be designed for two operating scenarios 1) lead-only or 2) lead/lag (Table 1-3). With lead-only operation, the water is treated through a single vessel, or pair of vessels operating in parallel. In other words, the water passes through only one GAC vessel before being delivered to the distribution system. With lead/lag operation, the water is treated through a lead vessel (or vessel pair), then treated through an equally sized lag vessel (or pair) before being delivered to the distribution system. In other words, the water passes through two GAC vessels.

The lead-only design is a lower cost solution than the lead/lag design because lead-only design requires fewer GAC vessels. However, lead/lag design offers several advantages.

- First, with a lead/lag design, the lead GAC vessel(s) can be operated to and beyond PFAS breakthrough because the PFAS that breaks through the lead vessel(s) is simply removed in the lag GAC vessel. With lead-only design, operators cannot use the GAC until breakthrough because it would mean accepting that upon breakthrough either (1) the well/facility would have to be shut off until the GAC was replaced (which can take time because lead time for GAC is about four weeks) or (2) allowing water with PFAS to be delivered to the distribution system until the well/facility could be shut off for GAC replacement.
- Second, more frequent sampling for PFAS in the treated water is needed with lead-only designs compared to lead/lag designs to ensure that impending breakthrough in the lead-only vessel(s) is observed early enough to schedule well/facility shutdown for GAC replacement. The presented annual O&M costs assume equivalent PFAS sampling for the lead-only and lead/lag options in order to establish a baseline for GAC performance. Sampling is expected to be reduce in subsequent years with a lead/lag operation.

Thus, with lead/lag design compared to lead-only design, GAC replacement frequency and the related cost is lower because the GAC can be used to exhaustion, and sampling/lab costs are lower because less frequent PFAS testing of the treated water is needed to ensure safe and reliable operation.

Also note that with lead/lag design, the well/facility does not need to be shut off for GAC replacement when the GAC is exhausted in the lead vessel. When the GAC is exhausted in the lead vessel, valves would be adjusted to take the lead vessel out-of-service and place the lag vessel in the lead position. Once the GAC is replaced in the lead vessel, it would brought back online in the lag position (in other words, the lead/lag vessels are rotated so that the vessel with the newest GAC is always in the lag vessel).

It is estimated that optimal GAC replacement would occur after approximately 60,000 bed volumes of water treated with lead-only operation and after approximately 75,000 bed volumes treated for lead/lag operation, a 25% difference in GAC replacement. A bed volume is equivalent to volume of GAC installed in the vessels. Because GAC replacement under lead operation requires the well to be taken out of service, replacements would have to be scheduled during non-peak season resulting in either GAC replacement before it is needed or increased risk of PFAS breakthrough. The additional capacity provided by lead/lag operation could result in approximately three to four months of additional operation between GAC replacements. Alternative 2 (existing garage with two pairs of vessels) is the only evaluated alternative that includes the ability for lead/lag operation.

The average annual O&M costs ($/yr) are based on the estimated GAC usage rate (lbs/yr), which is independent of vessel size, times the cost of GAC ($/lb). The carbon replacement frequency (vessel/yr) will be based on the GAC usage rate (lbs/yr) divided by the vessel size (lbs/vessel). The 8' diameter vessels contain half the carbon as the 12' vessels (10,000 lbs vs 20,000 lbs) resulting in a need to replace the GAC twice as frequently at the same GAC usage rate.

TABLE 1-3
GAC Vessels

	Existing Garage		New Building	
	8' Vessels		8' Vessels	12' Vessel
Vessel operation	Lead	Lead/Lag	Lead	Lead
Number of vessels	2	4	2	1
Vessel Height	13' 11"	13' 11"	16' 4"	16'
GAC/vessel (lbs/vessel)	7,500	7,500	10,000	20,000
Total installed GAC (lbs)	15,000	30,000	20,000	20,000
Estimated GAC Usage to Avoid PFAS Breakthrough (lbs/yr)[1,2]	11,843	11,843	11,843	11,843
Estimated GAC Usage at PFAS Breakthrough(lbs/yr)[1,2]	9,475	9,475	9,475	9,475

[1] Assumes operation at average flow rate of 300 gpm.
[2] Assumes 60,000 bed volumes treated to avoid PFAS breakthrough and 75,000 bed volumes treated to PFAS breakthrough

1.4.2 Expansion

For the new building options presented in the Technical Memorandum, the building was only sized large enough to treat Well 6 (Table 1-4). If treatment of additional wells is required due to increasing PFAS concentrations or changes in regulatory standards, a building expansion would be required, which is not included in the presented costs. This option was not selected due to the limited expansion for treating Wells 9 and/or 11. The existing garage is a larger structure than the proposed new buildings and would provide space for up to five pairs of 8' diameter vessels within its existing footprint, which substantially reduces expected capital costs for future expansion. Five pairs would provide enough capacity to treat Wells 6 and 11 in lead/lag or Wells 6, 9, and 11 in lead only. The existing garage was selected as it allows for treatment beyond Well 6 while limiting future costs and reducing the schedule for designing, permitting, and constructing a building expansion for additional treatment. The existing garage would provide a more rapid response if additional treatment is required due to increasing PFAS concentrations or changing regulations.

Table 1-4
Building Size

Alternative	Building Size (LxWxH)	Area (square feet)
Existing Garage	40' x 70' x 15'	2,800
New Building 8' Vessels	38' x 26' x 20'	988
New Building 12' Vessel	47' x 30' x 20'	1,410

1.4.3 Selected Alternative

The selected alternative for design and construction was Alternative 2 (existing garage with two pairs of vessels). This option has a higher construction cost than the other three options (Table 1-5) but was selected because it provides the most reliable treatment (i.e. lead/lag design versus lead-only design as described in this memo), will facilitate expansion to treat additional wells at much lower cost if needed in the future, and can be constructed for the 2021 peak demand season. All PFAS management evaluations that have been conducted since 2017 included consideration for treatment of Well 6 and expansion options for treating additional Mill Road wells. The need for additional treatment is more likely given the recent Well 11 PFOA concentrations that were higher than the MCL. The expandability of the existing garage for additional treatment with minimal building modifications was a major factor in the selection of the existing garage.

The two primary factors contributing to the higher capital cost for the selected alternative are the additional raw water main and the second pair of GAC vessels. The existing garage alternatives require approximately 1,100 feet of additional raw water main to pipe water from Well 6 to the garage. The selected alternative is the only one that provided a lead/lag configuration which increases capital cost but optimizes annual O&M costs and operational flexibility for GAC replacement.

The O&M costs presented in the Technical Memorandum (Table 1-5) conservatively assumed that GAC replacement in one pair of vessels would be required once per year for Alternatives 1 and 2 to avoid impairing production capacity for GAC replacement during peak demand season. O&M costs in Table 1-5 for Alternatives 3 and 4 assumed GAC replacement at 385 or 770 days of operation as these options utilize larger GAC vessels. GAC replacement costs are identical for Alternatives 3 and 4 as the costs are annualized. The cost per GAC replacement will be a function of the volume of GAC in each vessel. In practice, GAC replacement costs would be similar for all lead only alternatives as GAC usage rates would be identical unless GAC replacement is prescheduled to avoid peak demand season. Lead/lag operation allows the full utilization of the GAC, which decreases GAC usage rates, and allows GAC replacement to be scheduled any time of year as described earlier in this memo. The volume of GAC replaced each year, and hence the annual O&M cost, will be less with lead/lag operation (Alternative 2). After gaining operational experience, PFAS sampling could also be reduced with the lead/lag alternative, which would further reduce annual O&M costs compared to the other lead-only options.

Another significant advantage of Alternatives 1 and 2 is that the existing garage provides space for expanding treatment to include additional wells in the future. As described above, PFAS concentrations in Wells 9 and 11 have been increasing since 2017. It also seems highly likely that additional PFAS regulations will be promulgated in coming years, which

may impact operations. Lower MCLs and/or MCLs for currently unregulated PFAS may drive the need for more GAC vessels. The Opinions of Probable Construction Cost presented in the Technical Memo for Alternatives 3 and 4 included a new building that is just large enough to fit vessels needed to treat water from Well 6. The existing garage is approximately twice as large as the proposed new buildings, and provides space for up to a total of five pairs of 8' diameter GAC vessels within the existing footprint. This would provide treatment capacity of up to 1.2 mgd in lead/lag mode, or 2.4 mgd if operated in lead-only, with only minimal additional building modifications. It should also be noted that the existing garage is approximately 35 years old and will require future improvement that are included in this project regardless of whether treatment is installed (e.g., $125,000 for roof replacement due to current leaks is included in the construction costs for the "existing garage" options).

Alternatives 1 and 2 (existing garage) provide substantial benefits in reducing schedule and cost risks by not requiring Town approvals for pipework. The project will only require a building permit for building modifications. The initial capital costs is estimated to be higher for the existing garage but the costs to expand treatment for Wells 9 or 11 would be lower given the existing garage has additional footprint available for treatment expansion. Constructing a new building would require Town permitting; a process, based on past experience, that poses much risk to project cost and schedule. The Mill Road Water Treatment Plant that was put into service in 2020 at the same site as the proposed PFAS treatment system required six months of Town permitting. After Town approval the project was delayed by approximately 1.5 years due to a lawsuit filed by an abutting property owner. If the new building option experienced similar delays, PFAS treatment would not likely be online until 2023 and the associated delays would increase the costs for Alternatives 3 and 4 (new building) as presented. Delaying treatment into 2023 would also result in two more years with the system operating at increasingly reduced production capacity to ensure compliance with the PFOA MCL.

Table 1-5

Opinion of Probable Construction Cost and O&M Costs

	GAC			
	Existing Garage		New Building	
	8' Vessels (One Pair)	**8' Vessels (Two Pairs)**	**8' Vessels**	**12' Vessel**
Number of Vessels	2	4	2	1
Vessel Operation	Lead	Lead/Lag	Lead	Lead
Building Size	40’ x 70’ (2,800 ft^2)	40’ x 70’ (2,800 ft^2)	38’ x 26’ (988 ft^2)	47’ x 30’ (1,410 ft^2)
Room for Expansion	Yes – Up to 8 additional vessels	Yes – Up to 6 additional vessels	No	Yes – 1 vessel for lead/lag
Operate GAC to Breakthrough	No	Yes	No	No
Ability to Operate After PFAS Breakthrough and Schedule GAC Replacement	No	Yes	No	No
Opinion of Probable Construction Costs				
Site Work	$227,050	$227,050	$124,644	$124,644
Building	$193,300	$193,300	$160,437	$215,073
Process Equipment	$371,750	$659,250	$295,000	$297,500
Construction Subtotal	**$792,101**	**$1,079,600**	**$580,081**	**$637,217**
General Conditions - 15%	$118,815	$161,940	$87,012	$95,583
Contingency - 20%	$132,183	$248,310	$133,419	$146,560
Engineering - 15%	$156,465	$223,480	$120,077	$131,904
Total Project Cost	**$1,200,000**	**$1,713,000**	**$920,588**	**$1,011,264**
Annual O&M Costs for GAC replacement and Backwashing				
Backwash Tank Rental	$2,000	$2,000	$1,000	$1,000
GAC Replacement	$35,250[1]	$35,250[1]	$22,279[2]	$22,279[2]
Water Quality Sampling	$21,000	$21,000	$21,000	$21,000
Natural Gas (Heating)	$2,000	$2,000	$2,000	$2,000
Total O&M Cost	**$60,250**	**$60,250**	**$46,279**	**$46,279**

[1] Assumes annual GAC replacement prior to peak demand season

[2] Assumes GAC replacement based on monitoring of PFAS breakthrough.

J:\A\A1000 AWC\83F-Mill Road PFAS Treatment Design\Memo\Well 6 Treatment\2021-4-20 Addendum\2021-4-21 PFAS Treatment Memo.docx

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 1

Data Request Received: April 14, 2021 Date of Response: April 26, 2021
Request No.: Staff 1-6 Witness: John Walsh

REQUEST: **Petition at 4.**
It appears that the Company is awaiting approvals from the PUC and the G&C before it begins the construction process. Please explain the following:

a) Which of the options presented in Table ES-1 of the Memorandum has the Company chosen to construct (Bates number 21);
b) If construction has not begun, when does the Company anticipate beginning and completing construction of the project; if construction has begun, what is the construction status of the project?
c) Has the Company considered the possibility of implementing a solution to the PFAS concerns at the Mill Road Wellfield and then seeking the necessary PUC long-term loan approval?

RESPONSE:

a.) Please refer to Staff 1-5 Attachment 1, page 11. The selected option for construction is to install two pairs of GAC vessels to be operated in lead/lag configuration in the existing garage. This option was selected because it provides the most reliable treatment, is expandable, if needed in the future, to treat additional wells at lower cost, and can be constructed before the 2021 peak demand season.

b.) Construction is anticipated to start in early May; functional water treatment is projected for mid-summer; and final project completion by Oct/Nov 2021.

c.) Construction of the treatment facility is expected to commence prior to obtaining the DES PFAS RLF final approval which requires PUC approval as a prerequisite. As such, the Company does not consider it necessary to finalize the loan process prior to implementing the solution. However, the Company believes it is prudent to prioritize obtaining timely PUC approval of the loan, so that final loan approval from DES may be obtained with the current interest rate, which is valid until August 5, 2021.

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 1

Data Request Received: April 14, 2021 Date of Response: April 26, 2021
Request No.: Staff 1-7 Witness: John Walsh

REQUEST: **Exhibit JPW-1, Bates number 21**
The engineering consultant, Tighe & Bond, prepared a report (Memorandum) with an executive summary that indicated:

"Installing GAC treatment in the existing garage is the recommended approach to meet the goal of having treatment online by June 2021."

Tighe & Bond's Memorandum also appears to indicate that the two options utilizing an existing garage facility will cost the most up front and on an ongoing basis. Bates number 21 and 33.

In addition, the Company presented the following timeline:

DES letter of award of loan funds dated February 22, 2021; Aquarion Petition for PUC Order *Nisi* effective June 30 filed March 31, 2021; Aquarion anticipates G&C Approval sometime in July; and finally loan closing by August 5, 2021.

Relative to the Memorandum and the timeline presented by the Company, please provide further explanation regarding the following:

a) Please detail the reasons for Tighe and Bond's recommendation based on a June 2021 completion date. Specifically, was it the Company's decision to provide the anticipated on-line date of June 2021? If so, why did the Company provide this date which appears to have shaped Tighe and Bond's recommendation but does not appear to fit with the Company's timeline of loan closing by August 5, 2021? Furthermore, when did the Company engage and contract with Tighe and Bond to provide this recommendation?
b) Is the Company's ultimate choice of a solution driven solely by the guaranteed window of availability of loan funds at 1.55%, or are there other factors that were weighed by the Company in making its determination?
c) Please cite the requirement that specifically states PUC approval is required before G&C approval?

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 1

Data Request Received: April 14, 2021 Date of Response: April 26, 2021
Request No.: Staff 1-7 Witness: John Walsh

RESPONSE:

a.) The basis for having treatment online by June 2021 is unrelated to the timeline for the loan.

As described in section 1.3 of the Tighe and Bond Addendum (Staff 1-5, Attachment 1), the goal is to have PFAS treatment for Well 6 online for the 2021 peak water demand season to minimize operating risk (i.e. risk of not being able to meet water demands and risk of non-compliance with PFOA MCL) resulting from the reduced production from Well 6, as well as the increasing PFAS concentrations in Wells 6 and 11. Under current operations, the system does not have adequate supply to meet peak demands for 2021 with its largest well out of service, as suggested by the "Ten States" Recommended Standards for Water Works design. Thus, loss of a well during a peak demand period could result in the Company not being able to meet water demands without risking non-compliance with the PFOA MCL. Having PFAS treatment in operation by June 2021 for Well 6 will allow the Company to use this well at its full capacity, which will mitigate the risk of not being able to meet water demands this summer.

The recommended option not only meets the schedule need described above, but also when compared to the other options, the recommended option provides the most reliable treatment, and is expandable to treat additional wells if needed in the future (for a further description of the evaluation of options, see Section 1.4 of Staff 1-5 Attachment 1, pages 8-13)

Tighe and Bond has been assisting Aquarion with PFAS management in the Mill Road Well Field since 2017, as described in Section 1.1.

b.) Section 1.4 of Staff 1-5 Attachment 1, pages 8-13, further detail the factors that were considered when deciding to install two pairs of GAC vessels in the existing garage. The selected option was not influenced by the PFAS RLF schedule, as construction is expected to commence prior to loan approval and construction costs prior to loan approval will remain eligible for reimbursement under the loan program.

c.) Please refer to Staff 1-7 Attachment 1 for the PFAS RLF Final Application form checklist. NHPUC approval is required under Authority to Borrow section. In addition,

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 1

Data Request Received: April 14, 2021 Date of Response: April 26, 2021
Request No.: Staff 1-7 Witness: John Walsh

NHDES has stated in correspondence that PUC approval is needed prior to G&C approval. Please refer to Staff 1-7 Attachment 2 for the correspondence.

FINAL APPLICATION CHECKLIST FOR PRIVATELY-OWNED SYSTEMS

Water Division/Drinking Water and Groundwater Bureau
Per- and Polyfluoroalkyl Substances
Remediation Loan Fund (PFAS RLF)

RSA 485-H/Env-Dw 1400

The following forms need to be submitted for the final application. Forms listed below can be found on the NHDES website.

I. FINAL APPLICATION
A. **Final Application**
B. **Financial Statements:** Submit financial statements for prior three fiscal years for the borrowing entity; or personal financial statements for prior three fiscal years for all individuals having >20% ownership in borrowing entity. *Examples:* year to date, income, and/or audited statements; balance sheets; tax returns
C. **Authority to Borrow (+ Attachments):** ☐ Bylaws and Bylaws and/or Articles of Incorporation (Agreements) ☐ Meeting Minutes ☐ NHPUC approval order (if applicable)
D. **Environmental Review**
E. **Vendor Registration:** Applicants must obtain a state vendor code (*if not already on file with NHDES)* to establish an account with the State of New Hampshire for disbursement purposes. Applicants may register online for a vendor code on the Department of Administrative Services Vendor Registration webpage.
F. **Secretary of State Good Standing Status:** Applicant must be in good standing with the NH Secretary of State and able to provide Certificate of Good Standing at the closing (see section III).
G. **Certification Statement:** Written statement that the applicant has the financial capability to support both the project loan repayment and continuing operation and maintenance.
H. **Asset Management Maintenance and Renewal Plan (Business Plan)**
I. **Planning Document(s) supporting the project need, cost and schedule, including:** ☐ Project background; such as engineering reports or sanitary survey letters ☐ Project cost estimates including planning, design, bidding and construction. *Note: Additional information may be required depending on the type of project.*

II. PRINCIPAL FORGIVENESS
This step is to determine if a water system is eligible for principal forgiveness. The system's affordability index is used to determine principal forgiveness amount. Affordability index = water rate/MHI.
A. **Income Survey:** Needed if the municipality's Median Household Income (MHI) is not representative of the community water system. Instructions and forms are provided separately to applicants requiring this step.
B. **Water Rate:** Necessary to determine water expenses if not already known. Template is provided separately to applicants requiring this step.
*Note: A & B are **not** needed if applicant is not pursuing principal forgiveness. Projects requesting interim financing or systems with 50% or more seasonal ownership are not eligible for forgiveness.

III. LOAN CLOSING

After the required documents are received from Part I and II, loan documents are drafted and sent to the Borrower for review. The loan documents are first approved by the Governor and Council. Once the loan documents are approved by the Governor and Council, a loan closing date will be set when the Borrower and NHDES will meet to sign all of the loan documents. Below is a list of additional documents that may be needed for the loan closing. The required items will be listed on the closing agenda, which is provided with the loan documents.

A. Loan Documents: Loan agreement, promissory note, disclosure of costs (there are no closing costs associated with the loan, however if security instruments or a title policy is needed fees associated with recording and obtaining those documents are at the expense of the Borrower (these costs are eligible for loan funds).

B. Certificate of Good Standing: Certificate issued by NH Secretary of State for the borrowing entity. To order a Certificate of Good Standing visit the Secretary of State's website. A current certificate is needed as close to the closing date as possible.

C. Security Instruments: These items will be determined based on the type of Borrower. Required items may include: legal description of the mortgaged property; budget; mortgage and security agreement; mortgage deed; security agreement; stockholder guarantees; collateral assignments; title insurance-loan policy; certificate of insurance; declaration of condominium of borrower.

Please submit documents and forms to the NHDES PFAS RLF Program to:
Amy Rousseau
amy.rousseau@des.nh.gov
(or by mail to): NHDES MtBE Remediation Bureau/PFAS RLF
PO Box 95, Concord, New Hampshire 03302-0095

John Walsh

From: Rousseau, Amy <Amy.E.Rousseau@des.nh.gov>
Sent: Thursday, April 22, 2021 8:32 AM
To: James Collins
Subject: RE: Mill Road Wellfield PFAS Treatment Project Approval Letter

Yes, we need it prior to going to G&C.

AMY ROUSSEAU | PFAS Response Administrator - MtBE Remediation Bureau
New Hampshire Department of Environmental Services |PO BOX 95, 29 Hazen Drive, Concord, NH 03302-0095
• Email: Amy.Rousseau@des.nh.gov • Phone: **603.848.1372** •

NHDES|NH PFAS INVESTIGATION|MTBEREMEDIATION BUREAU

From: James Collins
Sent: Wednesday, April 21, 2021 10:50 PM
To: Rousseau, Amy
Subject: RE: Mill Road Wellfield PFAS Treatment Project Approval Letter

Hi Amy,

Can you confirm that PUC approval is required prior to going to G&C?

Thanks
James

From: Rousseau, Amy <Amy.E.Rousseau@des.nh.gov>
Sent: Thursday, February 25, 2021 11:26 AM
To: James Collins <JCollins@tighebond.com>
Cc: dj.smiarowski@eversource.com
Subject: RE: Mill Road Wellfield PFAS Treatment Project Approval Letter

Good morning,

I have some answers for you.

Timeline:
I have to confirm one more thing, but Erin and I decided that you should submit the final application. I will submit the financials to BFA without PUC approval. We do not believe that they need it, but they will ultimately let us know.

PUC approval will be needed to close. I am trying to determine if we need PUC approval prior to G&C.

Randy Suozzo will provide a letter of support. He is out of the office the remainder of this week, but plans on working on it next week.

Starting construction will not be an issue for the PFAS RLF due to the retroactive nature of the program. All PFAS related work will still be eligible for the loan. However, I believe you will have to show Randy that you can fund the project in some way prior to him giving you permission to award the bid.

Erin is planning on going to G&C in April with the grant. We were thinking we would bring both to G&C at the same meeting, but she will not delay the grant if PUC approval is causing a delay with the PFAS RLF.

Certificate of Insurance:
A certificate of insurance is needed. This can be the same as what is needed for the grant.

Please let me know if I have missed something or if you have any additional questions.

Thank you,
Amy

AMY ROUSSEAU | PFAS Response Administrator - MtBE Remediation Bureau
New Hampshire Department of Environmental Services **|**PO BOX 95**,** 29 Hazen Drive**,** Concord, NH 03302-0095
• Email: Amy.Rousseau@des.nh.gov • Phone: **603.848.1372** •

NHDES|NH PFAS INVESTIGATION|MTBEREMEDIATION BUREAU

From: James Collins <JCollins@tighebond.com>
Sent: Tuesday, February 23, 2021 4:54 PM
To: Rousseau, Amy <Amy.E.Rousseau@des.nh.gov>

Cc: dj.smiarowski@eversource.com
Subject: RE: Mill Road Wellfield PFAS Treatment Project Approval Letter

EXTERNAL: Do not open attachments or click on links unless you recognize and trust the sender.

Hi Amy,

Would you have a few minutes tomorrow to discuss the final paperwork? We just want to make sure we understanding timing needed for PUC approval. We're available anytime before 4 tomorrow if you're available.

Thanks
James

From: Rousseau, Amy <Amy.E.Rousseau@des.nh.gov>
Sent: Tuesday, February 23, 2021 3:22 PM
To: James Collins <JCollins@tighebond.com>
Subject: FW: Mill Road Wellfield PFAS Treatment Project Approval Letter

[Caution - External Sender]

Hello,

I just realized I forgot to include the checklist. I don't think it is on the website yet. Let me know if you have any questions.

Thank you,
Amy

AMY ROUSSEAU | PFAS Response Administrator - MtBE Remediation Bureau
New Hampshire Department of Environmental Services |PO BOX 95, 29 Hazen Drive, Concord, NH 03302-0095
• Email: Amy.Rousseau@des.nh.gov • Phone: **603.848.1372** •

NHDES|NH PFAS INVESTIGATION|MTBEREMEDIATION BUREAU

From: Rousseau, Amy
Sent: Monday, February 22, 2021 3:20 PM

To: JWalsh@aquarionwater.com
Cc: Holmes, Erin <Erin.L.Holmes@des.nh.gov>; Suozzo, Randal <Randal.A.Suozzo@des.nh.gov>; 'James Collins' <JCollins@tighebond.com>
Subject: Mill Road Wellfield PFAS Treatment Project Approval Letter

Dear Mr. Walsh,

On February 17, 2021, the NHDES completed their review of the PFAS RLF Eligibility Request submitted by Aquarion Water Company. The NHDES authorized a funding award to Aquarion Water Company. Please see the attached approval letter.

Thank you,
Amy

AMY ROUSSEAU | PFAS Response Administrator - MtBE Remediation Bureau
New Hampshire Department of Environmental Services |PO BOX 95, 29 Hazen Drive, Concord, NH 03302-0095
• Email: Amy.Rousseau@des.nh.gov • Phone: **603.848.1372** •

NHDES|NH PFAS INVESTIGATION|MTBEREMEDIATION BUREAU

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 1

Data Request Received: April 14, 2021 Date of Response: April 26, 2021
Request No.: Staff 1-8 Witness: John Walsh

REQUEST: **Testimony of John Walsh and Donald Smiarowski (Bates number 19), and DES Letter (Bates number 45), and Tighe and Bond Report (Bates number 21)**
According to pre-filed testimony, the Company received a letter of support regarding "the Project" included as Exhibit DJS-8. Bates number 19.

The DES letter of support submitted as Exhibit DJS-8 is dated March 3, 2021 and states that the Company is "in the process of presenting drinking water system upgrades" to the PUC and further states that DES is "in support of and recommend[s] system modifications." Bates number 45.

In relation to the four options presented by Tighe and Bond (Bates number 21), in the DES review of the report, does the DES provide support to a specific option? If so, please indicate, and provide the supporting documentation or reference, to which "system upgrades" DES indicates support for. Please provide supporting documentation of DES's examination and position in light of Tighe and Bond's report.

RESPONSE:

The Company provided the Tighe and Bond memo to DES as part of both the application for the Drinking Water and Groundwater Trust Fund and the Eligibility Request for the PFAS RLF. As part of the Trust and RLF processes, DES did not specifically comment on the existing garage verus new building options.

Please refer to Staff 1-8 Attachment 1 for the DES Design Review #005935 dated 2/16/2021. DES recommends that the second pair of GAC vessels to allow lead/lag operation be given strong consideration. The selected option is the only evaluated option that would provide lead/lag operation as recommended by DES.

The State of New Hampshire
Department of Environmental Services

Robert R. Scott, Commissioner

February 16, 2021

James Collins, P.E.
Tighe and Bond
55 Southampton Road
Westfield, MA 01085

Subject: Aquarion Water, Hampton, NH: PWS 1051010
Mill Road Wellfield PFAS Treatment
Design Review #005935

Dear Mr. Collins:

The New Hampshire Department of Environmental Services Drinking Water and Groundwater Bureau (DWGB) has reviewed the 90% design plans dated January 2021 for the subject project. I performed a review of the project in accordance with the design standards for large public water systems listed under Env-Dw 404 and referencing the Recommended Standard for Water Works. DWGB offers the following comments.

1. The proposed treatment for Well 6 (300 gpm yield) using granular activated carbon filtration for the removal of per- and polyfluoroalkyl substances (PFAS) contamination is summarized as follows:
   - GAC Filters – (set of 1 or 2, bid dependent) 2 x 8' diameter x 6' straight side height vessels operated in parallel, rated for 125 psi design pressure and 165 gpm each (330 gpm total), 7,500 pounds GAC media each, 10 minutes minimum EBCT.
   - Sample taps (each vessel): inlet, three (3) intermediate filter points, outlet.

   Operation of the filter vessels will support series (lead/lag) configuration, but this will be at half the design flow rate of 330 gpm. The Owner should be aware that operating the filters in parallel may lead to unexpected breakthrough of PFAS at levels above current standards. Since the system has other drinking water sources, this method of filtration is acceptable in this case. Still, DES does not normally recommend this configuration. Testing of carbon media has shown a phenomena called "shedding", which leads to PFAS levels in the filtered water at higher levels than the incoming raw water. This occurs when the filtering capacity of the media has been exhausted. DES normally recommends that carbon filtration for the removal of PFAS to be configured in series so breakthrough can be monitored at the first vessel and the lag vessel can filter any breakthrough that occurs during those periods and during media change out. This helps protect the system by not allowing the finished water to transport PFAS into the distribution system. Other significant factors in recommending lead/lag configuration are:
      - lag time between sampling and lab results
      - faster breakthrough of short chained PFAS contaminants
      - treatment redundancy

   We understand that media change out will be planned to a) stay ahead of breakthrough for regulated PFAS and b) occur outside of peak demand season. We also understand that the contract

specifications request an alternate bid for a second set of filter vessels so lead/lag configuration can be installed. We recommend that this alternate be given strong consideration for funding.

2. If funding from the PFAS Remediation Loan Fund (RLF) is approved for use on this project, it will require the same front end information used for the New Hampshire Drinking Water and Groundwater Trust Fund (DWGTF). A review of the updated front end specifications will be required prior to approval.
3. Current AWWA guidelines require 3.0 ft/sec flushing velocity prior to disinfecting water mains. Specification section 02501 Disinfection of Water Distribution Systems should be updated.
4. There are numerous water lines, shaded and bolded, labelled "PW" on the plans. Recommend using "RW" according to your legend on G-002 for transmission of Raw Water to the treatment station. This will also avoid the confusion of it being called "Potable Water" if the legend is not available.

In addition to the above comments, the following will be a condition of approval:

1. Submittal of electronic copies of **As-Bid Plans and Specifications** to this department prior to the bid opening, at the latest.
2. Approval of any changes to the submitted 90% design, including any addenda issued during the bid process.
3. Compliance with all construction requirements per Env-Dw 404 *Design Standards for Large Public Water Systems*.
4. All construction shall conform to AWWA standards.
5. **DES site inspection** prior to water treatment plant startup.
6. Submittal of a proposed **Primary Operator** minimum **Grade certification** for treatment operations, for DES approval. Scoring can be found under our administrative rules, specifically, Env-Dw 502: Certification of Water Works Operators.
7. Submittal of electronic copies of final **Record Drawings** to this department, and maintenance of copies on file by the water system owner.
8. Inclusion of all components of this project in an approved **Asset Management Plan**.
9. Preparation of a final **O&M Manual** and a copy kept on file by the water system owner. Water system copies of the O&M manual and Record Drawings shall be available for review during DES site inspections, when requested.
10. Submittal of a plan for final disposal of spent **carbon media**.
11. Submittal of a final plan for onsite disposal of **filter to waste water** and spent **backwash water**.
12. Submit all water quality results included in the specifications to NHDES for approval prior to discharging water to the distribution system.
13. Standard operating procedures (SOPs) should be established for many operations including, but not limited to, chemical deliveries, storage and startup of filters that are in not in operation, carbon exchange, disposal of wash water and filter to waste water, and pumping well to waste.
14. Post-startup, the system's lead and copper sampling plan will be reset.

General Comments for consideration:

1. The Treated Water Pipe and Raw Water Pipe labelled on M-101 do not appear to match the corresponding locations as shown on C-101.
2. The flow of backwash supply and backwash effluent on drawing PI-101 conflict with each other.
3. DES recommends utilities contact their energy providers for potential rebates and other incentives prior to final design as this could lead to potential capital and future O&M savings.
4. Alternative analysis did not reference future treatment for Wells 9 and 11. There is a future cost estimate to treat the entire Mill Road wellfield, but how does the chosen alternative incorporate the future treatment configuration(s)? It appears that a new building would have to be constructed to fit additional treatment for other wells.

DWGTF Funding Conditions

This project will be funded in part with a grant from the DWGTF. NHDES requires submission of the following materials prior to our written authorization to award the construction contract:

A. An estimate of eligible project costs, with monthly cash flow projections, including construction engineering and other costs.
B. Evidence of advertisement for bids.
C. A tabulation of all bids which were received.
D. A letter signed by the water system's Authorized Representative, indicating the name of the bidder to whom a contract will be awarded.
E. The bid proposal of the bidder to whom a contract will be awarded
F. Certification that all necessary permits, land acquisitions and easements have been secured.
G. Successful completion of the DWGTF Environmental Review including the necessary approval by the NHDES Commissioner.

If you have any questions or comments please contact me at 271-1746 or Randal.A.Suozzo@des.nh.gov.

Sincerely,

Randal A. Suozzo, P.E.
Drinking Water and Groundwater Bureau

ec: Carl McMorran, Aquarion Water Company
Thomas Gaidish, Aquarion Water Company

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 1

Data Request Received: April 14, 2021 Date of Response: April 26, 2021
Request No.: Staff 1-9 Witness: Carl McMorran

REQUEST: **Petition at 11, 12 and Exhibit JPW-2, Letters of Support, and Exhibit JPW-3, Letter of Award from DES, and Testimony of Dan Lawrence from Docket No. DW 20-184**
The Company explains that it has kept relevant stakeholders informed of the rising PFAS levels at various times since levels were first detected at the Mill Road wellfield in 2017. Bates number 11, 12.

The Company also provided Letters of Support from the Towns of Hampton and North Hampton, dated December 8 and 9, 2020, respectively. These letters appear to provide support for the Company's application for a grant from the Drinking Water and Ground Water Trust Fund (DWGTF) for which the Company was awarded $428,750.

Additionally, the Letter of PFAS RLF Award from the DES, submitted as exhibit JPW-3, references a date of February 10, 2021 for receipt of the Company's application for funds from the PFAS RLF.

a) Please explain further if the Letters of Support from the Towns of Hampton and North Hampton (Towns) extend to the specific project, and the costs associated with that project, the Company plans to implement as its solution to the PFAS concerns at well #6 of the Mill Road wellfield; and
b) If the Towns were made aware of the other possible solutions presented to the Company by Tighe & Bond.
c) Please present all supporting documentation relative to the Company's responses to (a) and (b).

RESPONSE:

a) The support letters do not specifically support the selected project option, because the RLF does not require as extensive documentation as the DWGTF.

b) A range of alternatives were presented to the Towns by Aquarion during meetings dating back to 2017, and the related discussions covered various details. The Tighe & Bond memo was one of multiple project cost iterations that went back and forth between Tighe & Bond and Aquarion, and was not sent to the Towns.

c) The following are attached:

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 1

Data Request Received: April 14, 2021 Date of Response: April 26, 2021
Request No.: Staff 1-9 Witness: Carl McMorran

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a. Staff 1-9 Attachment 1 - Presentations and Minutes from Town Meetings (August 2017 – March 2021)

b. Staff 1-9 Attachment 2 - PFC Treatment Alternatives Analysis for Mill Rd Wells (November 2017)

c. Staff 1-9 Attachment 3 - Conceptual Evaluation of GAC PFAS Treatment for Well 6 (September 2020)

Town Meetings and Minutes regarding PFAS

Date	Meeting or Document
08/16/2017	Letter from EPA to Hampton re: Coakley Landfill
08/28/2017	Meeting w/ Hampton Town Manager and others
09/11/2017	Meeting w/ Hampton Town Manager, other Hampton officials and North Hampton Water Commissioner
09/11/2017	Presentation to Hampton Select Board
10/04/2017	Settlement agreement for DW 17-114 Requests of Towns Related to Aquarion Water Company Service Issues
10/23/2017	Meeting w/ Hampton Town Manager, other Hampton officials and North Hampton Water Commissioners
10/23/2017	Presentation to Hampton Select Board
12/04/2017	Meeting w/ Hampton Town Manager and other Hampton officials
12/04/2017	Presentation to Hampton Select Board
02/05/2018	Meeting w/ Hampton Town Manager, other Hampton officials, North Hampton Town Administrator and North Hampton Water Commissioner
02/26/2018	Presentation to North Hampton Select Board
04/02/2018	Meeting w/ Hampton Town Manager and other Hampton officials
04/02/2018	Presentation to Hampton Select Board
04/23/2018	Presentation to North Hampton Select Board
05/22/2018	Memorandum from Fred Welch, Hampton Town Manager, to John Walsh re: Pre-application Deadline of June 15, 2018 for DWSRF and DWGTF Trust Funds Grants
05/30/2018	Memorandum from John Walsh et.al. to Hampton Select Board May 22 Letter re: PFAS Treatment
07/16/2018	Meeting w/ Hampton Town Manager, other Hampton officials, North Hampton Town Administrator and North Hampton Water Commissioners
07/16/2018	Presentation to Hampton Select Board
07/23/2018	Presentation to North Hampton Select Board
09/10/2018	Meeting w/ Hampton Town Manager, other Hampton officials and North Hampton Water Commissioner
10/15/2018	Meeting w/ Hampton Town Manager, other Hampton officials and North Hampton Water Commissioner
10/15/2018	Presentation to Hampton Select Board

Town Meetings and Minutes regarding PFAS

10/22/2018	Presentation to North Hampton Select Board
10/23/2018	Memorandum from EPA to Hampton re: Coakley Landfill Response to *Statement by Thomas P. Ballestero for Seacoast Cancer Cluster Commission meeting 10 October 2018*
01/14/2019	Meeting w/ Hampton Town Manager and others
01/14/2019	Presentation to Hampton Select Board
02/11/2019	Presentation to North Hampton Select Board
04/08/2019	Meeting w/ Hampton Town Manager, other Hampton officials and North Hampton Water Commissioner
04/08/2019	Presentation to Hampton Select Board
05/13/2019	Presentation to North Hampton Select Board
08/12/2019	Presentation to North Hampton Select Board
08/26/2019	Meeting w/ Hampton Town Manager and others
10/07/2019	Meeting w/ Hampton Town Manager and others
10/07/2019	Presentation to Hampton Select Board
12/09/2019	Presentation to North Hampton Select Board
01/13/2020	Meeting w/ Hampton Town Manager and other Hampton officials
01/13/2020	Presentation to Hampton Select Board
03/09/2020	Presentation to North Hampton Select Board
06/08/2020	Presentation to North Hampton Select Board
07/30/2020	Conference call w/ Hampton Town Manager and others
09/28/2020	Conference call w/ Hampton Town Manager and others
09/28/2020	Presentation to Hampton Select Board
11/09/2020	Presentation to North Hampton Select Board
02/22/2021	Presentation to Hampton Select Board
03/08/2021	Presentation to North Hampton Select Board

Aquarion Water Company

Presentation to
Hampton Board of Selectmen
September 11, 2017

AQUARION
Water Company

Agenda

- Where does Aquarion get the water it provides to its customers?
- What are PFCs?
- What concentration of PFCs are in the drinking water?
- What concentration of PFCs are in the groundwater?
- What actions is Aquarion taking to address PFCs?

AQUARION
Water Company

What are Perfluorochemicals (PFCs)?

- A large group of manufactured compounds widely used in products as water and oil repellents, and for heat and chemical resistance
- PFCs have been found in water, air, soil, house dust, and food
- As an emerging contaminant, health agencies are investigating the health effects, testing methods are being developed, and treatment alternatives are being assessed
- PFCs are measured in parts per trillion (ppt)
- Limits have been set for two compounds, PFOA and PFOS by USEPA, NHDES, NJ and VT.
- The EPA and NHDES limits are 70 ppt

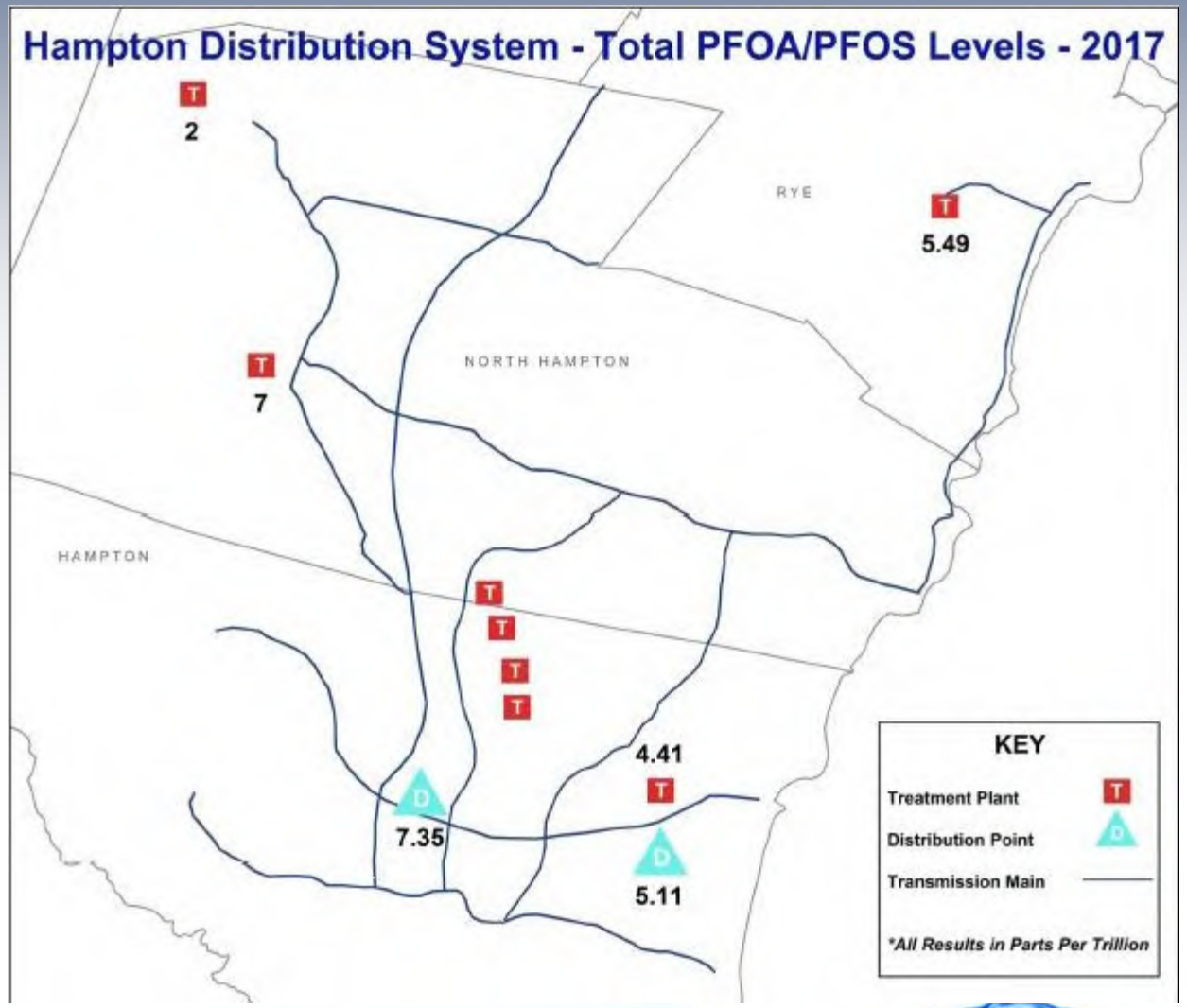
AQUARION
Water Company

What concentration of PFCs are in the Drinking Water?

- Aquarion has tested its wells for PFCs since 2014
- 2014 and 2015 – Testing was required for nationwide study by EPA
- 2016 and 2017 – Aquarion performed voluntary testing
  - Range of 2017 results PFOA + PFOS: 2 – 7.35 ppt
  - Range of 2017 results Total PFCs: 3.9 – 15 ppt

AQUARION
Water Company

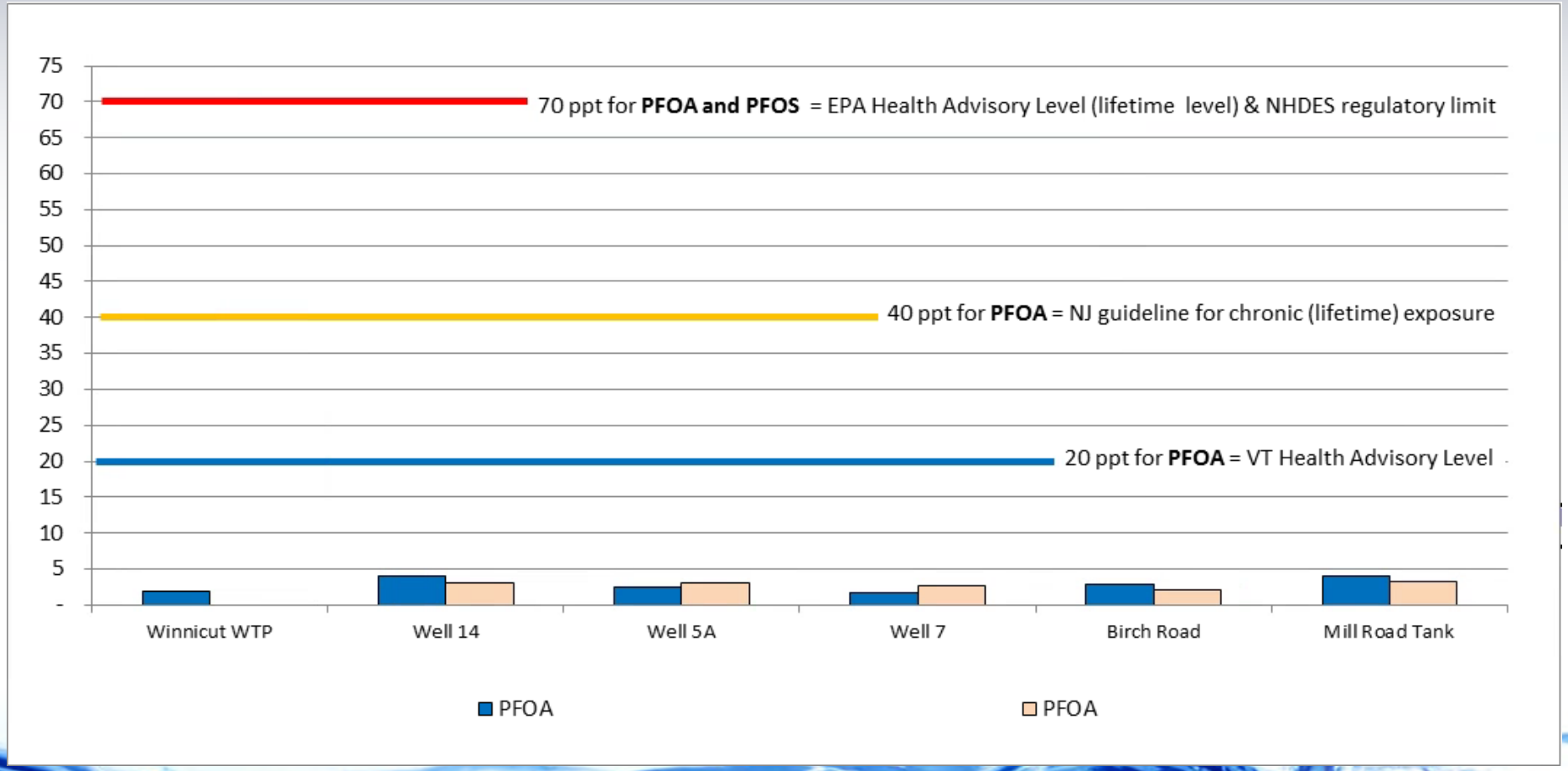
What concentrations of PFOA and PFOS are in the Drinking Water?



AQUARION Water Company

What concentrations of PFOA and PFOS were in the drinking water?

- The two regulated PFCs were found at concentrations well below the EPA lifetime Health Advisory Limit and NHDES limit of 70 ppt…..and below the advisory and recommended limits set by other states.



AQUARION Water Company

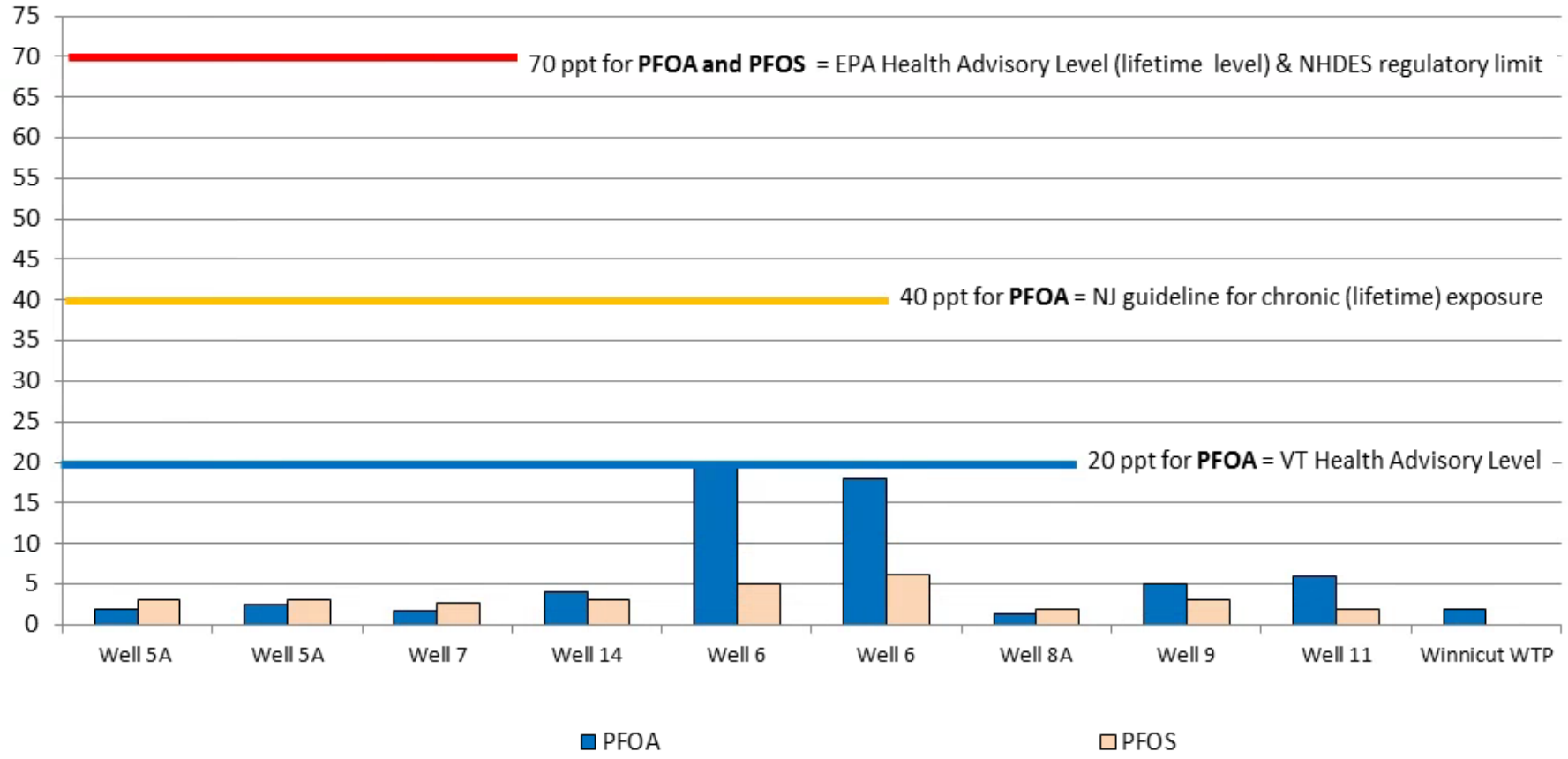
What concentrations of PFOA and PFOS are in the groundwater?

- Aquarion has tested its wells for PFCs since 2014
- 2014 and 2015 – Testing was required for nationwide study by EPA
- 2016 and 2017 – Aquarion performed voluntary testing
  - Range of 2017 results PFOA plus PFOS: ND – 25 ppt
  - Range of 2017 results Total PFCs: ND – 88 ppt

AQUARION
Water Company

What concentrations of PFOA and PFOS are in the groundwater?

- PFOA and PFOS results from wells are less than 10 ppt, except for Well 6
- Well 6 results are obvious outliers, and under further investigation



What actions is Aquarion taking to address PFCs?

Action 1 - Continuing and increasing testing for PFCs in Aquarion wells

Action 2 - Investigating the extent and source of PFCs at Mill Road Wellfield

Action 3 - Collaborating with stakeholders to investigate the extent and sources of PFC around all Aquarion wells

Action 4 - Evaluating treatment for wells at Mill Road Wellfield

Town Minutes

PFAS Treatment content highlighted

Hampton Select Board Meeting - September 11, 2017

Agenda Item 4. PFCs in Aquarion's Water (John Herlihy, Aquarion's Vice-President of Water Quality, Environmental Management and Government Relations & Carl McMorran (starts at 1:05:50 on video))

Chairman Waddell: Board of Selectmen, Town Manager and Town Counsel have been very aggressive in making sure the citizens of Hampton has safe clean water; had meetings with Aquarion and have been very transparent and they also have the same goal to provide safe clean water; working with Selectman Barnes and Selectman Bean

John Walsh (VP of Operations) introduced Carl McMorran, Manager of Operations in NH; Dan Lawrence, Director of Engineering & Planning and John Herlihy, VP of Water Quality & Environmental Management; presenting information about PFCs in the ground water and drinking water; multi-faceted approach to address this emerging issue. We are as concerned as you and our customers; provide high quality water is highest priority; committed to understanding the extent of PFCs concentrations, sources and risks to all wells; committed to sharing all of the information readily and addressing concerns of customers and public officials.

Chairman Waddell: could you explain what a PFC is?

Mr. Herlihy: power point presentation:

In contact with NHDES weekly; begun monitoring of test wells; retained hydrogeologist to identify additional sources of contamination; identify sources of contamination; determine if need to put in additional monitoring wells; identify where contamination is coming from.

Looking into different treatments, preliminary assessment is due in about 6 weeks from consultant.

Selectman Barnes: had meeting this morning with all officials and feel a lot better listening to presentation; happy you are working with us and being proactive to have clean water; can I get the presentation.

Selectman Griffin: who does your testing?

Mr. Herlihy: Eastern Analytical, Inc., they sub the work out to a lab in CA.

Selectman Griffin: do you feel this is something the state should be doing, but do not have the manpower?

Mr. Herlihy: I am not qualified to answer that, but they do use some of the labs we use; NH doing the right thing, do not know what would entail to get the expertise in-house.

Selectman Bean: State of NH held hearings with the PUC, Commissioner Bailey asserted our right that we have direct access with the PUC and can address the issues that are of concern with us directly to the PUC; Hampton independently will pursue what is in the best interest of our citizens. NJ in 2015 established lower limits for the carcinogens in the water; Hampton is going to ascribe to the lower limits; you are half way to the NJ maximum limit on some of these

wells and I do not think it is safe; activated carbon; would not agree with your ascertains that it is a safe level; robust testing. Coakley Landfill group is a united front; Aquarion did not pollute this water, Eversource did not pollute this water; meeting September 21, 2017 with the Coakley Landfill group and they are trying to hold this private; would say that is a violation of the state constitution; not transparent.

Attorney Gearreald: despite the fact in this emerging field, the levels set so far have not been met; Aquarion has shut down Well 6 out of an abundance of caution. The meeting on September 21, 2017 is a meeting of the Coakley Landfill Group; Coakley is the nearest potential source of PFCs to the north and west of this wellfield that is showing these levels. So far it has not been studied whether or not there is flow coming in this direction; monitoring wells are needed; should be responsibility of the Coakley Landfill Group; do those explorations at their expense and that is what we are urging the EPA and the DES to do. If the meeting is conducted in a nonpublic session, we will not know what EPA is requiring; should be conducted in public. I have written the EPA and DES that we strongly want this meeting to be conducted in public in the Seacoast area, so the public can have a meaningful insight into what is going on; urge Aquarion to join with us and urging that the meeting be a public meeting.

Mr. Walsh: with respect to this meeting we believe in all parties sharing information; stakeholders are up there and Coakley Landfill is one of the stakeholders; we would like to know the results of the meeting and would assume the information would be shared with all of us.

Selectman Barnes: have you ever had a polluter that you found out about.

Mr. Herlihy: yes, leaking underground storage tanks; worked with state, put in monitoring wells; tanks containing gasoline were pulled out and we are still monitoring

Selectman Barnes: did you end up treating for that.

Mr. Herlihy: no, the traces that were found went away, but threat is still there.

Selectman Bean: Seacoast media group article on this meeting; EPA and DES meeting; City Attorney Bob Sullivan who serves as the CLG Executive, subsequent to that meeting would propose an update of Coakley activities to the City Council in public session. Attorney Sullivan is going to talk as the City Attorney; conflict of interest; want to hear what is going on in this closed meeting. Mr. Murphy from the EPA said it is a pretty in-depth investigation and usually takes a couple of years. Attorney Sullivan acknowledged any request for CLG to install a pump and treat system would be a significant and expensive proposition; ominous; one sided; strictly serving the interest of Portsmouth, no mention of Hampton. I would ask that you support us in opposing the meeting being private; if we pursue any legal actions to open that meeting you join us.

Mr. Walsh: just heard about this meeting this morning, not knowing the goal or agenda of the meeting; I understand EPA, NHDES and CLG; do not know of any other parties. Presuming it is a technical session; we want to know the results/outcome of meeting, expect it would be a continuation of the public meetings that happened recently and information would be shared

at a public meeting. Without knowing the specific goals and the agenda for that meeting, I do not know if I can support it as enthusiastically as Selectman Bean is requesting.

Selectman Bean: EPA says this is going to take a couple of years; a 30-year problem; unknown plume heading towards our wells; they took the shortest and cheapest way out of this 30 years ago; expects with the DES and EPA discussions with the agencies concerning the expansion of group responsibilities relating to emergent contaminates, such as PFCs. I would think you would join us; ominous and threatening.

Mr. Skip Webb, 28 Seabury: Aquarion Water asking if I would speak in their behalf; had meetings with them; the Selectmen and Water Company need to be complimented on the way they have protected our water supply. Increase in Well 6 is a spiking, happened recently, not materialized over a period of time; might be permanent or temporary; testing put into place will tell us that. I took the approach of what has happened; large aquifer; North Hampton to Route 1 to center of town to the edge of our own landfill; what has caused the changes. We did a large change of groundwater flow; putting in pipes as residents on Mill Road were flooding; might have changed the flow from Route 1 to where these wells are. Another one is on Whites Road and the conservation property; put in subdivision; businesses on Route1/have a couple of gas stations; have our own landfill; no evidence; the possibility is low. The water company said they will also look at those locations in their determination to where the PFCs

are coming from.

Selectman Barnes: Aquarion is going to be testing everything; they have a plan in place and

are confident they will do what they need to do; put procedures in place.

1:58:40

Aquarion Water Company

Presentation to
Hampton Board of Selectmen
October 23, 2017

AQUARION
Water Company

Agenda

- Where does Aquarion get the water it provides to its customers?
- What are PFCs?
- What concentration of PFCs are in the drinking water?
- What concentration of PFCs are in the groundwater?
- What actions is Aquarion taking to address PFCs?
  - Groundwater Investigation
  - Treatment alternatives

AQUARION
Water Company

What are Perfluorochemicals (PFCs)?

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- PFCs are measured in parts per trillion (ppt)
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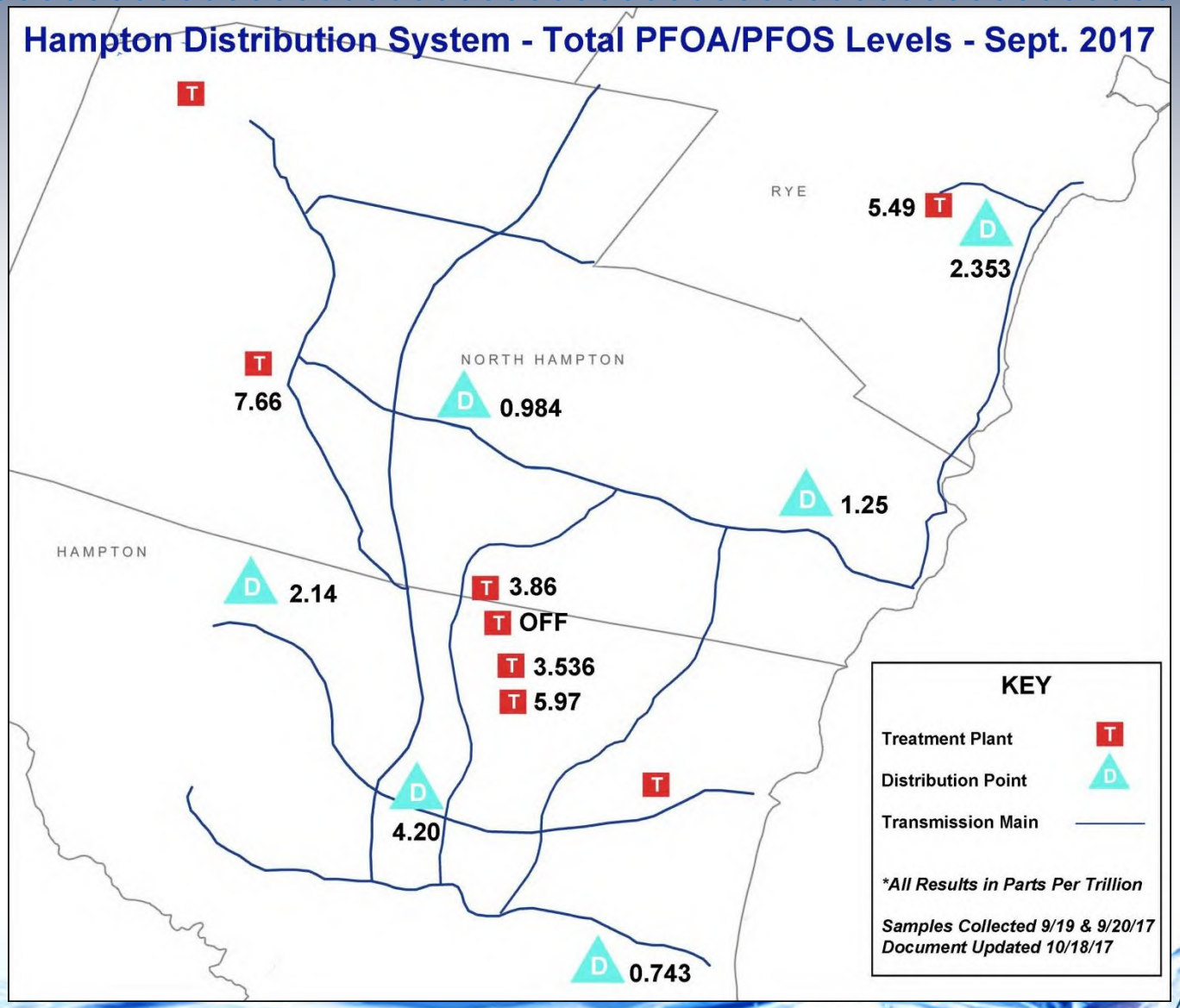
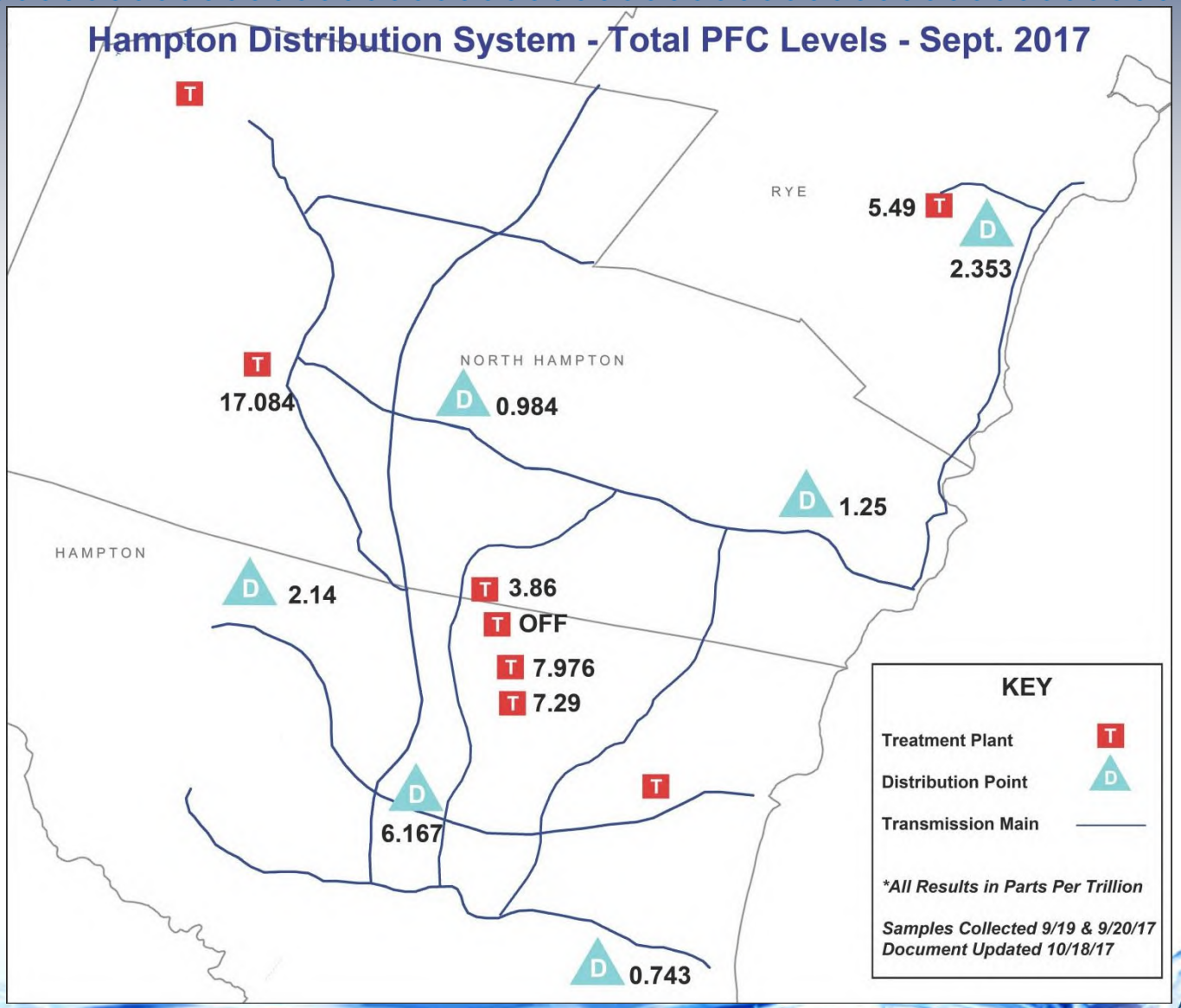
AQUARION
Water Company

What concentrations of PFOA and PFOS are in the drinking water?



AQUARION Water Company

What concentration of total PFCs are in the drinking water?



AQUARION Water Company

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  - Range of 2017 results Total PFCs: <1 – 15 ppt

AQUARION
Water Company

What concentrations of PFOA and PFOS were in the drinking water?

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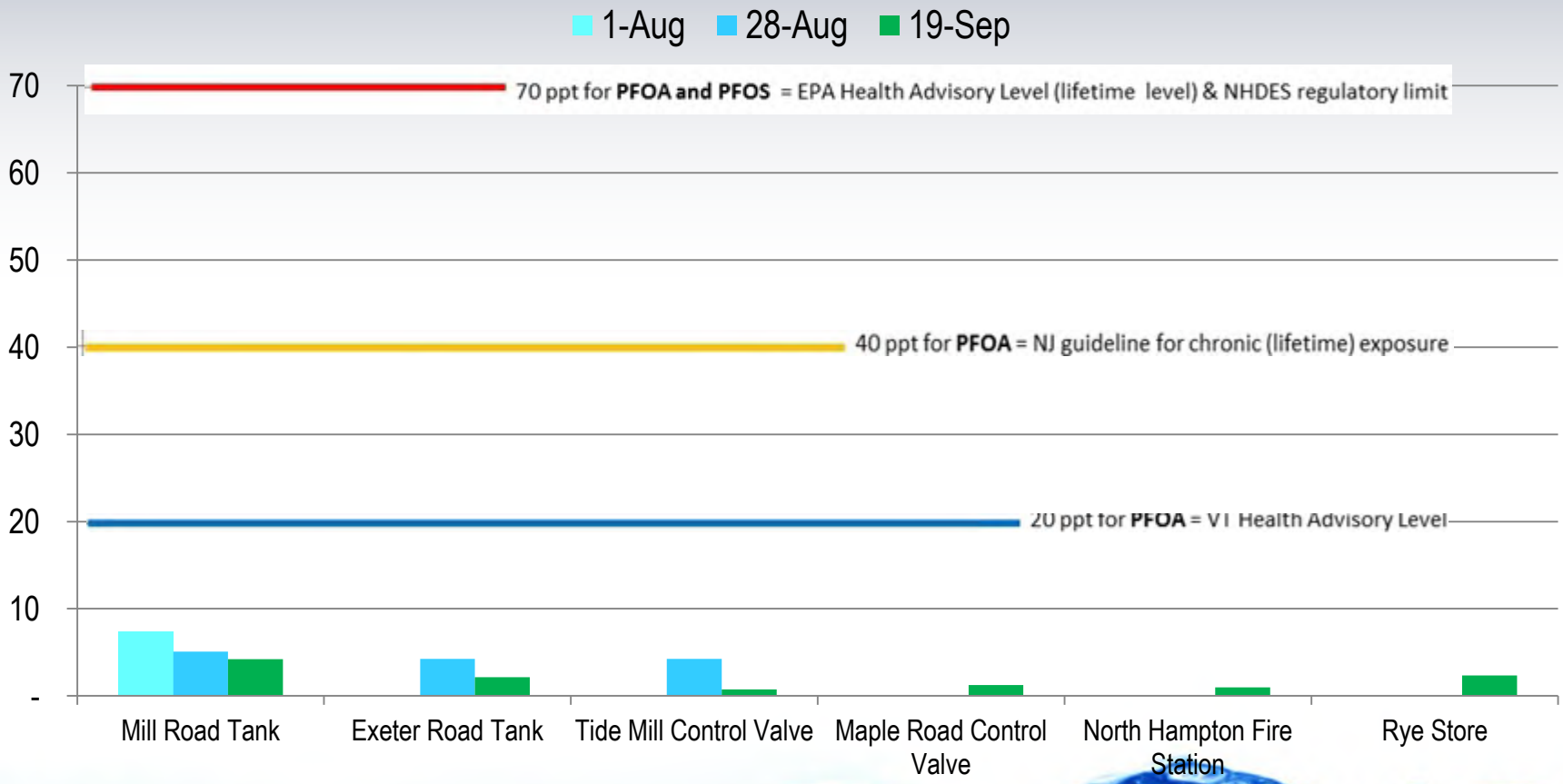

AQUARION Water Company

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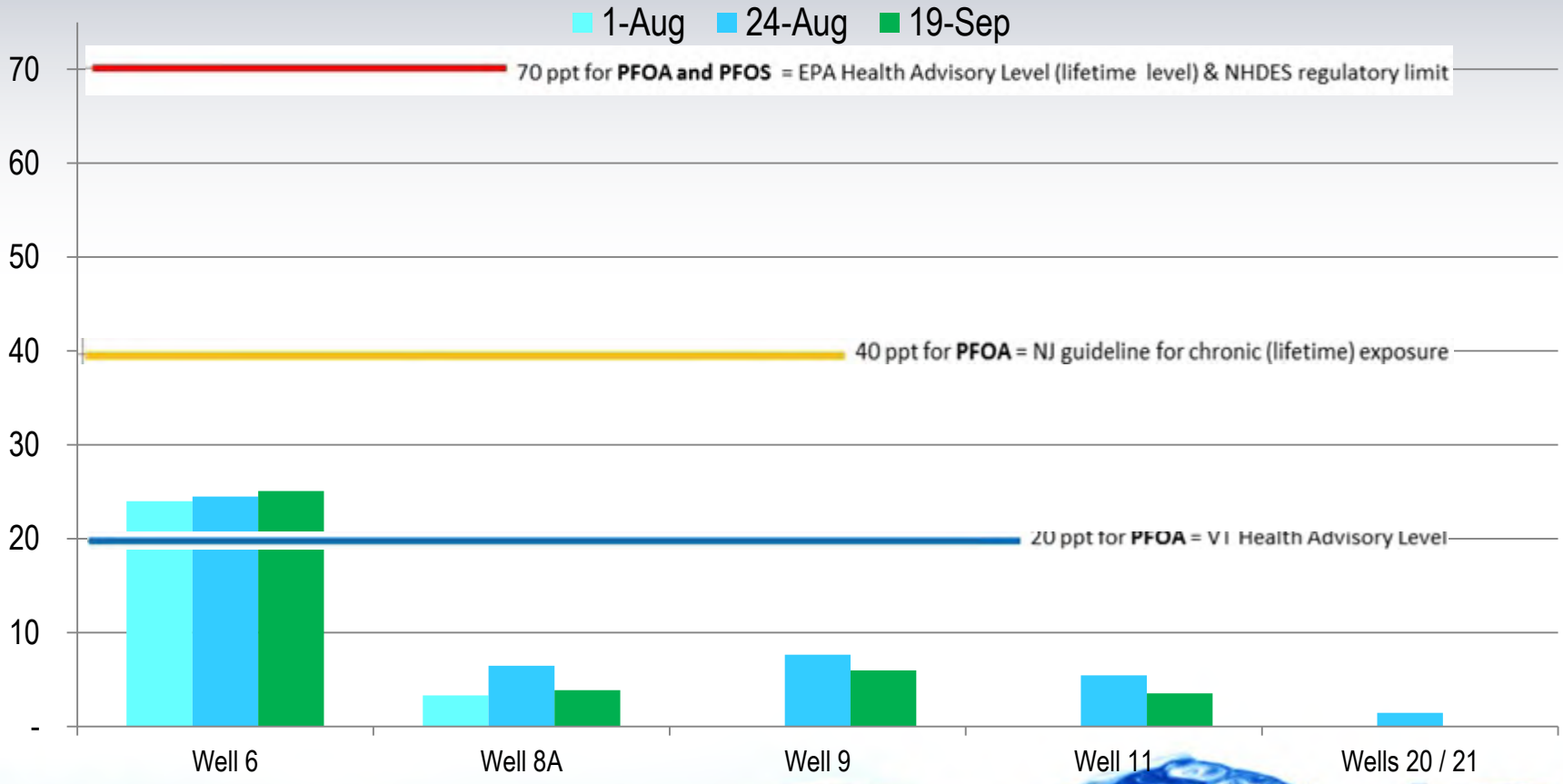

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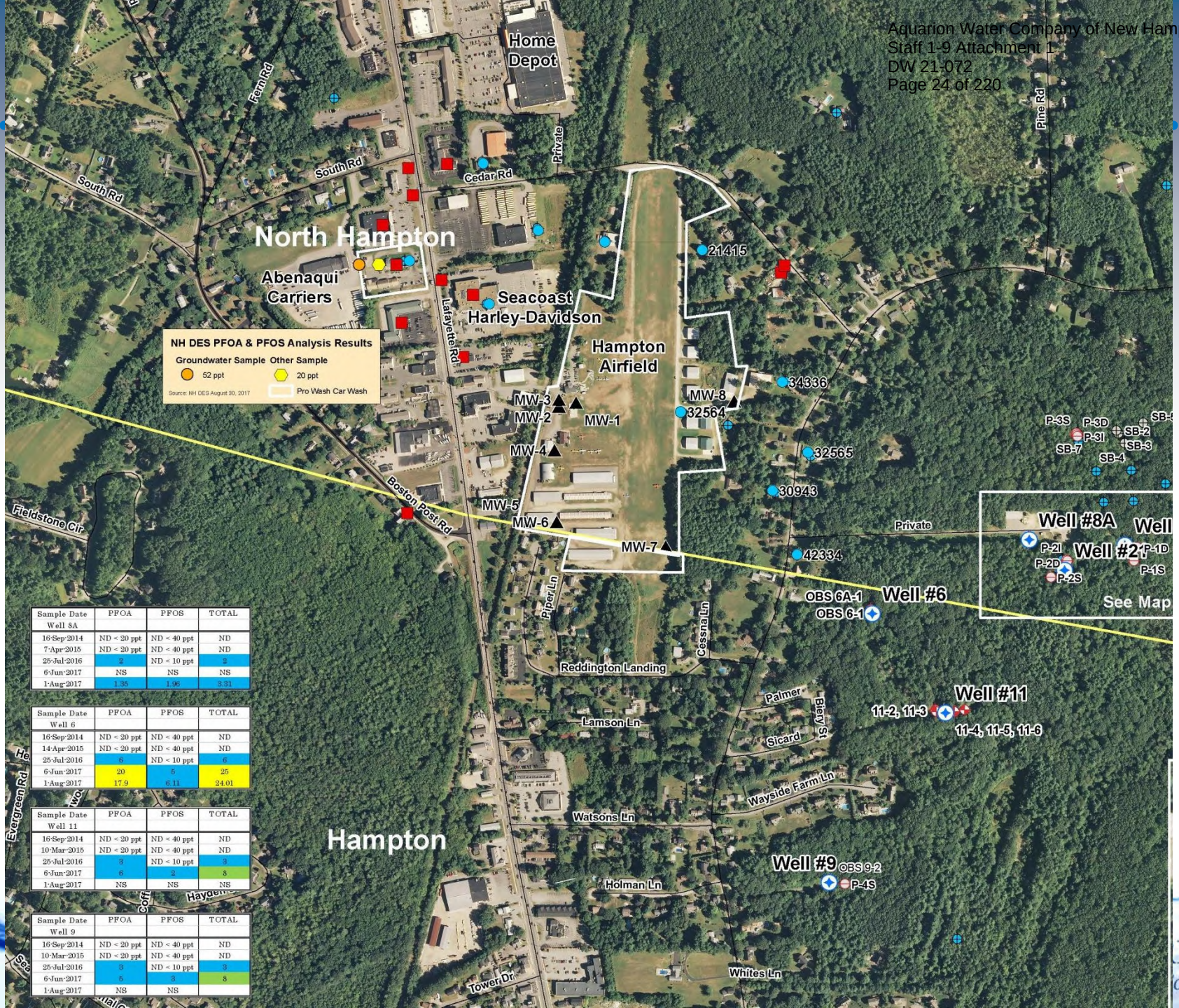
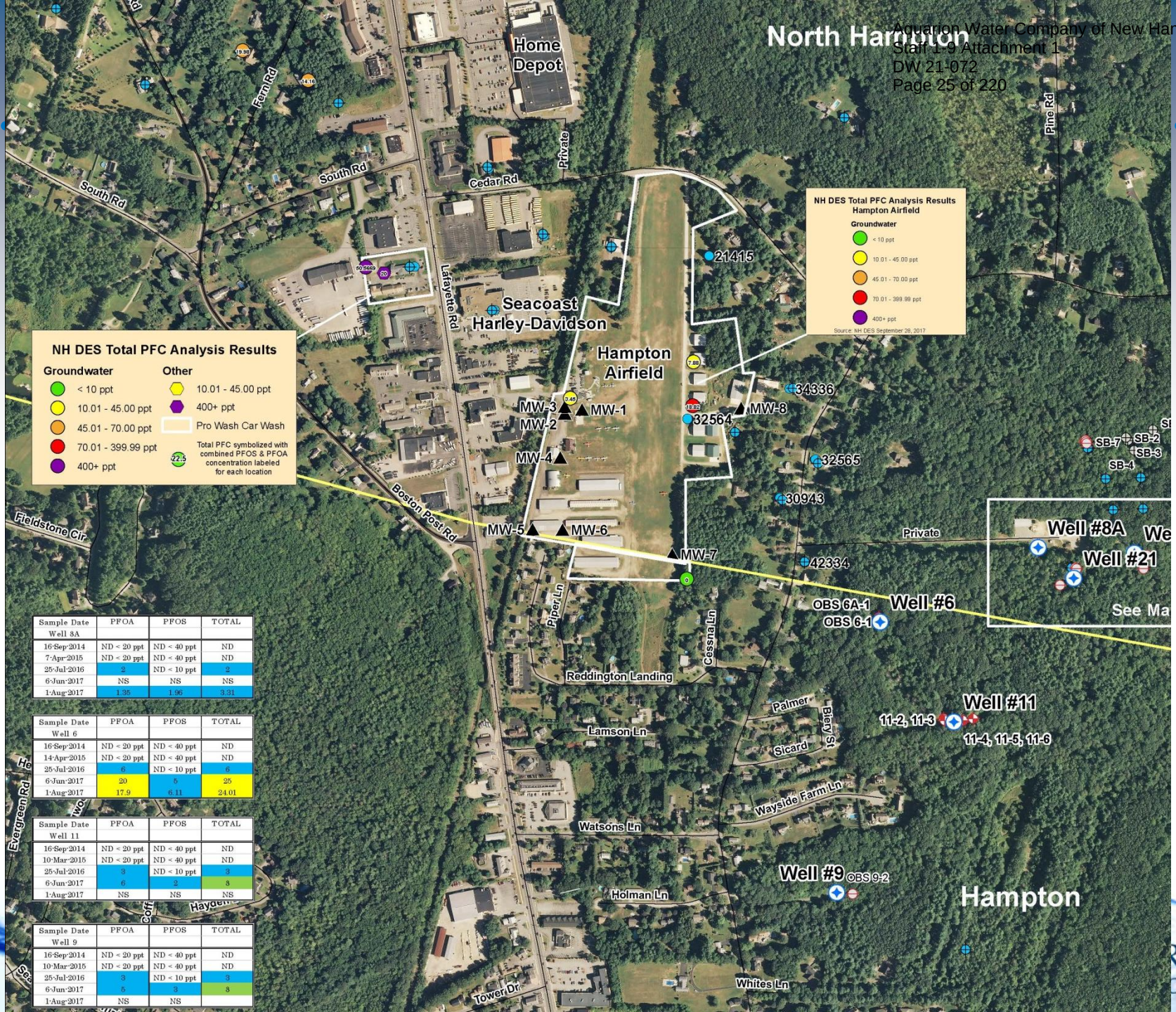


Sample Date	PFOA	PFOS	TOTAL
Well 8A			
16-Sep-2014	ND < 20 ppt	ND < 40 ppt	ND
7-Apr-2015	ND < 20 ppt	ND < 40 ppt	ND
25-Jul-2016	2	ND < 10 ppt	2
6-Jun-2017	NS	NS	NS
1-Aug-2017	1.35	1.96	3.31

Sample Date	PFOA	PFOS	TOTAL
Well 6			
16-Sep-2014	ND < 20 ppt	ND < 40 ppt	ND
14-Apr-2015	ND < 20 ppt	ND < 40 ppt	ND
25-Jul-2016	6	ND < 10 ppt	6
6-Jun-2017	20	5	25
1-Aug-2017	17.9	6.11	24.01

Sample Date	PFOA	PFOS	TOTAL
Well 11			
16-Sep-2014	ND < 20 ppt	ND < 40 ppt	ND
10-Mar-2015	ND < 20 ppt	ND < 40 ppt	ND
25-Jul-2016	3	ND < 10 ppt	3
6-Jun-2017	6	2	8
1-Aug-2017	NS	NS	NS

Sample Date	PFOA	PFOS	TOTAL
Well 9			
16-Sep-2014	ND < 20 ppt	ND < 40 ppt	ND
10-Mar-2015	ND < 20 ppt	ND < 40 ppt	ND
25-Jul-2016	3	ND < 10 ppt	3
6-Jun-2017	5	3	8
1-Aug-2017	NS	NS	



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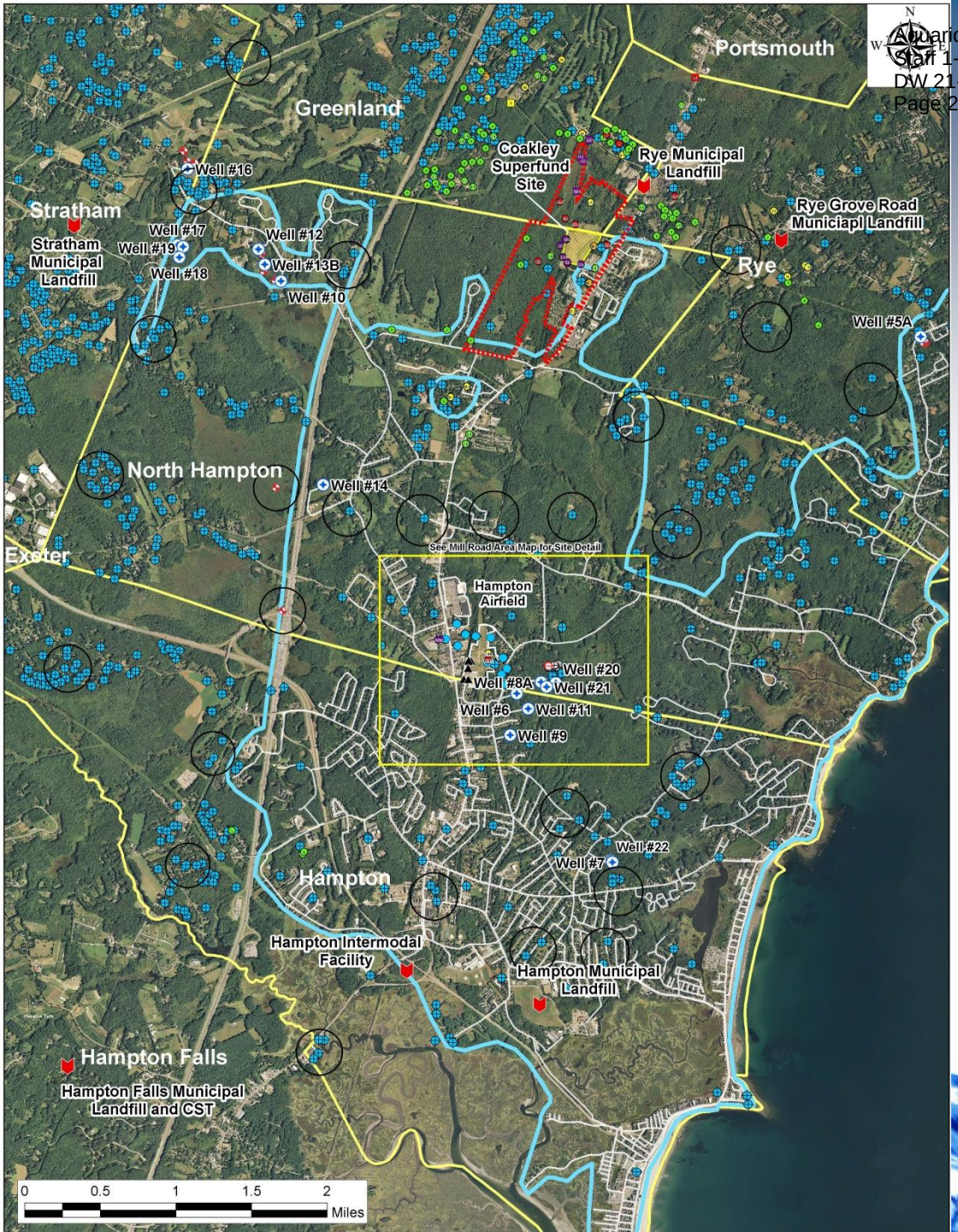
25-Jul-2016	3	ND < 10 ppt	3
6-Jun-2017	6	2	8
1-Aug-2017	NS	NS	NS

Sample Date	PFOA	PFOS	TOTAL
Well 9			
16-Sep-2014	ND < 20 ppt	ND < 40 ppt	ND
10-Mar-2015	ND < 20 ppt	ND < 40 ppt	ND
25-Jul-2016	3	ND < 10 ppt	3
6-Jun-2017	5	3	8
1-Aug-2017	NS	NS	


Portsmouth
Greenland
Coakley Superfund Site
Rye Municipal Landfill
Rye Grove Road Municiapl Landfill
Rye
Well #5A
Well #16
Stratham
Stratham Municipal Landfill
Well #17
Well #19
Well #18
Well #12
Well #13B
Well #10
North Hampton
Well #14
Exeter
See Mill Road Area Map for Site Detail
Hampton Airfield
Well #20
Well #8A
Well #21
Well #6
Well #11
Well #9
Well #22
Well #7
Hampton
Hampton Intermodal Facility
Hampton Municipal Landfill
Hampton Falls
Hampton Falls Municipal Landfill and CST
0
0.5
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1.5
2
Miles

What actions is Aquarion taking to address PFCs?

Action 1 - Continuing and increasing testing for PFCs in Aquarion wells

Action 2 - Investigating the extent and source of PFCs at Mill Road Wellfield

Action 3 - Collaborating with stakeholders to investigate the extent and sources of PFC around all Aquarion wells

Action 4 - Evaluating treatment for wells at Mill Road Wellfield

Hampton Select Board Meeting - October 23, 2017

Agenda Item 3. Update on PFCs in Wells (John Herlihy, Carl McMorran & Dan Lawrence (starts at 26:19 on video))

Mr. Herlihy: we issue a water quality report every year; available to all on our website; we talk about where the water comes from, protect and save water, and what is in the water. There are 14 compounds detected and standards; data on PFCs that we started testing for on 2014.

A lot of mixing that goes on in the system; distribution system; compared to 70 ppt the numbers are very low; the Mill Road group has a 7 ppt, Well 6 is off line; levels are low compared to standard. There is 17 ppt coming out of Well 14 and 0.7 Tide Mill.

What concentration of PFCs are in the Drinking water?

The last three monitoring periods level have been very consistent; 25 ppt; the two regulated PFCs were found at concentrations well below the EPA lifetime Health Advisory Limit in the NHDES limit of 70 ppt…and below advisory and recommended limits set by other states. We also have been working very closely with NHDES on a pollution monitoring investigation; the purpose is to protect our production wells; finding PFCs in Well 6 is known, what is not known what is heading towards our wells. If there is a contamination plume, where is it, how high are the levels in the plume, what rate is the plume advancing toward our production wells? DES has been in the lead on the investigation, have identified a number of the potential pollution sources; doing sampling; a few results are in; data on DES website; found PFCs at a number of locations in the area; found significant levels are car wash, lower at airfield. We want to know if contaminates are heading towards any of our wells; hired a hydrogeologist and working closely with us and DES; working with DES on a plan to sample private and monitor wells to determine the scope and level of contamination in our whole drinking water system. DES will send postcards asking people to participate; Aquarion will help pay for cost of testing; hopefully will help us establish a footprint for what we are finding out in the aquifers and what we are finding in our production wells and make a connection.

The next step would be for NHDES to work with pollution sources to abate the contamination of the ground waters in the state.

Mr. Lawrence: we retained a consultant around September; we wanted to evaluate treatment options for PFCs detected in the Mill Road well field; we are making sure we cover everything. We are looking at possibilities for treatment and potential of total PFCs for treatment; treat all or a few; Well 6 is off and has the highest concentration, but still below; the report came in last Friday and we are still reviewing; looking at potential rate costs for customers. We will bring the report to you on November 1, 2017; address costs; trying to figure who to speak to; not clear which program is running through; how money is distributed; drinking water/trust fund and how it is established.

Selectman Barnes: the test you did for September were not any substantial variances from the prior month; continue to test and continue looking; source of funding.

Mr. Lawrence: right, there are a number of private wells; within our system and out; where the contamination comes from and continuing to look

Selectman Bean: received a letter from Camp Lejeune historic drinking water organization; pardon me if I do not accept government ascertains about safety and subjective terms about how things are low. I was in Concord this week and a member of the commission was removed from the commission on the cancer cluster commission. The letter I received was from 1953-1987 there were carcinogens dumped into the water in a Department of Defense installation in Camp Lejeune where my family lived and drank the water; about 10 different cancers, a myriad of diseases; children were dying; have no confidence. I went to the State of NH lobbyist website; Eversource Energy will be a parent company of yours; I support it. We sit here and have transparency obligations to our citizens; grand total of $253,000 going for lobbying; fund transfer to influence legislators and government regulators. We heard tonight that the levels are low, but the rate is very high. A hydrologist stated that PFCs do not break down easily, once they are in our environment or our bodies they stay there for a long time; they cause cancer, immune dysfunction, development delays, liver and thyroid effects. VT advises no more than 20ppt; based on science; Coakley Landfill has been known to be leaching 2,586 ppt; this concentration was detected this spring; one of the PFCs detected was at the second highest concentration in the world in any surface water body. There is a PFC issue at the landfill; detected at deep bedrock wells and deep bedrock groundwater flow regime has not yet been adequately investigated. I would like a copy of this power point; would like a detailed synopsis of your testing efforts going forward; your exact detailed testing; a copy of your communications with DES. We want to know the money that is spent lobbying is not used against the interest of people consuming your product and would like a guarantee of that; would like to know if you are spending money to oppose legislation to keep cancer levels PFOAs in our drinking water closer to the levels they are at now.

Mr. Lawrence: our alternative analysis looks at multiple levels down to 20 ppt.

Selectman Bean: I heard tonight that the level is low and hearing about blending cancer in water with water that is less cancer ridden with contaminates; I am not for that; not an intelligent, mature, scientific, responsible way to mitigate a cancer threat. The assurances I heard from Mr. Hunt that we invest in treatments we do not have now; make this the cleanest water in the nation. Well #6 is shut down.

Mr. Lawrence: yes.

Selectman Bean: what were the limits?

Mr. Lawrence: total PFC level of 86 and right now a total of PFOA and PFOS combined at 25.

Selectman Bean: lobbying money; buying something with that; we want to buy clean water; want to make sure that the money is not being used to fight a legislative agenda that protect people and their children in drinking clean water.

Mr. Lawrence: I truly believe we are being transparent with our information and willing to share where we are and it is going to be a productive process in moving forward as a group.

Mr. McMorran: we provided all the up to date data and happy to provide the power point.

Aquarion PFC Update

Hampton Board of Selectman Meeting
December 4, 2017

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9 PFC Have Been Detected in Mill Rd Wells

Name	Abbreviation	Number of Carbons
Perfluorononanoic acid	PFNA	9
Perfluorooctanoic acid	PFOA	8
Perfluorooctane-sulfonate	PFOS	8
Perfluoroheptanoic acid	PFHpA	7
Perfluorohexane-sulfonate	PFHxS	6
Perfluorohexanoic acid	PFHxA	6
Perfluoropentanoic acid	PFPeA	5
Perfluorobutane-sulfonate	PFBS	4
Perfluorobutanoic Acid	PFBA	4

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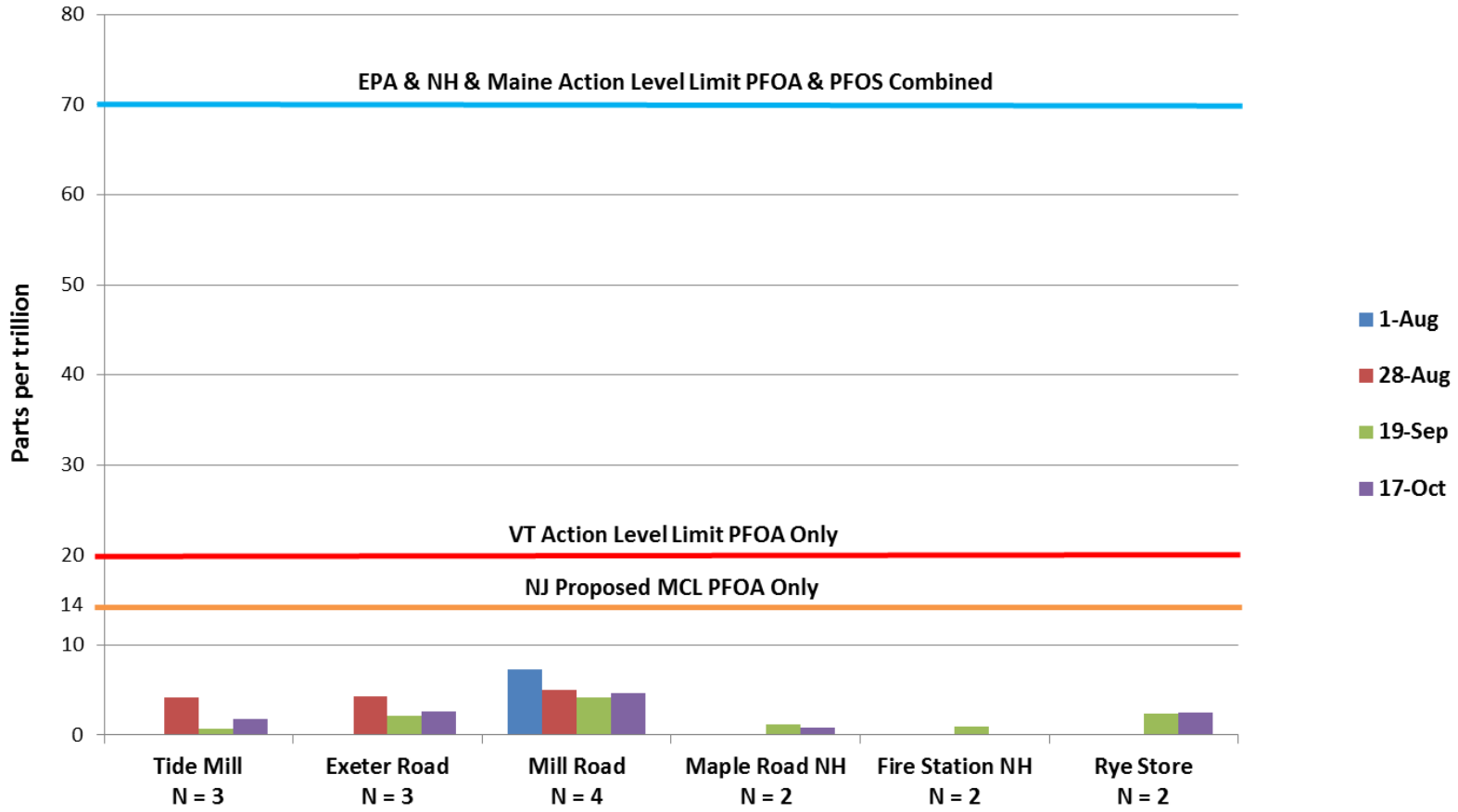
PFOA + PFOS: AWC Delivered Water 2017



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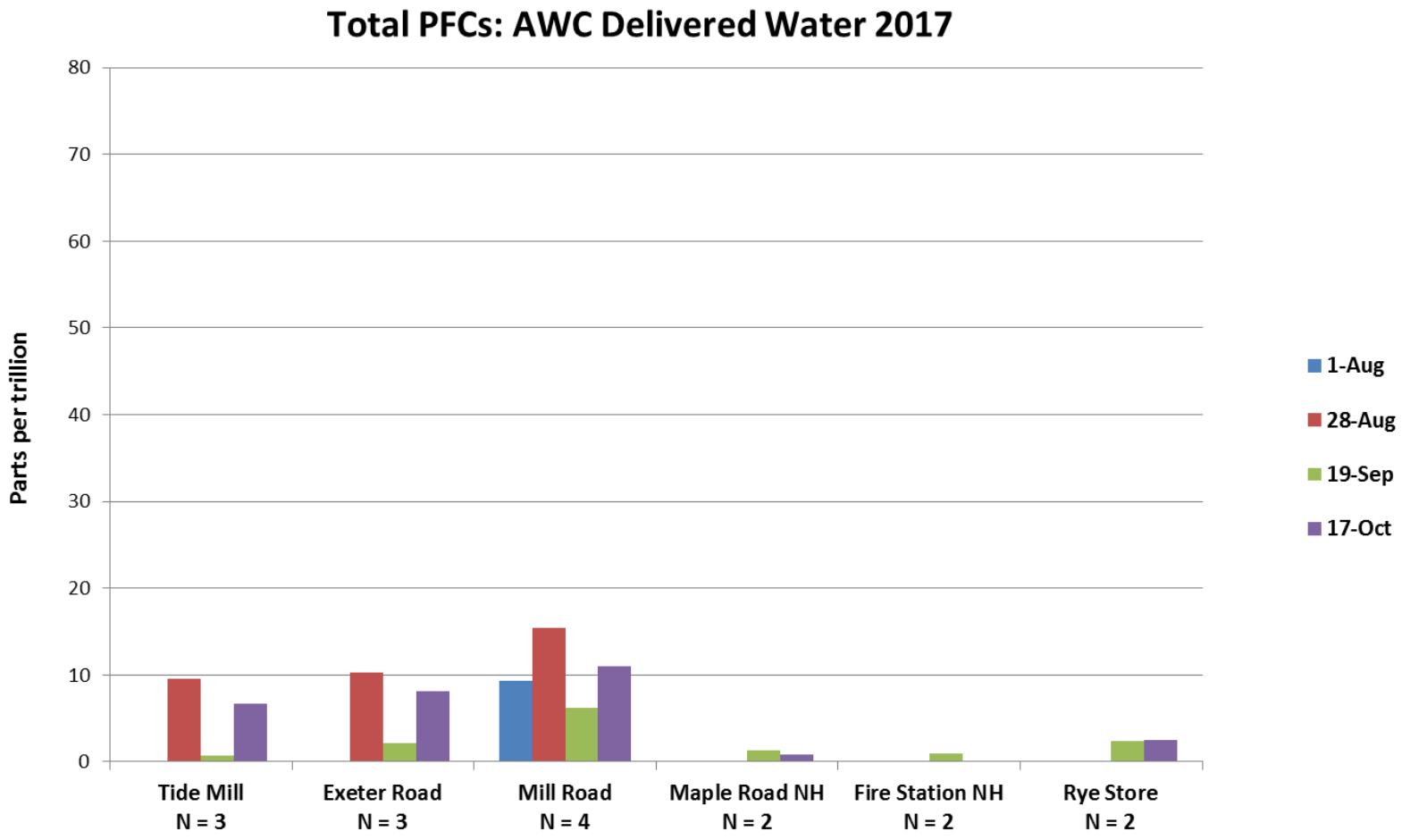

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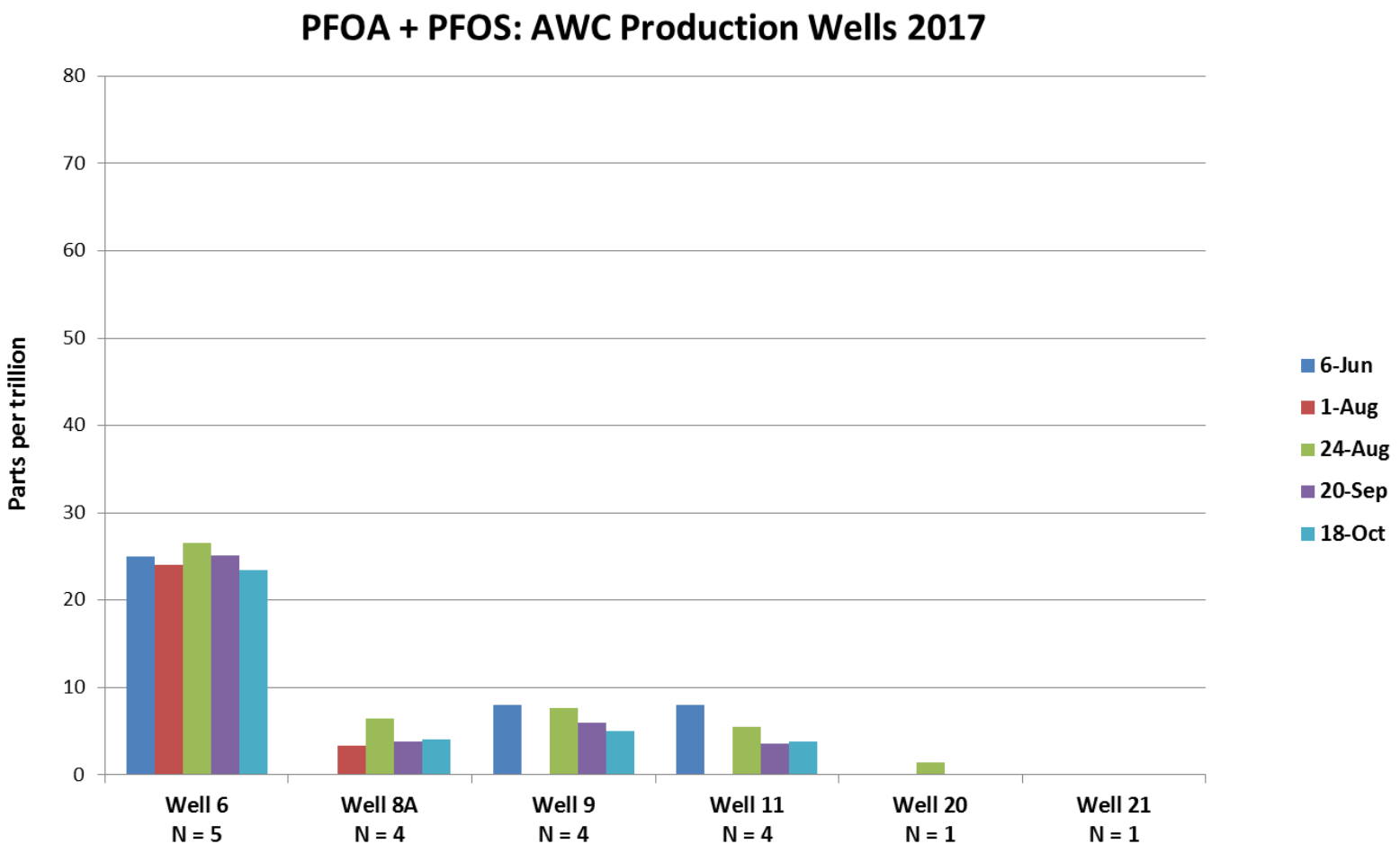

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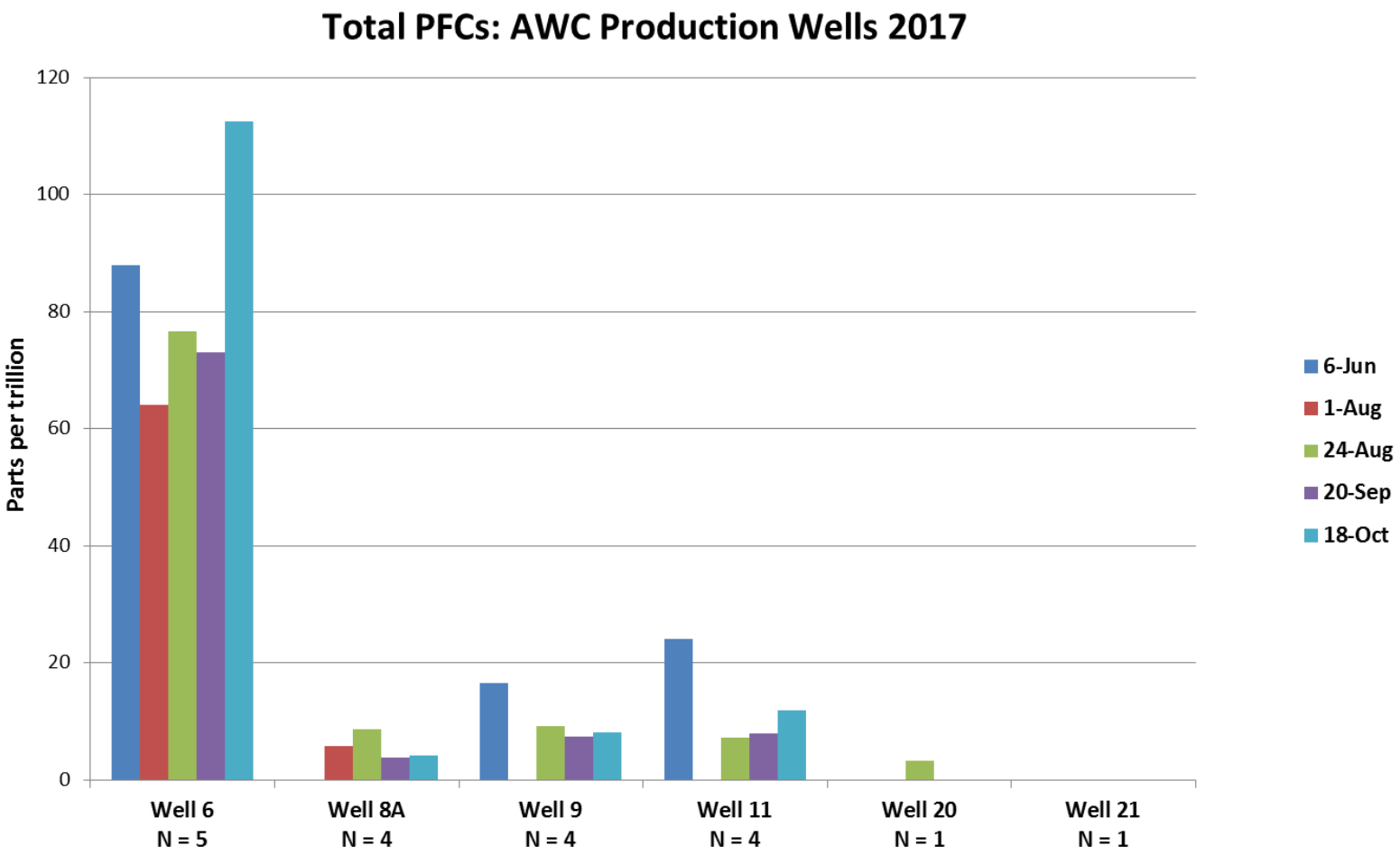

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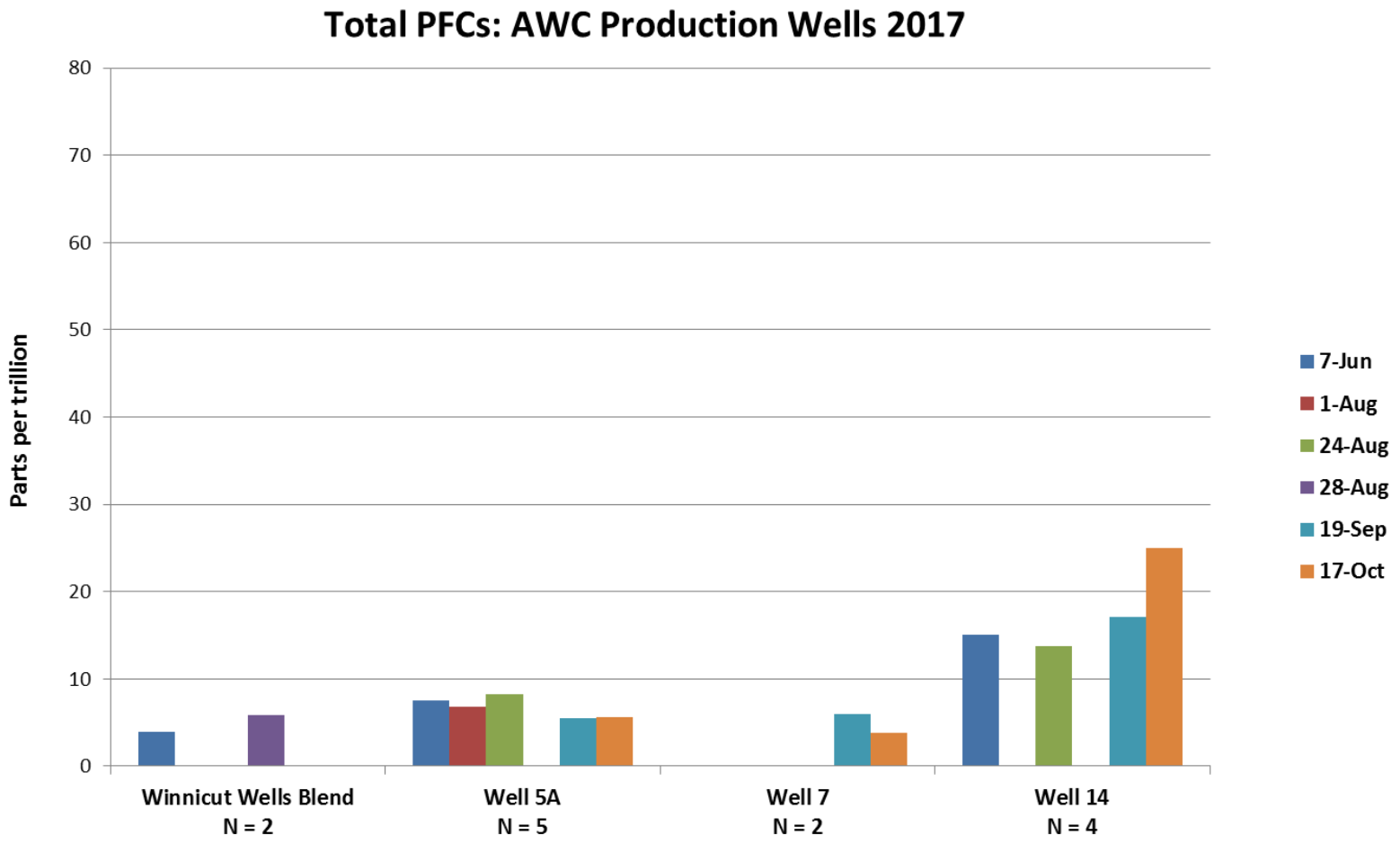

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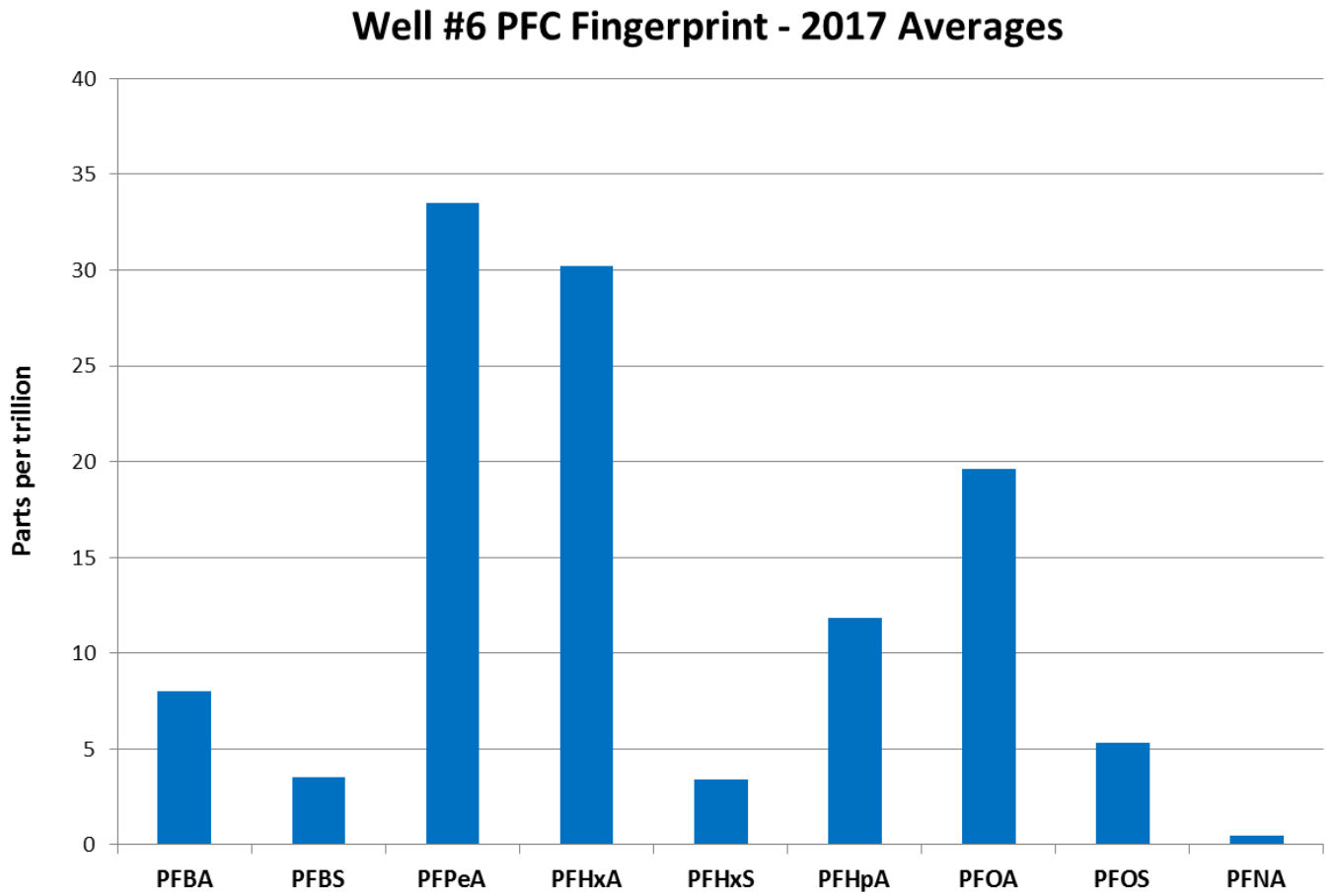

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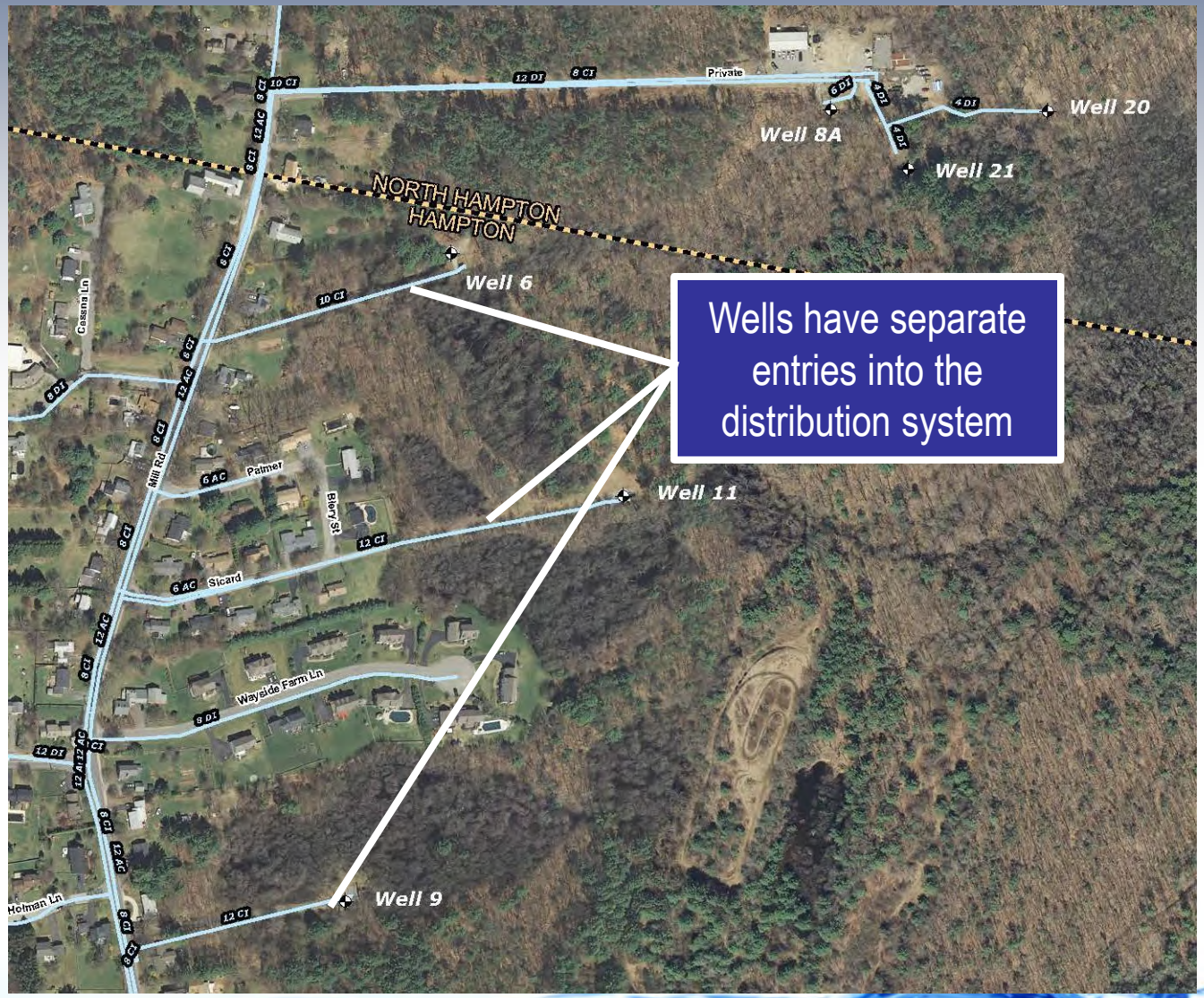
Actions for Limiting Exposure

Remove wells from service	• Mill Road Wells are critical infrastructure to meet water demands
Blend to reduce concentrations	• Lowest cost option • Shortest lead time
Treat affected wells	• Lowest final concentrations • Highest cost option

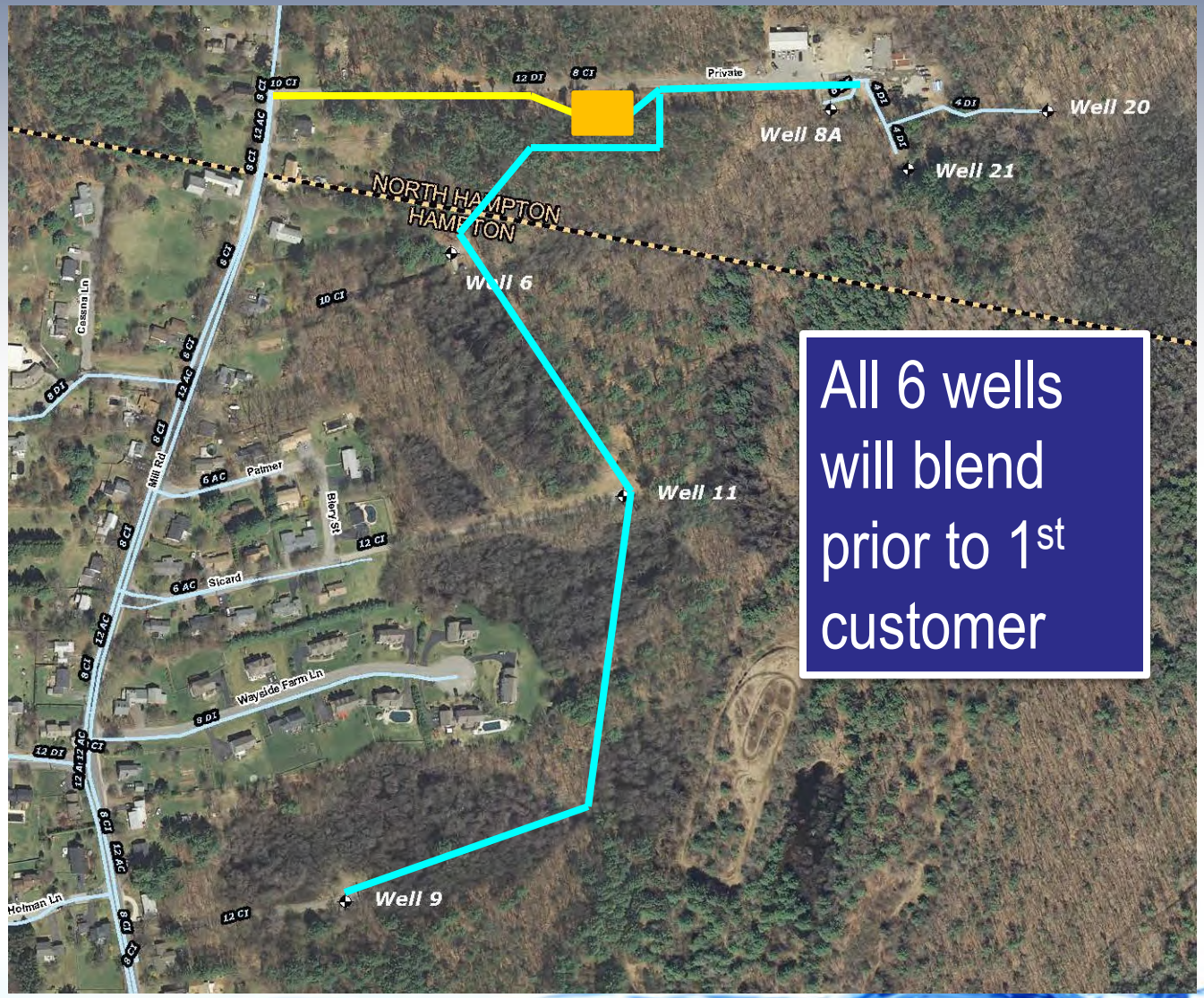
AQUARION Water Company

Planned Upgrades Provide Additional Redundancy



AQUARION Water Company

Planned Upgrades Provide Additional Blending



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Blending Will Maintain Concentrations Below Regulatory Levels

	Regulation (ng/L)	Blending All Wells (ng/L)[1]
PFOA/PFOS (ng/L)	70 (USEPA, NH, ME)	11
PFOA (ng/L)	14 (NJ[2]) 20 (VT)	8
PFOS (ng/L)	13 (NJ[2])	<4[3]
Total PFC (ng/L)	No Standard	40

[1] Based on maximum concentration of PFCs in well waters in 2017; concentration are as entering the distribution system
[2] NJ MCLs are proposed and not final
[3] Method Reporting Limit (MRL) assumed to be 4 ng/L.

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PFCs Treatment Technologies

Granular Activated Carbon (GAC)

Proven technologies

Ion Exchange (IX)

Lower capital and annual operating costs

High Pressure Membranes

Smaller waste streams

AQUARION Water Company

3 Treatment Alternatives were Evaluated

Scenario 1: Treat Well 6

- Highest concentration well
- 360 gallons per minute

Scenario 2: Treat Wells 6, 9, 11, 8A

- All overburden wells
- 1,930 gallons per minute

Scenario 3: Treat Wells 6, 9, 11, 8A, 20, and 21

- All Mill Rd Wells
- 2,120 gallons per minute

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Treatment Will Decrease PFC Concentrations

	Regulations (ng/L)	Blending All Wells	Scenario 1 PFC treatment of water from Well 6	Scenario 2 PFC treatment of water from Wells 6, 8A, 9, 11	Scenario 3 PFC treatment of water from Wells 6, 8A, 9, 11, 20/21
PFOA/PFOS [1]	70 (USEPA, NH, ME)	11	6	<4[2]	<4[2]
PFOA[1]	14 (NJ[3]) 20 (VT)	8	4	<4[2]	<4[2]
PFOS[1]	13 (NJ[3])	<4[2]	<4[2]	<4[2]	<4[2]
Total PFC [1]	No Standard	40	18	<4[2]	<4[2]

[1] Based on maximum concentration of PFCs in well waters in 2017; concentration are as entering the distribution system
[2] Method Reporting Limit (MRL) assumed to be 4 ng/L.
[3] NJ MCLs are proposed and not final

AQUARION Water Company

Conceptual Treatment Costs

	Blending All Wells	Scenario 1 PFC treatment of water from Well 6	Scenario 2 PFC treatment of water from Wells 6, 8A, 9, 11	Scenario 3 PFC treatment of water from Wells 6, 8A, 9, 11, 20/21
PFOA/PFOS (ng/L)[1]	11	6	<4[2]	<4[2]
PFOA (ng/L)[1]	8	4	<4[2]	<4[2]
PFOS (ng/L)[1]	<4[2]	<4[2]	<4[2]	<4[2]
Total PFC (ng/L)[1]	40	18	<4[2]	<4[2]
Conceptual capital cost[3]	$0M[6]	$1.9M	$5.8M	$5.7M
Conceptual annual O&M costs[4]	$0M[6]	$0.1M	$0.3M	$0.3M
Rate increase required[5]	**0%[6]**	**5%**	**16%**	**16%**

[1] Based on maximum concentration of PFCs in well waters in 2017; concentration are as entering the distribution system
[2] Method Reporting Limit (MRL) assumed to be 4 ng/L.
[3] Conceptual capital costs have an expected accuracy of -30%/+50%.
[4] Annual O&M costs for GAC are based on a one year replacement frequency.
[5] Actual rate increase required will depend on final capital and annual O&M costs.
[6] Connecting Wells 9 and 11 is planned under a separate project

AQUARION Water Company

Funding Opportunities

- Groundwater and Drinking Water Trust Fund
  - Aquarion reached out to Rick Skarinka from NHDES to better understand the program, timelines and funding.
  - RSA 485f is the controlling statue that established a 19 member advisory commission and is chaired by Senator Chuck Morse. The committee holds monthly public meetings and the next meeting is December 19, 2017 at SH Room 103
  - No rules or guidelines have been established or defined. This will be developing in the first half of 2018. The next possibility may be as early as the 2nd quarter of 2018 to submit a request for funding.
  - Grants are probable, maybe as high as ~50%, but some or all of the fund may be administered through the State Revolving Fund(SRF) Program. Broad scope of water projects will be considered including infrastructure, source protection, and land purchases.
  - Funding Available - $278 M (total). The yearly allocation for projects has not been defined at this time.

AQUARION
Water Company

Hampton Select Board Meeting - December 4, 2017

PFC Studies / PFC Treatment Alternatives Analysis (John Herlihy, Dan Lawrence, Carl McMorran, John Walsh, Alan Hewitt & Bryan Mills (starts at 14:00 on video))

Mr. Walsh: provide update on the PFCs that we are finding in our wells; provide with a summary of the alternatives to address the PFCs and the cost associated to those alternatives; levels.

Mr. Herlihy: 7 wells in the Winnicut Road Wellfield, 6 wells in the Mill Road Wellfield, 3 individual wells, one in Rye, one in North Hampton and the other in Hampton. Have been monitoring the wells since June; 6 locations in distribution system since August.

[PFOA] and [PFOS] are the two that have limits in NH, USEPA and ME; the levels of the PFOA and PFOS combined are low compared to the current standard in NH and lower than NJ; levels have been very consistent over the last 3 months. In October detected two new compounds; have remained consistent; all less than any standard that is out there. The highest contamination in Well 6; picking up some PFC levels in Well 14; fingerprint average; new compound detected in Well 6, will help identify where the contamination is coming from.

Continue to work with DES to plan a monitoring round out beyond our production wells; DES will be performing sample collection; Aquarion will pay for the testing, cost about $20,000.

Mr. Lawrence: November 6, 2017 provided copy of our treatment analysis; costs and impacts to Town; have three main options; remove wells from service, blend sources and treat effective wells. Well 6 is critical infrastructure, as it is needed during high demand periods; wells are blended already; wells have separate entries into the distribution system; combine all the wells and create one entry point into the system; chemical treatment facility; results in overall lower PFCs.

Selectman Barnes: you are still working on an agreement with NHDES.

Mr. Lawrence: one of the things that are important to us, we selected 50 locations throughout the communities; not good data of where contamination might be coming from and what type of contamination; would like to understand that better to make sure we are moving in the right direction.

Selectman Barnes: when do you think we can have all the testing?

Mr. Lawrence: we are finalizing the contractual terms with DES, should be done by the end of the year of the first part of January; they have a staff to call people to arrange for sampling; when we have contract going out to bid for the results; first quarter spent collecting the data; results goes direct to the DES. There are a number of landfills around besides Coakley; understand potential sources; proceed with blending

Selectman Bridle: sounds like with the blending use old adage the best solution for pollution is dilution.

Mr. Lawrence: not going to stop investigating.

Selectman Griffin: depending on you to make sure things stay the way, they need to be.

Selectman Bean: Dr. Ballestero testified November 15th in North Hampton; CLG brief; were any of you at the meeting in North Hampton? Has anyone seen Dr. Ballesteros's synopsis of his comment.

Mr. Lawrence: yes

Selectman Bean: Dr. Ballestero states the challenge of the plume coming from Coakley; the well shut down produced just over 65,000,000 gallons of water per year; overburden well; 4 other wells nearby; water supply has recognized it has insufficient supply in storage to meet the water needs of the communities it serves; magnified water shortage. Aquarion seeking to put online a bedrock well in the same vicinity as its other wells; DES has recognized the PFC contamination may be drawn into this well and is requiring monitoring for this and other contaminant. The communities served by Aquarion Water and by private wells are now caught in the precarious position of not owning the company; downgrad from the landfill plume. Communities are requesting additional monitoring of wells; initial response is Coakley Landfill is not the source of PFCs that shut the well down; all the data suggests against this conclusion. Regulatory response is there are other sources much closer to the shut down well; concentration in well is cumulative metric; represents totality of all sources; he states CLG and not Aquarion should pick up the tab for additional testing; Dr. Ballestero taught the senior EPA representative in Boston. I heard people from your company earlier in the year said blending was not a good idea; I do not think it is a good idea; Ms. Messmer is doing great work in Concord. We support Eversource and Aquarion; support your attempts at solution and ask that you work closely with our scientist on solutions. Chairman of the PUC said we have direct access to courses of action we can pursue with them to protect our interest in filings, legal actions or hearings; prudent for Board to do that if we are not satisfied with the courses of actions you are taking.

Chairman Waddell: the water being delivered right now is below the most conservative standards in the country, is that true.

Mr. Herlihy: yes.

Chairman Waddell: If it was blending, it would be below the most conservative standard; think you have to go with science that is available right now; want people to know they are receiving safe water right now according to all standards. Aquarion has been very transparent and has gone above and beyond.

Selectman Barnes: we talked about blending at the meeting today; and blending was not going to be the way we were going to treat this; treat well 6 and then blend; if you could get together with Dr. Ballestero. My alternate is to have scenario 3, but do not think Aquarion or the ratepayer should have to pay; the polluter should have to pay.

Selectman Bean: On August 28, it appears to be 15.

Mr. Herlihy: that is total PFCs.

Selectman Bean: well 6 lost 65 million gallons of capacity.

Mr. Herlihy: when you blend those 6 wells together as is, the max level would be 11.

Selectman Bean: looking at limits approaching 30, is that correct?

Mr. Herlihy: that is PFOA plus PFOS; if you add NJ 14 for PFOA and 13 PFOS, that is 27; we are right around there before we blend.

Selectman Bean: my comfort level is much different from the chairs; you are higher than NJ and going to blend that with good water; can you tell me what the numbers on page 7 are about?

Mr. Herlihy: those are the totals of the 9 PFCs that have been detected.

Selectman Bean: how do those compare with NJ.

Mr. Herlihy: no state has a standard for total PFCs.

Selectman Bean: these PFCs are they carcinogens?

Mr. Herlihy: I am not qualified to answer that; do not think they have determination; PFOA they have said is carcinogen.

Selectman Bean: did you shut down well 6 because you were confident there were not carcinogens?

Mr. Herlihy: we shut down well 6 out of an abundance of caution, we did not have enough information about the levels the wells were producing and what is safe.

Selectman Bean: these are emerging threats; aggressive; science is evolving almost on a daily basis.

Attorney Gearreald: ever since the Board and my office were informed this summer that there was a level of contamination in well 6, this Board has been very vigorous in our approach encouraging further monitoring to find out the source of the contamination; encouraging treatment in the meantime. Aquarion and the Towns of Hampton and North Hampton entered into an agreement[1] to further the monitoring effort as well as explore the treatment possibilities. Thank Aquarion for following up on that agreement; in January will be able to provide input to Aquarion as to whether there would be a go or no go with response to these treatment legalities that have been mentioned. This Board's opinion will be heard by Aquarion and be followed up on; aggressively pursuing the contamination and what to do about it. Dr. Ballestero gave a very well informed presentation and has submitted this in writing to EPA and Aquarion; find out whether Coakley is the source of the contamination; have offered Dr. Ballesteros's assistance to Aquarion and hope they will take advantage of that.

[1] Eversource agreement DW17-114

PFAS means Per- and Poly-FluoroAlkyl Substances, which is a more accurate scientific and regulatory acronym, which refers to those flouride containing compounds in water.

The old acronym, PFC, may be confusing because it is also used to describe other environmental contaminants that are not associated with water.

Agenda

- Where does Aquarion get the water it provides to its customers?
- What are PFAS (Per- and Poly-Fluoroalkyl Substances, formerly PFCs)?
- What health standards have been set for PFAS?
- What concentration of PFAS are in tap water?
- What concentration of PFAS are in groundwater?
- What actions is Aquarion taking to address PFAS?
  - Monitoring drinking water and wells
  - Source selection strategy
  - Groundwater Investigations
  - Treatment alternatives

2

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Water Company

Actions to Identify PFAS Levels

- Unregulated Contaminant Monitoring Rule Testing
  - 2014 – 2015
  - 6 PFAS parameters from
    - 8 Sources
    - 2 Distribution System Locations
- 2016 - 2018 – Aquarion performed voluntary testing
  - All wells
  - 6 Distribution System Locations
  - PFAS Analyses Expanded to 26 Parameters
  - Total samples: 100 (2017 – 2018)
  - Total tests: 2,072 (2017 – 2018)

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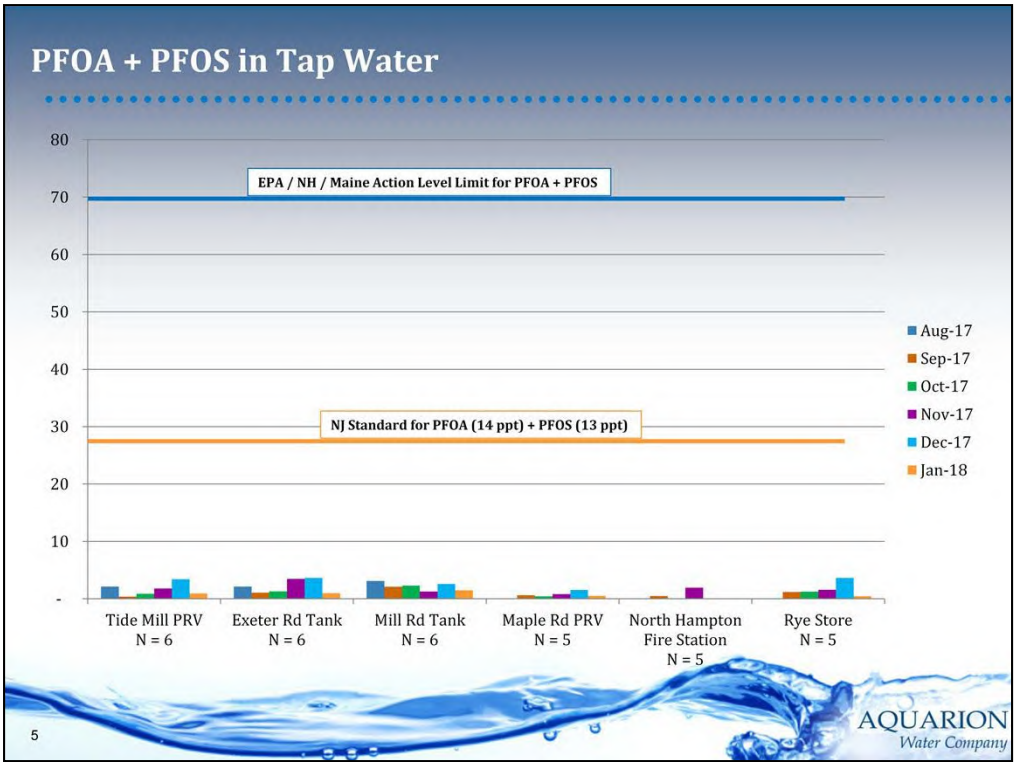
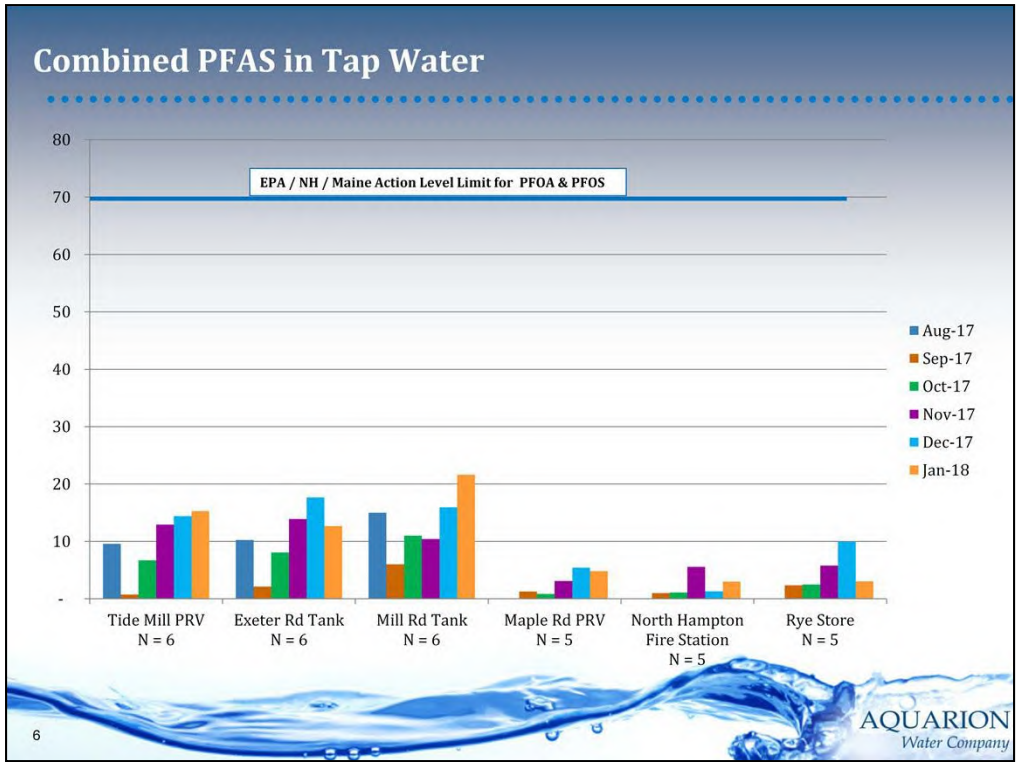


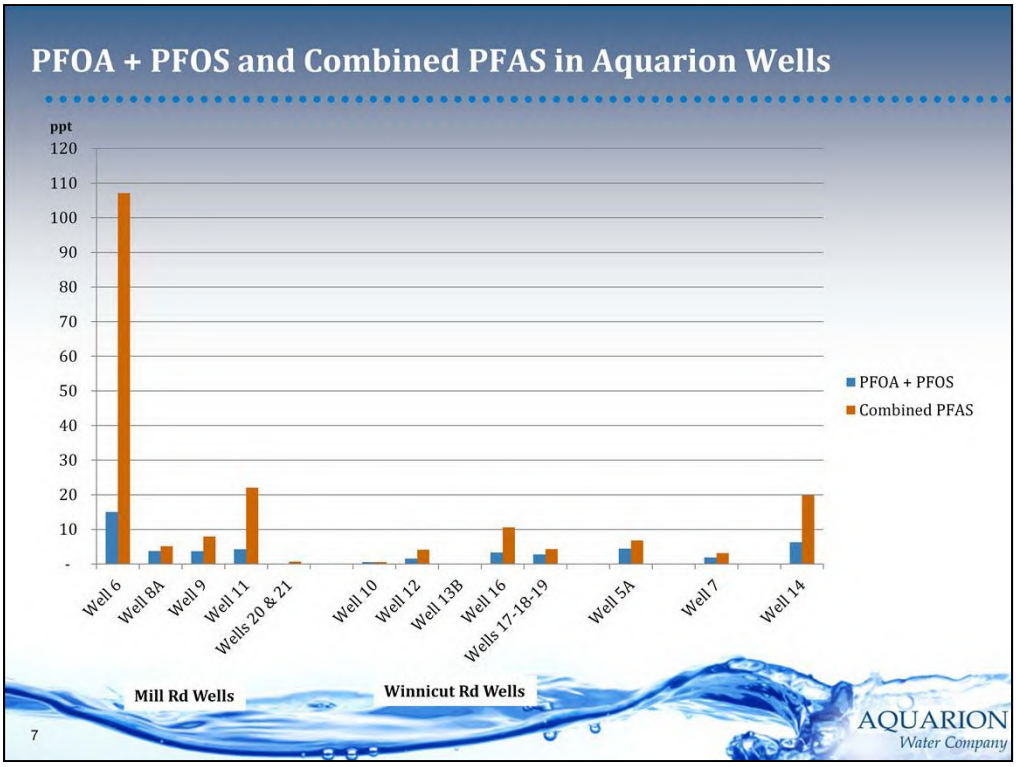
PFOA and PFOS are currently the only two regulated PFAS, and have only been detected in very low concentrations in tap water.

This chart shows how much below PFAS concentrations are compared to the current action level of 70 parts per trillion (ppt), and to the most conservative regulation currently in place in New Jersey.



Laboratory analyses can detect 26 different PFAS compounds, of which only 9 have been detected.

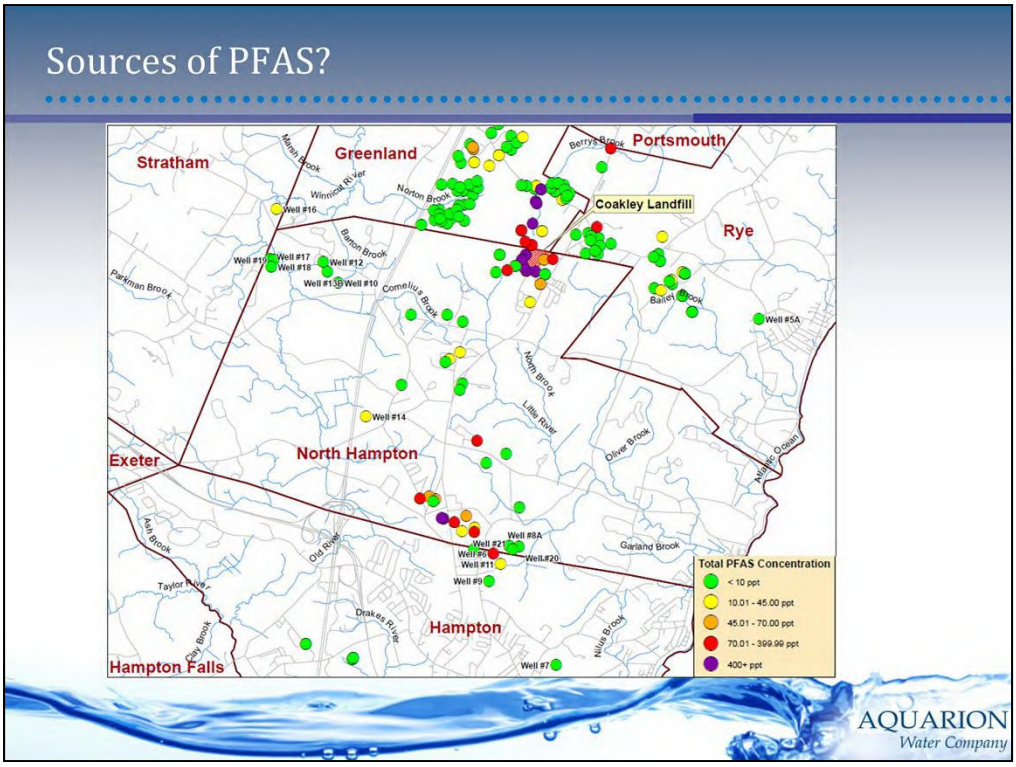
Although most are not regulated, the combined amounts are still much lower than the Action Limit.



PFAS levels in individual wells are also very low.

A few wells are somewhat higher, although the Action Limit is not exceeded.

Water from multiple wells is continuously mixed in the water distribution system, which results in the very low levels observed in tap water.

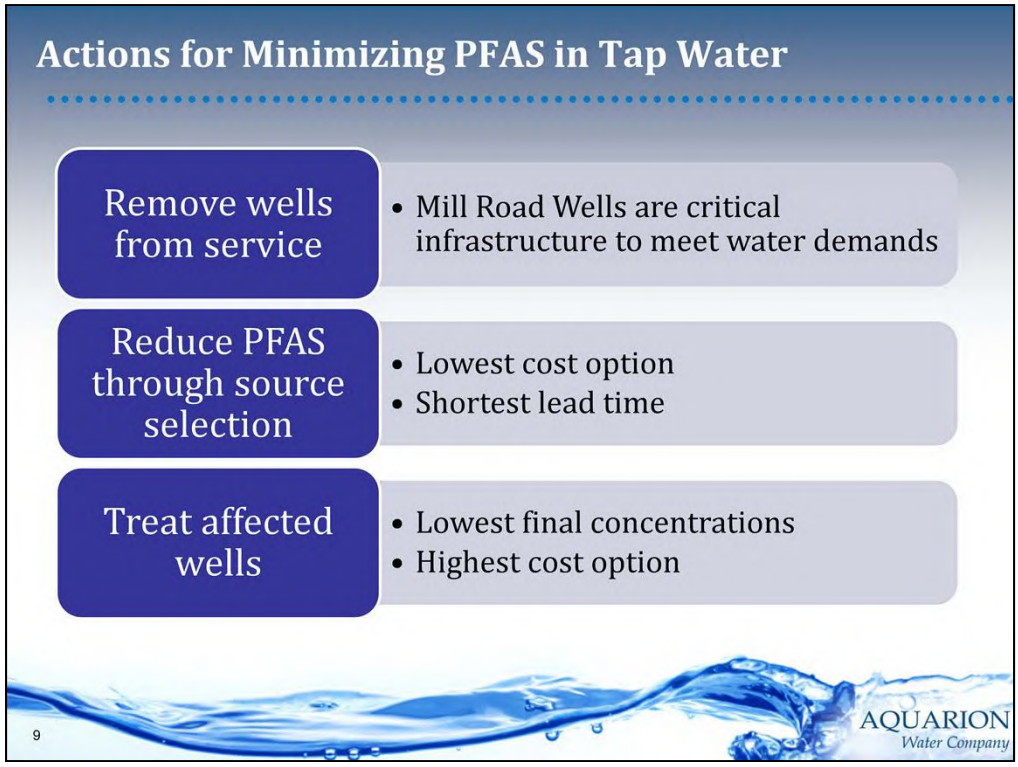


Aquarion is also helping develop more information on the general distribution of PFAS in the local aquifers by supporting work by DES to conduct PFAS sampling private wells in the area.

This map shows the higher concentrations near the Coakley Landfill, as expected, and in some other wells, which seem to concentrate along the Rt 1 corridor.

Also note many other wells in the area, indicated by the green dots, which indicate little or no PFAS concentrations.

DES is hoping to collect samples from an additional 50 wells in the area to fill in the blank spots on the map.

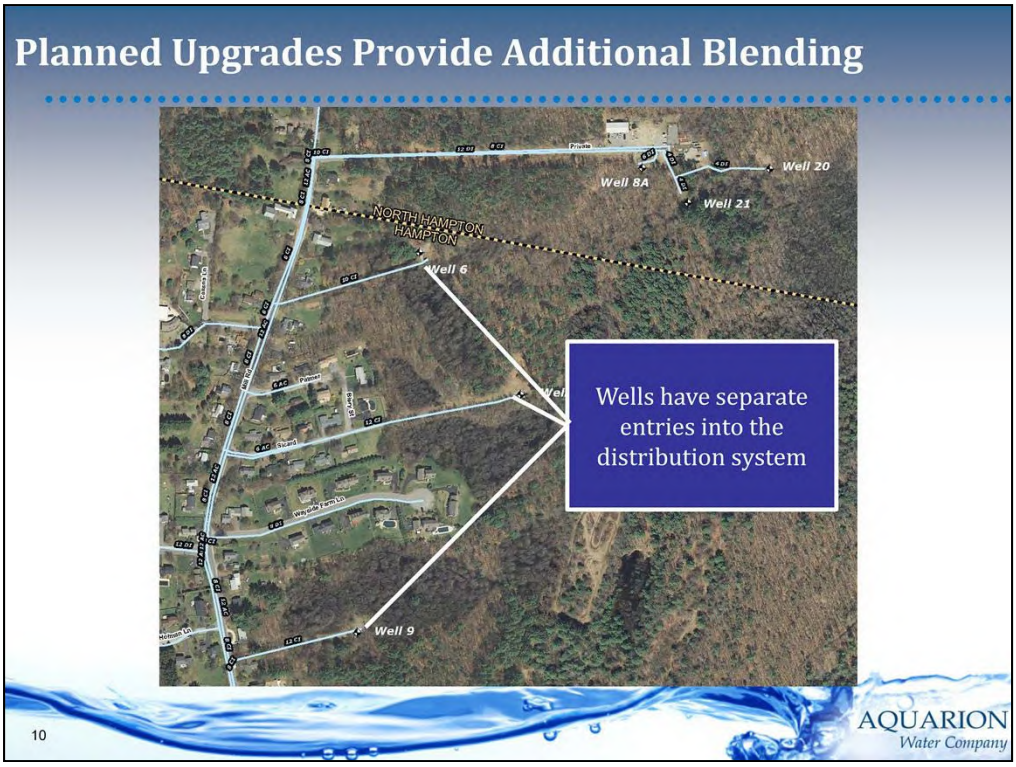


Aquarion is also evaluating options for reducing and removing PFAS in the water supply.

Removing wells with higher PFAS from service will reduce overall PFAS, but would also reduce production capacity and the ability to meet peak demands.

Source selection involves reducing the use of wells with higher PFAS on day-by-day and annual schedules, essentially using them only to meet peak demands.

Treatment options include installing granular activated carbon (GAC) or ion exchange (IX) filters. These two options would require capital investment in treatment facilities and equipment, an increase in annual operating costs, and will take several years to design and construct.



In addition to improving chemical treatment and other operating efficiencies, combining the six Mill Rd wells into one treatment facility allows for optimization of PFAS levels though source selection.

Planned Upgrades Allows For Optimized Source Selection

11

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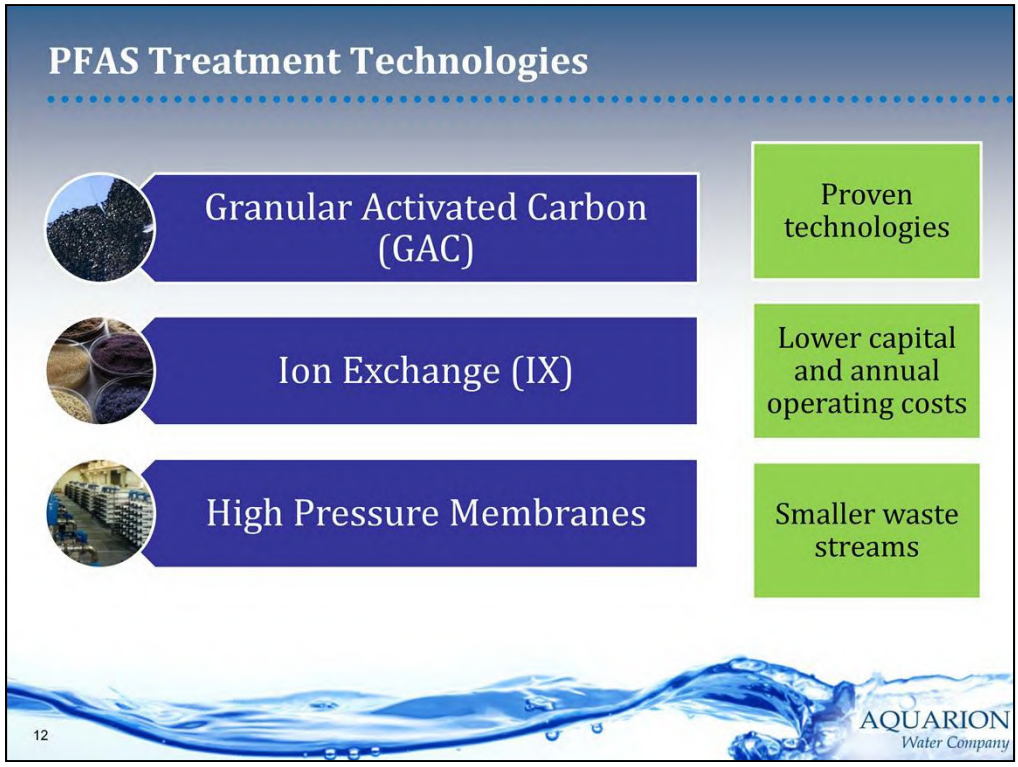


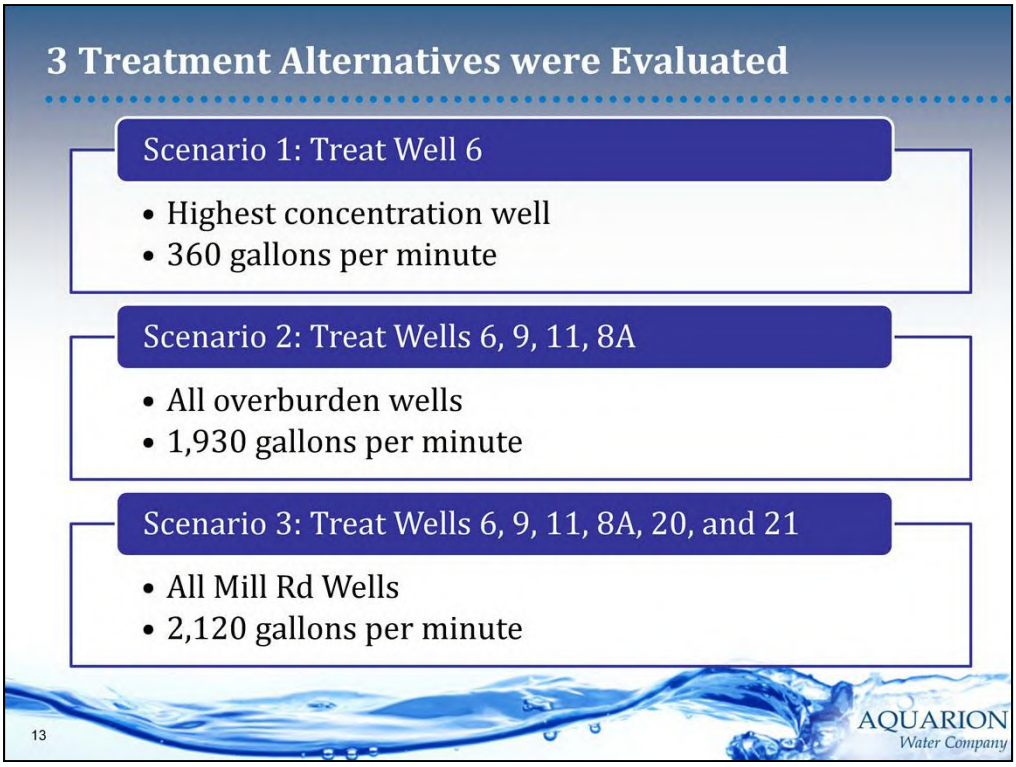
GAC is a proven method of removing PFAS.

IX is newer, but has the potential for lower costs.

High pressure membranes are not practical for the volume of water to be treated.

Due to the chemical differences of different PFAS, a combination of GAC and IX map also be advantageous.

We are conducting bench scale testing of GAC and IX.



The scope of treatment is also to be determined, and is partly dependent upon forthcoming changes to regulatory standards.

The scale and cost of treatment depends upon how much water volume needs to be treated.

Conceptual Treatment Costs

	Blending	Scenario 1 PFAS treatment of water from Well 6	Scenario 2 PFAS treatment of water from Wells 6, 8A, 9, 11	Scenario 3 PFAS treatment of water from Wells 6, 8A, 9, 11, 20/21
PFOA/PFOS (ng/L)	11	6	<4	<4
PFOA (ng/L)	8	4	<4	<4
PFOS (ng/L)	<4	<4	<4	<4
Combined PFAS (ng/L)	46	20	<4	<4
Conceptual capital cost	$0	$1.9M	$5.8M	$5.7M
Conceptual annual O&M costs	$0	$0.1M	$0.3M	$0.3M
Rate increase required	**0%**	**5%**	**16%**	**16%**

14

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Source selection would allow for marginally higher PFAS levels, but incurs no additional cost to the Mill Rd Plant project.

Adding treatment to Well 6 is projected to reduce PFAS levels by roughly half. Estimated costs for needed capital improvements and operating costs would increase water rates by 5%.

Adding treatment to all wells on Mill Road is projected to remove all PFAS (for those wells only). Estimated costs for needed capital improvements and operating costs would increase water rates by 16%.

North Hampton Select Board Meeting – February 26, 2018

Carl McMorran, John Herlihy and Dan Lawrence

13.7 Aquarion Water Company PFAS Update – Carl McMorran

Carl McMorran, John Herlihy and Dan Lawrence presented a lengthy update to the Select Board. The

entire Power Point presentation can be accessed on the town website here: https://www.northhamptonnh.gov/sites/northhamptonnh/files/pages/north_hampton_select_board_2018_02.pdf or the entire

presentation can be viewed on Town Hall Streams here:

http://townhallstreams.com/stream.php?location_id=35&id=15763

Aquarion Water Company Update

Hampton Select Board Meeting
April 2, 2018

John Walsh, Vice-President, Operations

John Herlihy, Vice-President, Water Quality & Environmental Management

Dan Lawrence, Director Engineering & Planning

Carl McMorran, Operations Manager

AQUARION Water Company
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Agenda

- Project Updates
  - Main Replacements
  - Mill Road Water Treatment Plant
  - PFAS Data
  - Well 22

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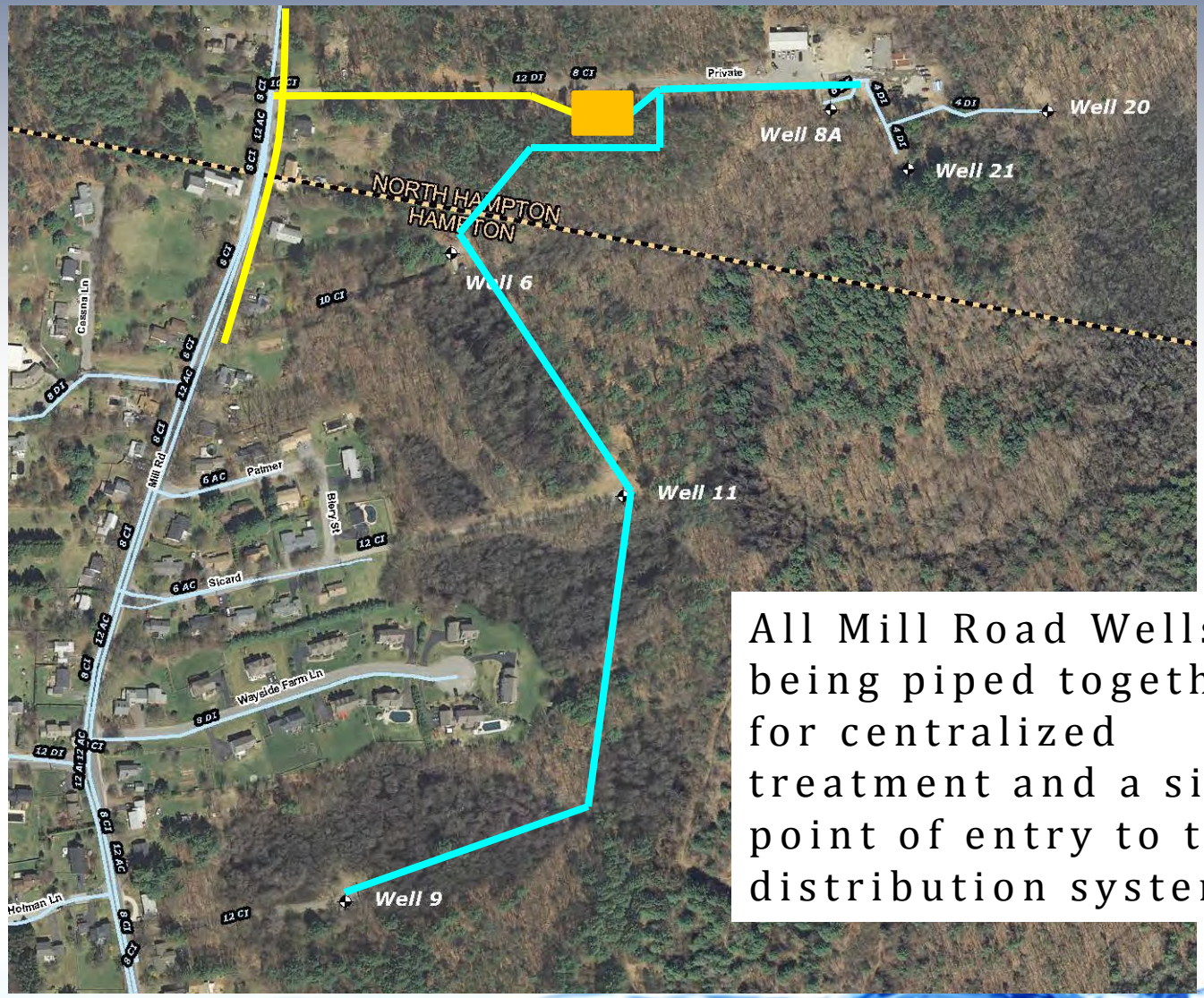
Mill Road Water Treatment Plant



All Mill Road Wells are being piped together for centralized treatment and a single point of entry to the distribution system

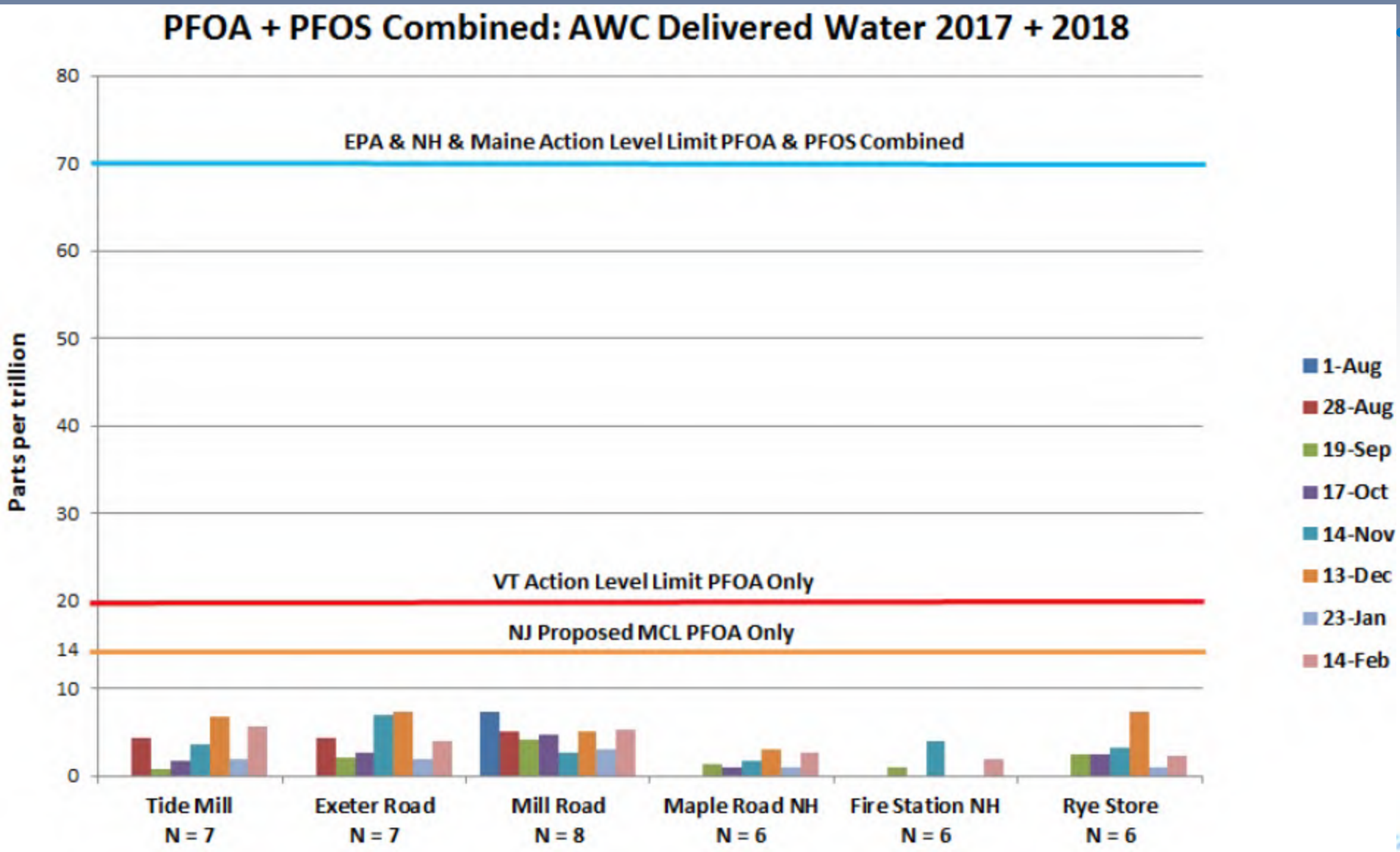
AQUARION Water Company

Conceptual Treatment Costs

	Blending / Source Selection	Scenario 1 PFAS treatment of water from Well 6	Scenario 2 PFAS treatment of water from Wells 6, 8A, 9, 11	Scenario 3 PFAS treatment of water from Wells 6, 8A, 9, 11, 20/21
PFOA/PFOS (ng/L)	11	6	<4	<4
PFOA (ng/L)	8	4	<4	<4
PFOS (ng/L)	<4	<4	<4	<4
Total PFAS (ng/L)	46	20	<4	<4
Conceptual capital cost	$0	$1.9M	$5.8M	$5.7M
Conceptual annual O&M costs	$0	$0.1M	$0.3M	$0.3M
Rate increase required	**0%**	**5%**	**16%**	**16%**

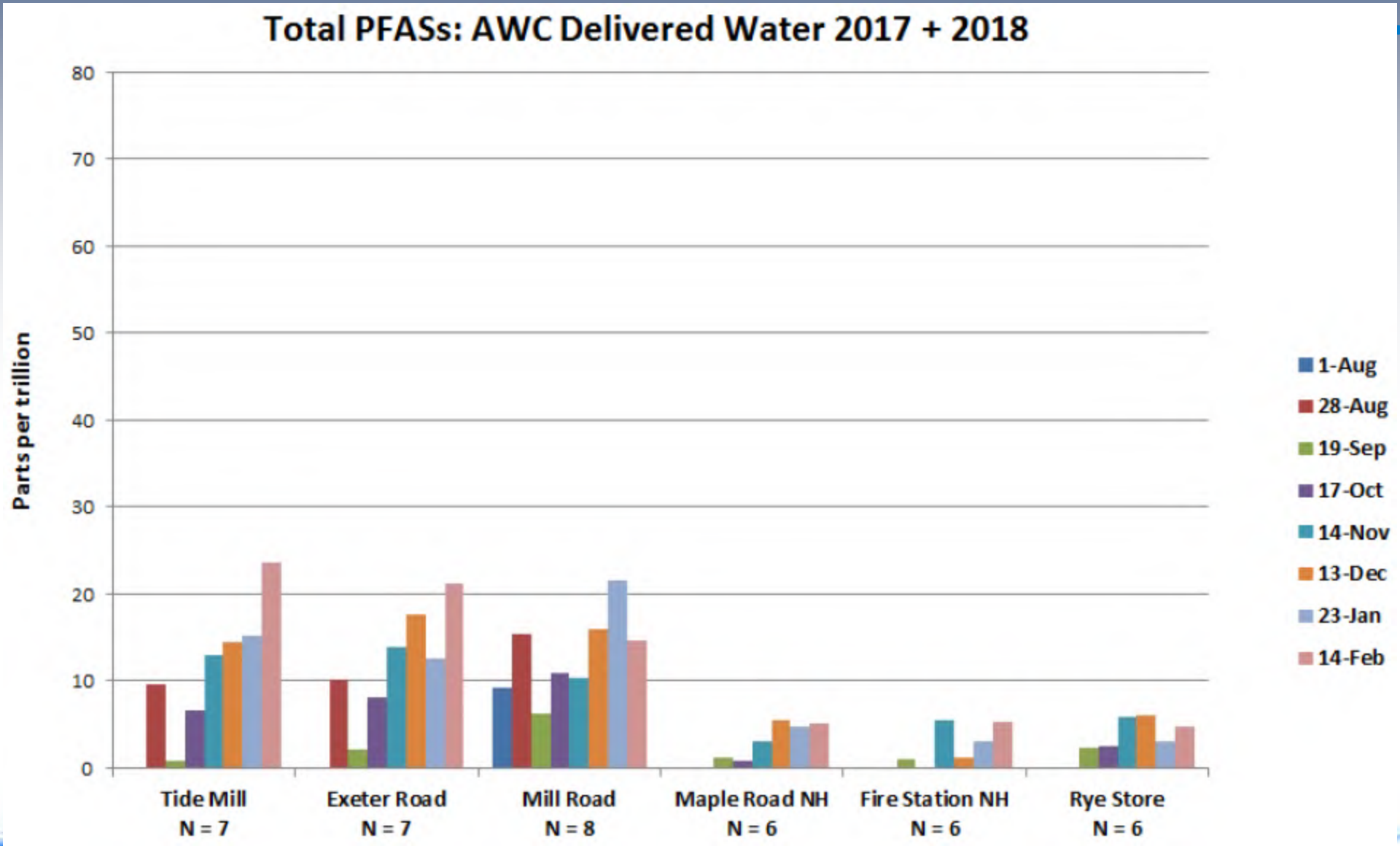
AQUARION Water Company

PFAS Occurrence



AQUARION Water Company

PFAS Occurrence

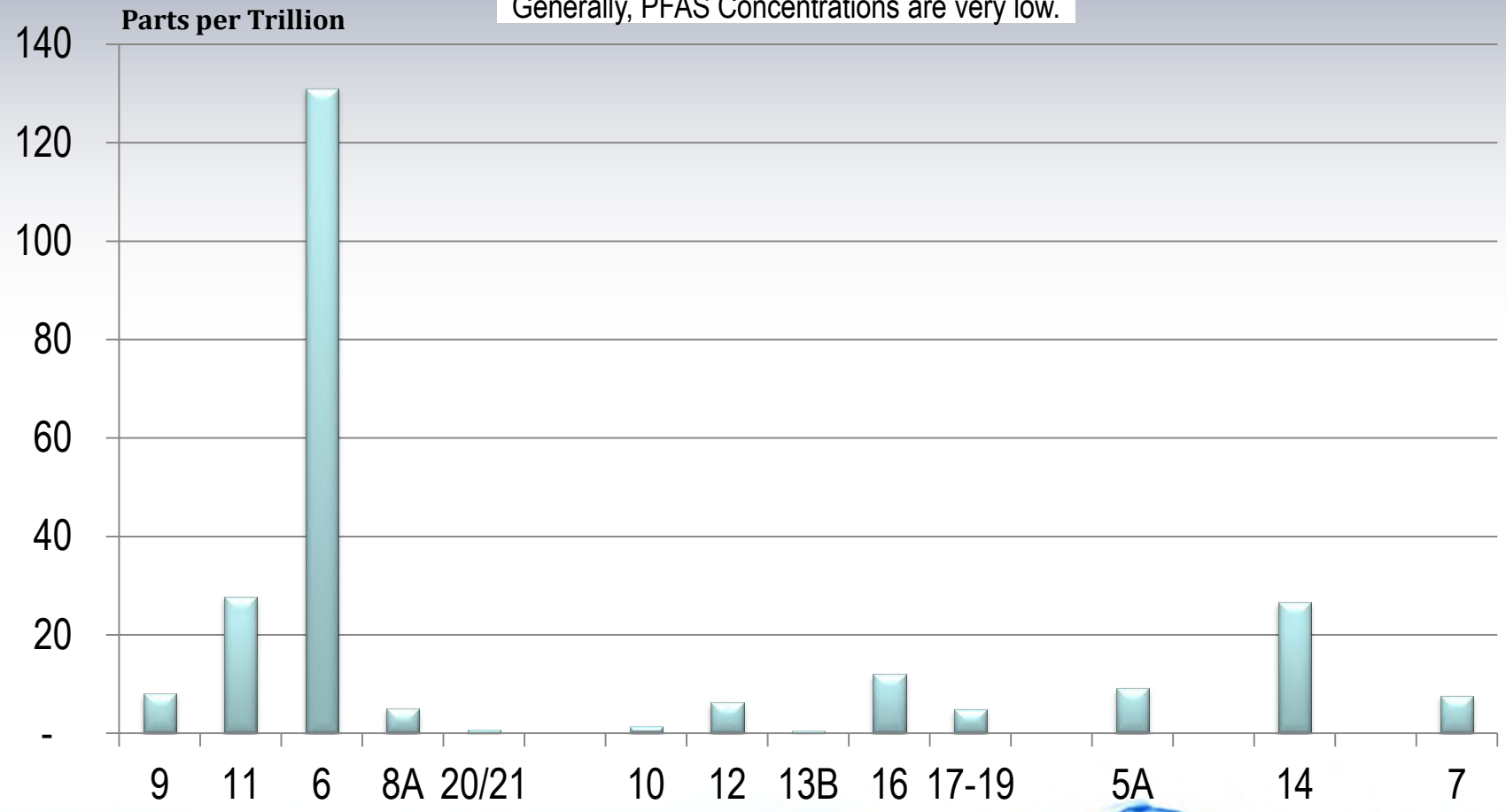


AQUARION Water Company

PFAS Occurrence

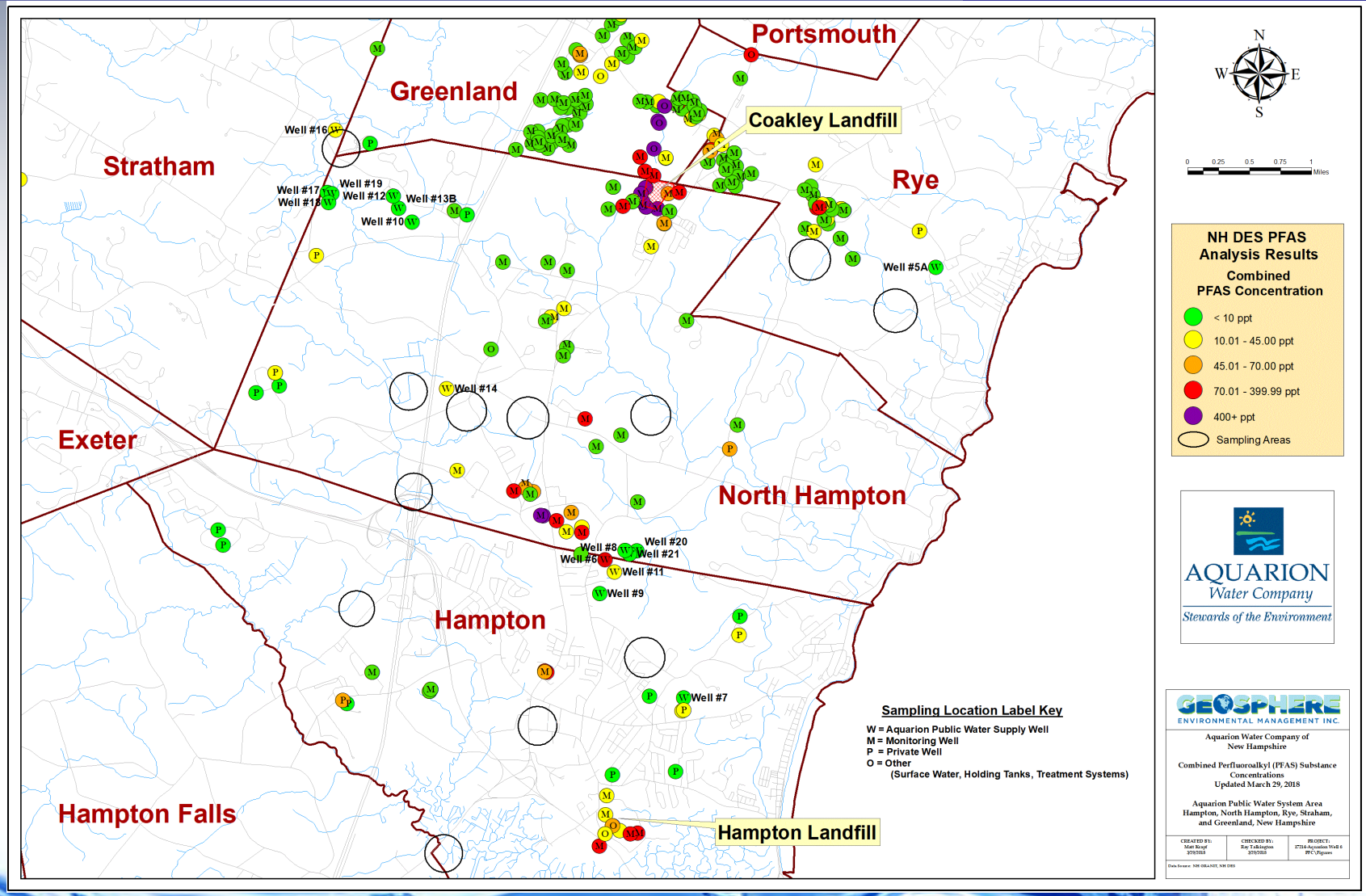
Average Total PFAS Levels in Wells

Generally, PFAS Concentrations are very low.



AQUARION Water Company

Area PFAS Distribution



Private Well Testing

- Link to NH DES PFOA Investigation Well-Testing Request Form: www.surveymonkey.com/r/NHDES-S-03-008
- OR
- Call Derek Bennett, NHDES, (603) 271-8520

Operational Protocols to Minimize PFAS in Tap Water

- Trace PFAS in most wells; leaving Well 6 off will not eliminate PFAS in tap water
- PFAS in tap water can be minimized through
  - Source Selection: running wells with higher PFAS last
  - Blending: combining flows from multiple wells prior to entry to the distribution system to dilute PFAS

Hampton Select Board Meeting – April 2, 2018

Carl McMorran, John Herlihy, John Walsh and Dan Lawrence (starts at 2:10:10 on video)

Mr. Walsh: collaboration; open communication; update on PFCs; take issue very seriously; following through on commitments; evaluating level of PFCs; evaluating treatment to remove PFCs; testing groundwater; working with DES for testing wells.

Mr. Lawrence:

- Project Updates
  - Main Replacements
  - Mill Road Water Treatment Plant
  - PFAS Data
  - Well 22
  - Water Main Replacement

All Mill Road Wells are being piped together for centralized treatment and a single point of entry to the distribution system

Selectman Woolsey: east side of Mill Road; time frame.

Mr. Lawrence: will finish the work prior to June 15th; 3 scenarios; take granule media; remove PFAs in laboratory; update information on design and cost; expect information in late May; draft report in June with the information; on schedule.

Mr. Herlihy: talk about monitoring and results found; talking about PFCs; PFAS; done a lot of testing; chemicals were used for properties to repel water, oil and grease; found in many places; finding them in many places in the environment; EPA in process of setting an enforceable standard, so far set unenforceable standard; 70ppt; DES adopted standard for 2 compounds; have found 10 in our testing; standards set for 2 of the 10 we detected; highest concentrations we have found are less than 10ppt. Reporting on all 10 the PFAS, the highest levels detected under 25ppt; levels in drinking water are much lower. Testing of wells; well 6 is the only one that is above the 70ppt and has been out of service since August 2017; mix wells together; two different methods used to keep the distribution levels low. Map shown – Area PFAS Distribution; working with DES to test private wells; want to test 50 private wells; currently testing 20.

Private Well Testing. Link to NH DES PFOA Investigation Well-Testing Request Form:

www.surveymonkey.com/r/NHDES-S-03-008 or Call Derek Bennett, NHDES, (603) 271-8520

Selectman Barnes: can we get the contact information put up on our website?

Town Manager Welch: yes.

Selectman Woolsey: are you keeping up with the situation at Coakley?

Mr. Lawrence: yes

Selectman Woolsey: left a copy of the Hampton Landfill report with Carl.

Mr. McMorran: the map shows there are areas where there are not any PFAS; nothing confirms that Coakley has an impact on our wells at this point.

Selectman Woolsey: do you have an area of Hampton where you are finding more private wells; any count of how many private wells are in town?

Mr. McMorran: done survey; tried to identify particularly in the north central area; trying to pin down all the private wells.

Selectman Woolsey: well 22; 450' down; concerned about tapping into salt water.

Mr. McMorran: had public hearing; public comments; what issues are; make educated decision; sustainable impact; water quality; make judgment on treatment.

Selectman Woolsey: availability of water is great, but neighbors concerned; salt water.

Mr. McMorran: surveyed a lot of private wells in that area; have 30 on the list; pumping test in mid-May; water quality samples; measure conductivity.

Selectman Woolsey: are you having more capacity; summer season; do you shut wells down in off-season?

Mr. McMorran: yes; will do pumping test; put together data; hopefully result in actual withdrawal permit by the end of the year; new regulations are being discussed; optimize our operation; source selection; leave high level well off; blend; dilution; minimize PFAS.

Selectman Waddell: Aquarion has demonstrated a real commitment to clean water in Hampton; rates; they have done a good job on testing the wells and trying to come up with a solution; people can be confident they are drinking clean water; making sure Well 22 is safe; they have shown commitment.

Selectman Griffin: they do a great job communicating; appreciate Carl's commitment to the BOS.

Selectman Barnes: we need to have confidence in what Aquarion is doing for us; the CLG whether the State has the authority to make what Mindy's bill wants being done; issue to get through; hearing tomorrow in Concord; at meeting last week and EPA was asked a question that I found horrifying; they were asked how many PFOS and PFCs they are testing for and they could not say the answer; Aquarion knows; want public to know we are in good hands with our water quality and Aquarion is doing everything possible.

Selectman Waddell: anybody can have their well tested for free; good thing to do; contact will be on the website.

North Hampton Select Board Meeting
April 23, 2018

AQUARION
Water Company

John Walsh, Vice-President, Operations
John Herlihy, Vice-President, Water Quality & Environmental Management
Dan Lawrence, Director Engineering & Planning
Carl McMorran, Operations Manager

Agenda

- Eversource Settlement
- PFAS
  - Monitoring
  - Operations
  - Treatment
- Well 22
- Mill Road WTP
- Mill Road Main Replacement

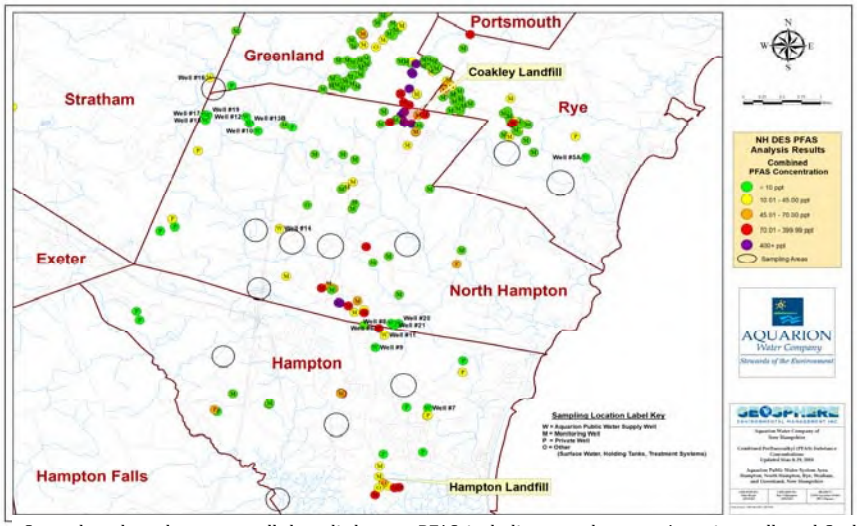
Eversource Settlement

- PFAS
- Exeter Road Water Storage Tank
- Well 22
- Hydrants
- Regular Meetings
- Inclining Block Rates

Per- and Poly-Fluoro-Alkyl Substances (PFAS)

- Extensive monitoring since August 2016
- Partnered with DES to collect data from private wells
- To date, no data supports that Coakley Landfill is a PFAS source to our wells, but other potential sources have been identified
- Well 6
  - Trace PFAS levels observed in most wells, and in tap water, which cannot be removed
  - Well 6 will likely be needed to meet summer demand
  - Tap water levels will be <u>minimized</u> through source selection and blending
- Evaluation of Treatment Options
  - Bench scale test report expected in June
  - Regulatory uncertainty, but standards being proposed are higher than the PFAS levels observed in wells

Per- and Poly-fluoroalkyl Substances (PFAS)



Green dots show that many wells have little or no PFAS, including some between Aquarion wells and Coakley. There are other wells with higher PFAS near Rt 1 corridor and other local landfill.

North Hampton Select Board Meeting – April 23, 2018

Carl McMorran, John Herlihy and Dan Lawrence

11.4 Aquarion Water Company Update – Carl McMorran, John Herlihy, Dan Lawrence

Carl McMorran thanked the board for their openness and cooperation. Items discussed were:

- Eversource settlement
- PFAS – Monitoring/Operations/Treatment
- Well 22
- Mill Road Water Treatment Plant
- Mill Road Main Replacement

The complete power point presentation can be found here: https://www.northhampton-nh.gov/select-board/files/aquarion-water-company-presentation-select-board-april-23-2018

Town of Hampton

May 22, 2018

John Walsh, Senior Vice President
Aquarion Water Company
900 Main Street
Hingham, MA 02043

Re: Pre-Application Deadline of June 15, 2018 for DWSRF and DWGTF Trust Funds Grants

Dear Mr. Walsh:

Pursuant to a vote by the Hampton Board of Selectman at its meeting on May 21, 2018, I am writing to you to urge Aquarion Water Company to apply for a grant under the NHDES Drinking Water State Revolving Fund and the Drinking Water and Groundwater Trust Fund by the June 15, 2018 pre-application deadline, to seek funding to the maximum extent possible from those funds, for the construction of a PFAS Treatment facility for the Aquarion wells in the Mill Road well field, the conceptual design of which has already been presented to the Board. Our understanding is that the Company is currently conducting bench scale testing of Granular Activated Carbon and Ion Exchange systems.

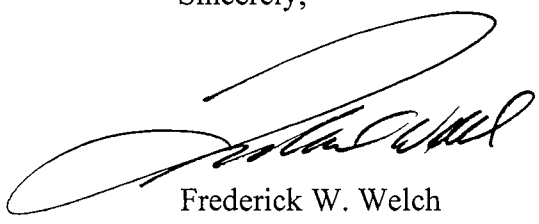
The treatment facility that would treat the PFC's found in the Aquarion wells in its Mill Road well field has already reached the point of conceptual costs as presented to the Board for the Company last November by Daniel R. Lawrence, PE. The price tag for Scenario 3 was approximately $5.7 million with conceptual annual O & M costs of $.3 million, with a projected required rate increase of 16%. However, as you will see from the enclosed materials, grants are available under the above two programs for up to 50% of these costs. Non-profit water systems that are privately owned have the ability to apply and eligible projects include improvements related to emerging contaminants. Our Town Attorney obtained these materials just last week at a conference sponsored by N.H. DES.

Although the levels of PFC's in Aquarion wells have yet to reach the 70 parts per trillion maximum contaminant level currently utilized by the Environmental Protection Agency and the NHDES for two such contaminants, you doubtless will also have seen that federal Health and Human Services experts have been poised to conclude that the current maximum contaminant level of 70 parts per trillion should be much, much lower. Their report has not yet been released, but EPA is holding a conference on PFAS next week where this may occur. Aquarion's design of a PFAS treatment system that is projected by the Company lower the levels

to less than 4 parts per trillion is something that will likely be necessary to be implemented if the public health is to be adequately protected.

Accordingly, before the grant money runs out, or is spent elsewhere, please have Aquarion get in line for same by the preapplication deadline by June 15, 2018. This grant could cut in half the cost to the Company's ratepayers of having the treatment facility constructed.

Sincerely,



Frederick W. Welch
Hampton Town Manager

cc: Board of Selectmen
Carl McMorran
Daniel R. Lawrence

AQUARION Water Company
Stewards of the Environment

Aquarion Water Company of New Hampshire
7 Scott Road
Hampton, NH 03842
603-926-3319 phone
www.aquarionwater.com

To: Hampton Select Board

From: John Walsh, Vice-President, Operations
Dan Lawrence, Director of Engineering and Planning
Carl McMorran, Operations Manager

Date: May 30, 2018

Subject: May 22 Letter re: PFAS Treatment

Thank you for your May 22, 2018 letter regarding the New Hampshire Department of Environmental Services (NHDES) Drinking Water State Revolving Fund (SRF) and new Drinking Water and Groundwater Trust Fund (GWTF) program. Aquarion staff are familiar with both of these programs and will file a pre-application by the June 15 deadline for the GWTF program.

Aquarion is committed to delivering clean, safe drinking water by the most cost efficient means possible. We appreciate the Town of Hampton's interest and support on the PFAS issue, and acknowledgement that any required PFAS treatment will impact rates. We look forward to our continued collaboration with the Town of Hampton as we explore the best options to address concerns about PFAS contamination.

As you know, there is currently much regulatory uncertainty regarding the need for PFAS treatment as NHDES, the state legislature, the U.S. Environmental Protection Agency (EPA), municipalities, New Hampshire citizens and other stakeholders learn more about PFAS, their effect on drinking water and human health, and the various options for treatment. We are as concerned about PFAS contamination as our customers, and have been proactive in addressing the issue, despite regulatory uncertainty and overall lack of information about PFAS.

Thank you for recognizing that we have not waited on the regulatory process to start exploring the options and costs for PFAS treatment. In accordance with our agreement with each of the Town's signed on October 5, 2017, the Company commenced an Evaluation for PFC[1] Treatment at the Mill Road Wellfield in Hampton and North Hampton. This work includes the following three major tasks:

Task 1 - Alternatives Analysis. This task was completed and submitted to the Town's on November 6, 2017 (the basis for the town's request to apply for SRF and GWTF funding).

Task 2 - Preliminary Design and Bench Scale Treatment Evaluation. This task is nearing completion, and will include updates to projected cost estimates and rate impacts. We plan on presenting this information to the town in the next month or two.

Task 3 - Final Design and Permitting. This task requires definition of treatment objectives and specifications (an outcome of Tasks 1 and 2), full design of a new treatment facility (or facilities), and acquisition of the necessary approvals from town Planning, Zoning and/or Select Boards, DES and possibly the PUC.

[1] Subsequent to starting this evaluation, DES implemented the use of the term per- and poly-fluorinated compounds (PFAS) for the group of compounds formerly referred to as PFCs.

We appreciate the comments provided in the May 22 letter. As we proceed on evaluation and planning for PFAS treatment, we request further discussions with the town to clarify project objectives, primarily:

- Whether the 4 ppt target addresses only regulated PFAS (compounds with an Action Level or MCL set by NHDES or EPA), or total PFAS, the latter being the sum of all detectable PFAS?
- Whether the 4 ppt target applies only to water produced from the Mill Road wells, or for water produced from our other treatment facilities (Winnicut Road wells, Well 5A, Well 7 & Well 14)?
- Whether a 4 ppt target is appropriate if regulatory limits are higher? Although the regulatory outlook remains murky, information company staff have obtained seem to indicate that several more PFAS compounds will be added to the regulated list, with Maximum Contaminant Levels (MCLs) for drinking water likely to be established. There are rumors of possible MCLs of 14 ppt for PFOA and PFOS; similar to what has been established by New Jersey. This are very low numbers, but more than double what we have observed for these two compounds in any of our distribution system samples.
- Higher cost and rate estimates based on new data from Task 2 work. Since completing Task 1, analytical improvements expanded the number of PFAS detected. Some of the newly detected, shorter-chain compounds have significantly different characteristics that will increase treatment costs; even if not regulated.

Our goal is to install and operate whatever systems are necessary to provide safe drinking to residents and businesses. Possible rate increases required to build and operate these systems could be mitigated with grant funding or low interest loan funding from the state programs (SRF and GWTF). The SRF is almost strictly a loan program, with conditions such as Bacon-Davis wage rates and American made iron, that may not make it competitive with other funding alternatives available to the company.

The GWTF is similar, but also has some fundamental differences. There seems to be a better opportunity for grants, although DES staff tells us that they want to see most of the funds revolve through loans so that it can fund more projects in the years ahead. Our conversations with DES staff suggest that a 50% grant is not likely.

Also, funding decisions are made by the appointed Advisory Committee, not DES, which has only an advisory role for GWTF projects. There will be a great deal of competition for funding awards and the Advisory Committee is expected to focus on approved, but unfunded or underfunded SRF and MtBE projects.

Although the company will be submitting an application to the GWTF this year, we are not optimistic of funding because our project is still at the conceptual stage and we do not have a fully designed, shovel-ready project. Our odds of getting funding will improve heading into the next cycle next year after we complete Task 3 and have a final treatment system design. However, even if the odds of getting funding are low this year, submitting an application this year hopefully will serve to make the project familiar to the Advisory Committee, and may provide some valuable feedback for future applications.

Thank you for your continued interest. We look forward to presenting our Task 2 results to you on July 16.

DWSRF and DWGTF
PRE-APPLICATION FORM
For Drinking Water Infrastructure Improvement Projects Loans and/or Grants

NEW HAMPSHIRE DRINKING WATER &GROUNDWATER TRUST FUND

RSA/Rule: RSA 486:14, Env-Dw 1100 **RSA/Rule**: RSA 485-F

The NHDES Drinking Water State Revolving Fund (DWSRF) and Drinking Water and Groundwater Trust Fund (DWGTF) are seeking pre-applications for drinking water infrastructure improvement projects. Project rankings for the DWSRF program will be based on compliance with the Safe Drinking Water Act, protection of public health and affordability of water service. Pre-applications not funded by DWSRF and all grant requests will be forwarded to the DWGTF Advisory Commission for review and selection.

The deadline for submission is June 15, 2018.

More information about the two funding programs is available at:

DWSRF - https://www.des.nh.gov/organization/divisions/water/dwgb/capacity/dwsrf.htm

DWGTF - https://www4.des.state.nh.us/nh-dwg-trust/

SECTION 1 – APPLICANT AND PROJECT INFORMATION		
1.1 APPLICANT INFORMATION		
APPLICANT NAME: Aquarion Water Company of New Hampshire		
ORGANIZATION NAME: Aquarion Water Company of New Hampshire		
PWS # (if applicable):		
ADDRESS: 7 Scott Road		
CITY: Hampton	NH	ZIP: 03842
CONTACT PERSON: Carl McMorran	TITLE: Operations Manager	
PHONE: (603) 926-3319, ext 116	EMAIL: CMcMorran@aquarionwater.com	
MEDIAN HOUSEHOLD INCOME (MHI): $ *If known, MHI of population served (using the results of a recent income survey or latest data from the American Community Survey). Note: An income survey may be required for small, privately-owned water systems serving portions of a community where the survey data does not accurately reflect the income of the residents.*		
CURRENT ANNUAL RESIDENTIAL WATER RATE: $ $667.97 *Based on 71,996 gallons/year. If cost of water is included in other charges (rent, condominium fee), break out the estimated annual cost per unit of water. NHDES may request back-up documentation as these figures are used to determine affordability.*		

1.2 FUNDING REQUEST
PROJECT NAME: Mill Road Wellfield PFAS Treatment
REQUESTED **LOAN** AMOUNT: $ 2,622,000
REQUESTED **LOAN** TERM (select one): ☒ 5 ☐ 10 ☐ 15 ☐ 20 ☐ 30* ☐ 40* **The loan should not exceed the useful life of the financial improvement(s).*
REQUESTED **GRANT** AMOUNT (see Section 3): $ $2,622,000
OTHER FUNDS CONTRIBUTING TO THE PROJECT (from Section 2.2): $ 556,000 for Planning and Design

1.3 PROJECT INFORMATION
SELECT ONE: ☐ Design/Preliminary Engineering Only ☐ Design and Construction ☒ Construction Only
PROJECT DESCRIPTION: *Provide a concise summary of the project.* **The proposed project will provide for treatment for Per and Polyfluoroaalkyl (PFAS) that is present within the groundwater at the Mill Road Wellfield. The Mill Road Wellfield consists of 6 wells (6, 8A, 9, 11, 20, and 21) located in Hampton and North Hampton, New Hampshire and produces up to 2,120 gallons per minute. The Mill Road Wellfield is critical to meet the water supply needs of the communities of Hampton, North Hampton, and Rye.. The levels of PFAS in the groundwater is presently below the existing regulatory limit, but there are sources close to the wellfield with levels above the existing PFOA and PFOS limits.**

PURPOSE AND NEED: *Provide a summary identifying the need and justification for the project. Feel free to include additional information with the application, such as planning documents that support the project need and scope (i.e., preliminary engineering report, project cost estimates, planning studies, analysis of alternatives); copy or link to source water protection plan(s); energy audits; water conservation plans; asset management plans; or water rate analyses.*

In 2014 Aquarion Water Company sampled and tested the water supply wells in Hampton, North Hampton, and Rye for PFAS as requested by the NHDES. The results showed low levels of PFAS, below the current limits for PFOA and PFOS. Aquarion continued to sample of PFAS in 2015, 2016 and 2017 to track if there were any concerns related to these compounds. In September of 2017 higher levels of PFAS were detected in Well 6 at the Mill Road Wellfield. The levels were below the existing PFOA and PFOS limit but were higher than past results causing concern. A copy of the summary tables showing the levels of PFAS at the Mill Road Wellfield are included in Attachment A. Aquarion retained the services of Tighe & Bond to review the existing data and develop a Treatment Analysis to better understand the work required, capital costs, expense costs and the potential rate increase that could result from the proposed improvements. A copy of the Mill Road PFC (PFA) Treatment Analysis is included in Attachment B and was completed on November 6, 2017.

This preliminary analysis included an evaluation based on seven (7) detected PFAS compounds (see Table 1-3 of the Analysis). The analysis reviewed alternatives for treatment of the PFAS at the concentrations observed and presents a summary of the alternatives considered, amount of water to be treated, PFOA and PFOS concentration entering the distribution system, total PFAS entering the distribution system, conceptual capital costs, conceptual annual operating costs and the rate increase associated with each of the Scenarios. This information is presented on Table 5-1 of the analysis and includes that to achieve treatment to less than 4 parts per trillion (the laboratory detection limit) would cost approximately $5.8 million and result in a rate increase of 16%.

Since the completion of the Mill Road Wellfield PFC (PFA) Treatment Analysis the laboratories have expanded the number of PFAS that can be detected to 26 compounds. Aquarion expanded our list of compounds to 26, which has resulted in higher levels of total PFAS at the Mill Road Wellfield. The results of the sampling and testing are included in Attachment A.

The final cost of a Treatment System at the Mill Road Wellfield will be dependent upon the limits that are developed by the USEPA and NHDES for PFAS. The expanded list of compounds has resulted in the detection of smaller carbon chain PFAS that may require treatment and would increase the cost operating costs and associated rate increase. Aquarion is presently conducting bench scale testing of various media to better define the capital and operating costs that will be required. This additional analysis will be completed in draft form in June 2018 for discussion with the communities.

Aquarion has a Source Water Protection Plan, Water Conservation Plan and Asset Management Plan in place for our New Hampshire system. These documents are presented in Attachment C for reference..

PUBLIC HEALTH PROTECTION: *Describe how the project will address public health protection and achieve compliance with the Safe Drinking Water Act (if applicable).*

The proposed project will provide treatment for PFAS at the Mill Road Wellfield to meet the limits established by USEPA and NHDES. PFAS have been shown to cause cancer based on long term exposure. The proposed treatment would remove the PFAS to the limits established by USEPA and NHDES to provide for safe drinkling water to the residents of Hampton, North Hampton, and Rye New Hampshire.

Describe any additional benefits for the following categories that the project may include (besides basic infrastructure improvements) and what activities the water system is already implementing for the categories below. If a section is not applicable please enter N/A.

ENERGY EFFICIENCY:
Aquaron has installed variable frequecy drives at all but three wells within the water system to help with the operation of the overall water system and reduce electrical demand and costs. The three wells without variable freqeucy drives have three step drives.

WATER EFFICIENCY:
Aquarion works to reduce non-revenue through leak detection, repair of issues discovered during leak detection and water main replacement. The Water Conservation Progress Report submitted in May of 2017 is included as Attachment D.

SOURCE WATER PROTECTION:
Aquarion is active in Source Water Protection through the aquisition of property and evaluation of risks. A copy of the Wellhead Protection BMP Report (2016) is included in Attachment E.

ASSET MANAGEMENT:
Aquarion utilizes both SAP and GIS for asset management. SAP is utilized to track maintenance of equipment within the water system and GIS is utilized to track the location, age, and material of water mains within the water duistribution system. Updates to each of these systems are made as equipment is changed or maintenance is performed.

SUSTAINABILITY AND RESILIENCY:
Aquarion works to ensure that proper planning will result in meeting the water needs for the communites we serve. This includes providing back up power to meet demands during power outages and developing new sources of water to meet the growing demands of the communities. Aquarion is presently working on the permitting of a new groundwater source in Hampton (Well 22) that could provide up to 600 gallons per minute of additional supply. Aquarion plans to have the source permitted in 2018 and brought on-line in late 2018 or 2019. The pumping test for this new source is scheduled for June 2018.

ECONOMIC IMPACT/JOB CREATION:
The proposed project will provide for 10 to 15 temporary jobs during the construction of the project over a period of 18 to 24 months.

The implementation of the treatment system will ensure safe drinking water to the communities of Hampton, North Hampton, and Rye, which will allow the communities to grow and Economic Development to occur. If the Mill Road Wellfield is not available due to PFAS within the supply greater then the established limits water restrictions would need to be put in place, which could impact economic growth within the communities.

PROOF OF THOROUGHNESS: *Describe how the project was formulated (e.g. whether it is part of a big picture approach to sustainable operations by the system, whether it was identified in a Capital Improvement Plan/Master Plan/Asset Management Plan, and whether it is the best use of funds.*
The proposed Mill Road Wellfield PFAS Treatment was developed in response to rising PFAS levels and is summarized in the Mill Road PFC (PFA) Treatment Analysis dated November 6, 2017. Aquarion has continued to sample the wells and expanded the analysis to include bench scale testing of possible media and is considering the implementation of a treatment pilot program in 2018 to furthur define the needs of the project, costs and associated rate impacts.

INNOVATION: *If applicable, describe how the project involves a unique and innovative approach and how it could be a valuable demonstration project to other water systems and/or communities.*
The treatment of PFAS is new within the water industry as a whole. The bench scale testing, pilot and implementation of the treatment project will provide for the needs of Aquarion's water system but can also be used to help other water systems evaluate the capital and operating costs associated with the implementation of a treatment system. The sharing of information surrounding the alternatives considered and the associated costs can be used to benefit other water systems and in the end benefit those that consume water in the communities Aquarion serves and others through New Hampshire.

PAST INFRASTRUCTURE INVESTMENT: *Describe what investments have been made in the past 5 years on drinking water and wastewater improvements in the community (no O&M). Were any projects deferred? If so, why?*
Aquarion invests annually within the water system. A summary of the investment over the past 5 years (2013 to 2017) is included below.

PROJECT NAME	WATER/WASTEWATER	AMOUNT	YEAR SPENT	FUNDING SOURCE

FUTURE INFRASTRUCTURE INVESTMENT: *Include a brief summary on the drinking water and wastewater needs for the next 2-5 years.*
Aquarion plans to continue in the investment in water supply development, water treatment improvements, and water main replacement annually into the future. The work outlined in 2018 and 2019 is outlined below and furthur included in Attachment G.

PROJECT NAME	WATER/WASTEWATER	ESTIMATED AMOUNT	PROJECT YEAR
Mill Road Treatment	Water		2018
Mill Road Water Main Replacement and New 16-inch Water Main on Mill Road	Water		2018
Consolidation of the Mill Road Wellfield Piping	Water		2018

CURRENT DEBT: *Describe the current debt level related to drinking water and wastewater projects.*

SECTION 2 – FUNDING PLAN INFORMATION

2.1 PROJECT COST/BUDGET (DRINKING WATER COSTS ONLY)

CATEGORY (add rows as needed)	**AMOUNT**
Construction Costs	$ 3,500,500
Construction Contingency	$ 913,200
Engineering/Planning Costs	$ 529,644 - Construction Enginnering and Inspection
Other Costs (describe)	$ 529,644 - Design
	$ $273,649 - Aquarion Internal Costs
TOTAL	$ 5,746,637 - rounded to $5,800,000

Project costs are based on:
Mill Road PFC (PFA) Treatment Analysis dated November 6, 2017 (Attachment B).

2.2 FUNDING SOURCES: *(List all funding sources (local, state, federal) being used for this project. Add rows as needed. The total should equal the total listed in the previous Project Cost/Budget table).*

SOURCE	AMOUNT	SECURED (Y/N) *(If NO, use expected date)*
Aquarion Capital Funds - Design and Associated Aquarion Costs related to the Design Portion of the Project	$ 556,000	Y
Requested Loan - DWSRF and/or DWGTF	$ 2,622,000	N
Requested Grant - DWSRF and/or DWGTF	$ 2,622,000	N
	$	
TOTAL	**$** $5,800,000	

FUNDING PLAN: *Describe how any funds not already secured will be obtained and when. If any planned but uncommitted sources of funding were not awarded, how would the shortfall be addressed?*

Aquarion has the funding in place for design of the improvements for 2018 and 2019. If grant funding was not received the project would proceed utilizing Aquarion Capital Funds resulting in a 16% rate increase.

2.3 PROJECT SCHEDULE

Date Authority to Borrow/Accept Funds was received or will be received	
Anticipated Design Start Date	
Anticipated Construction Start Date	
Anticipated Project Completion Date	

SECTION 3 – GRANT REQUEST

Instructions: If you are requesting grant funds, please complete the section below. The DWGTF Advisory Commission will review grant requests to make funding decisions.

GRANT JUSTIFICATION: *Provide a justification for the requested grant funds.*

The proposed project is a result of PFAS contamination of the groundwater at the Mill Road Wellfield in Hampton and North Hampton, New Hampshire. Aquarion has evaluated the treatment and the resulting rate increase to implement the project. The grant funding would be utilized to offset the increase in rates to the customers of the water system. The presence of PFAS in the water system was not caused by Aquarion or customers of Aquarion. The source of pollution is under investigation by NHDES at this time.

AUTHORIZATION/CERTIFICATION	
By signing below you are certifying that the information in the pre-application and in any attachments are true, correct and complete to the best of the representative's knowledge and that you are authorized to submit the pre-application.	
Signature of Authorized Representative:	Date:
Print Name:	Title:

Hampton Select Board Meeting
July 16, 2018

AQUARION
Water Company

John Walsh, Vice-President of Operations, CT, MA & NH

John Herlihy, Vice-President, Water Quality & Environmental Management

Dan Lawrence, Director Engineering & Planning

Carl McMorran, Operations Manager

Agenda

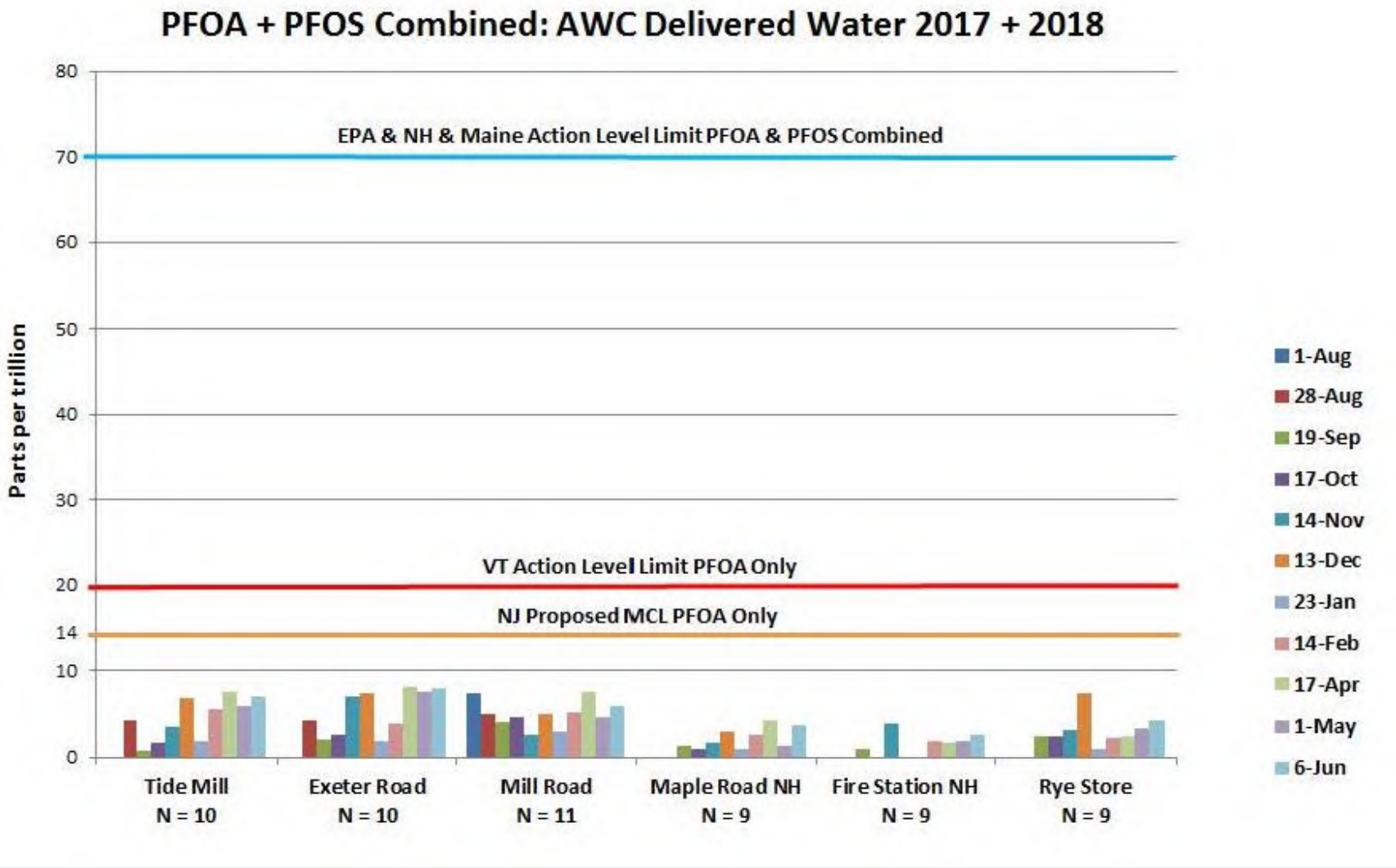
- Well 22
- Mill Road Main Replacement
- Mill Road Water Treatment Plant
- PFAS

Per- and Poly-Fluoro-Alkyl Substances (PFAS)

- PFAS Monitoring
  - AWC Wells: stable PFAS levels
  - Continue minimizing PFAS levels through source selection strategy
  - Tap water PFAS levels remain below current and anticipated standards
- PFAS Health Standards Development
  - EPA, NHDES, NJ, MADEP, CTDPH activities
  - EPA Regional Community PFAS meeting
- Current regulatory uncertainty will be resolved when DES issues drinking water standards; expected by January 1, 2019
- Groundwater Pollution Abatement and Remediation
  - Car Wash discharge to groundwater has been stopped by NHDES
  - NHDES Private Well Study

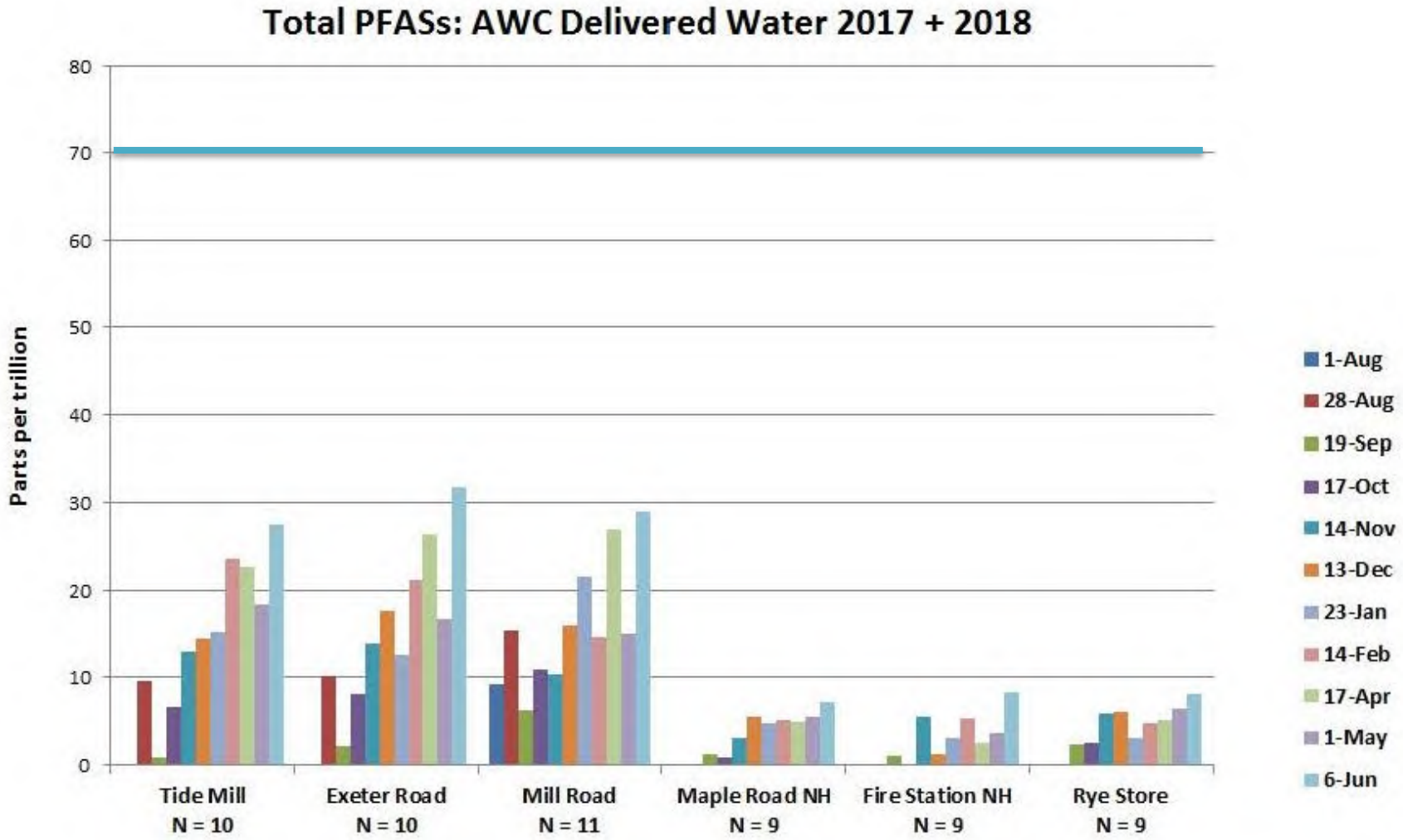
Per- and Poly-Fluoro-Alkyl Substances (PFAS)

PFOA and PFOS levels in tap water are lower than any current drinking water standards.



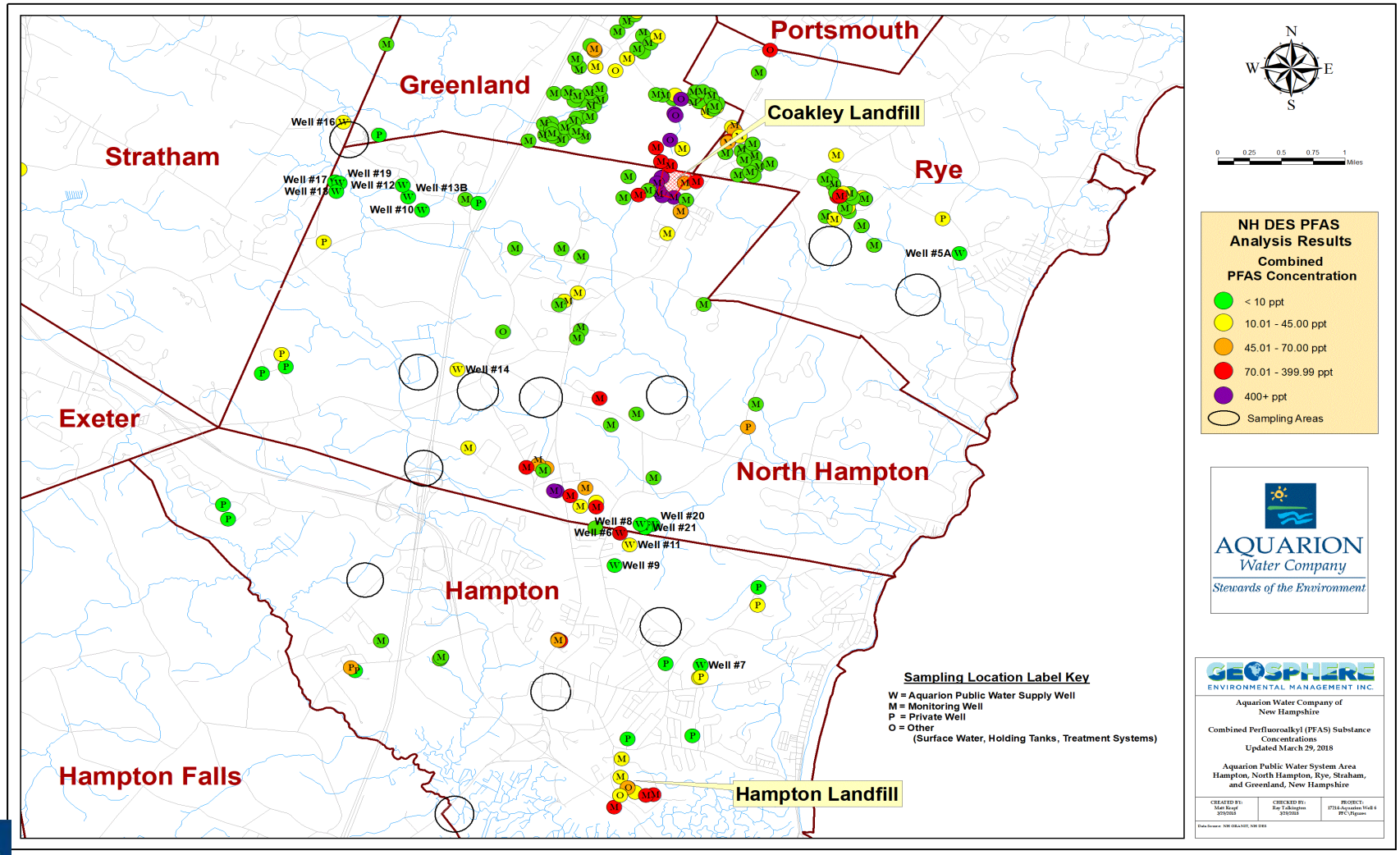
Per- and Poly-Fluoro-Alkyl Substances (PFAS)

Total PFAS levels in tap water are lower than 70 ppt



Per- and Poly-fluoroalkyl Substances (PFAS)

Green dots between Aquarion wells and Coakley Landfill show many wells that have little or no PFAS. There are other sources of PFAS along the Route 1 corridor.
Coakley Landfill is not contributing PFAS to any of Aquarion's wells.



Mill Road Wellfield – Bench Scale Testing for PFAS Treatment

- Recommendations and Conclusions
  - Granular Activated Carbon (GAC) and Ion Exchange (IX) filters were both evaluated for PFAS removal
    - Both filters can remove most PFAS, but shorter chain PFAS breakthrough faster than expected
      - IX does not remove PFBA
    - GAC was more effective than IX
    - Faster breakthrough shortens filter run times. This would require more frequent replacement of filters and increase operating costs
  - A larger scale pilot test should be conducted to provide better estimates of filter performance and probable costs

Mill Road Wellfield – Bench Scale Testing for PFAS Treatment

- Summary of Capital and Operating Costs and Ranges in Rate Increases
  - Source Selection – reduce Regulated PFAS to 19 ppt
    - Capital Cost $0
    - Annual Operating Costs $0
    - Range in Rate Increase 0%
  - Well 6 – Phase 1 – reduce Regulated PFAS to 11 ppt
    - Capital Cost $3.7 M
    - Annual Operating Costs $0.1M to $0.2M
    - Range in Rate Increase 8% to 9%
  - Well 6, 9 and 11 – reduce Regulated PFAS to 4 ppt
    - Capital Cost $2.4 M
    - Annual Operating Costs $0.6M to $1.8M
    - Range in Rate Increase 14% to 35%

Regulated PFAS: drinking water standards for PFHxS, PFOA, PFOS and PFNA to be set by NH DES by January 2019

Hampton Stakeholders Meeting Agenda

July 16, 2018

Hampton Town Hall

1. Well 22
2. Mill Road Main Replacement
3. Mill Rd WTP
4. PFAS Update
    a. Monitoring Data
    b. Source Selection Operations
    c. Treatment Evaluation
5. Hydrants - Q2 reports
6. Other
7. Next Meeting Date

Minutes

Attendees

Aquarion: John Walsh, John Herlihy, Carl McMorran & Greg Lane

Hampton: Fred Welch, Jamie Sullivan, Jim Waddell, Mary-Louise Woolsey & Mark Gerrauld

North Hampton: Bryan Kaenrath, Henry Fuller & Bob Landman

1. Well 22
    a. Pumping test at 830 to 850 gpm since June 23
        i. Water level changes in only 10 of 20 observation wells; no adverse
    b. Excellent water quality
        i. No taste, odor or discoloration
        ii. Water quality parameters meet all drinking water standards
        iii. Softer than average
        iv. No VOCs; low PFAS, lower than other bedrock wells
        v. No changes in salinity
            1. Max = 0.4 ppt; threshold for Salt Water is 300 ppt
            2. Mary-Louise expressed concern that long term pumping will still draw salt water inland.
    c. Schedule is to stop pumping test tomorrow if weather is favorable
        i. 6-8 weeks to prepare final Large Groundwater Withdrawal Permit application
        ii. Public Hearing
        iii. Final permit (by yearend)
        iv. Installation of permanent pump and piping, and upgrades to power and chemical feed systems
    d. Follow ups
        i. Carl to send a copy of the letter sent to private well owners to Fred and Mary-Louise
        ii. Ensure salt water intrusion issue is thoroughly evaluated by Geosphere
2. Mill Road Main Replacement
    a. Replacement of 4,200 feet of old, cast-iron main (prone to breaks) between Atlantic Ave and Pine Rd
    b. 3,741 feet installed as of June 13; rest will be installed this week

Hampton Select Board Meeting – July 16, 2018

Agenda Item 7. Quarterly Update (Carl McMorran, Dan Lawrence and John Herlihy (starts at 38:40 on video))

Mr. McMorran: test on Well 22

Pumping test started on June 20 at 650 gallons per minute

- Increased to 840 on June 23 gallons per minute
- 20 private wells are being monitored for both water levels and water quality
- Only 10 wells have shown any water level response to the pumping from Well 22
- This water is treated and flows into the distribution system
- 1/3 of water production since June 20
- Well 6 production reduced by 2/3rds
- Water quality has been very good; soft; lower PFAS levels; lower than our other
- bedrock wells
- Final application by late summer
- Public Hearing – to be scheduled
- Final permit from DES by year end
- Installation of permanent pump, pipes, etc.
- Power and chemical treatment upgrades

Mill Road Main Replacement

- Replacement of 4,200 feet from Pine Road to Atlantic Avenue
- Construction started on June 11
- 3,741 feet installed as of July 13
- Mid-August completion date
- Cost projection - $1,216,

Mr. Lawrence: Mill Road water treatment facility centralized chemical treatment; treat at Well 9, Well 11, Well 6, and then a couple others; combine those so we do not need to upgrade all the facilities, but only have one new facility; completed piping; was challenged and got a ruling in courts on July 6th; 30-day wait period; going well and hopeful appeal process will terminate on July 6th; working on consolidation of piping; single point of discharge to the distribution system on Mill Road; all Mill Road wells are now piped together.

Selectman Woolsey: you left the old pipe in place; just put the new line in and the old line is just discontinued.

Mr. Lawrence: lines that used to go from Well 9 to Mill Road, Well 11 to Mill Road and Well 6 to Mill Road are still in service right now; intention to abandon.

Selectman Woolsey: you will not be digging it up to remove.

Mr. Lawrence: that is not our intention.

Selectman Woolsey: excellent.

Mr. Herlihy: continued monitoring PFAS; June results are in; PFAS levels are consistent

- PFAS Monitoring
- AWC Wells; stable PFAS levels
- Continue minimizing PFAS levels through source selection strategy
- Tap water PFAS levels remain below current and anticipated standards
- PFAS Health Standards Development

EPA, NHDES, NJ, MADEP, CTDPH activities

- EPA Regional Community PFAS meeting
- Current regulatory uncertainty will be resolved when des Issues drinking water
- standards, expected by January 1, 2019
- Groundwater Pollution Abatement and Remediation
- Car Wash discharge to groundwater has been stopped by NHDES
- NHDES private well study

Per- and Poly-Fluoro-Alkyl Substances (PFAS)

Mr. Herlihy: PFOA and PFOS levels in tap water are lower than any current drinking water standards; levels remain well below the level of 70; discussion about revising current limits on PFAS lower; EPA going to take a look at 4 PFAS compounds; MCL – Maximum Contaminant Level; required to meet level; in place currently are action levels; look at total exposure; enforceable standards; we have detected as many as 8 compounds, all below 70; anticipate limits will come down and will be lower than the limits, as we are now; found car wash was exceeding one of the parameters for the discharge permit; no more new PFAS going into the ground; DES private well study; approximately 75 samples have been collected; most of private wells are very low levels; other than Mill Road not a significant source of PFAS that has been discovered.

Selectman Woolsey: there are quite a few private wells; surprised more are not listed on your map.

Chairman Bridle: those are just the ones that have been tested.

Selectman Woolsey: subsequent businesses like the car wash are found to be contaminating whatever waste they have; they may be charged with some of the remedy; some kind of consequences.

Mr. Herlihy: yes; plenty of PFAS in the groundwater; next potential step is remediation; state will be involved; talking to them about what is the next step; do they plan to do anything about the contamination that is already in the aquifer.

Selectman Waddell: Carl question; on Well 22 been testing; questions about this; whether it was going to reduce level in other wells; salinity; salt.

Mr. McMorran: been monitoring salinities; been low; .3 when 300 is the threshold for salt-water intrusion.

Selectman Waddell: people were concerned that it would bring down the water quality in other wells in the area.

Mr. McMorran: out of the 20 we are monitoring; have seen change in 10; none have been significant enough to threaten the pump well or anything like that; factored into final permit; see what data tells us.

Selectman Waddell: Aquarion has been very cooperative with the Town; Aquarion paid for testing the private wells; NH did it, but you paid for it; more people could have participated in the study, correct?

Mr. Lawrence: yes, DES sent letters out; some responded, but some did not; cannot make people test their wells

Selectman Waddell: people are asking why we are talking about PFAS now, not 5 years ago.

Mr. Herlihy: just in the last 5 years the health authorities have recognized that there could possibly be health concerns relative to PFAS; in 2013 and 2014 EPA had the larger water utilities test for PFAS; tested all our wells; only had the one hit in Well 6; Carl did additional testing in 2015 and 2016; improved analytical methods, that is when we found in most cases had low levels.

Selectman Waddell: you started with four or less, how many are you up to now?

Mr. Herlihy: we started with 6 in the EPA study and now we are testing for 26; EPA told the labs we were going to test for these 6; after study was done lab developed the methods more; now see 26.

Selectman Waddell: are there health notices going out to people?

Mr. Herlihy: I know that EPA has worked with the manufactures of Teflon to eliminate the use of PFOA and PFOS from their products.

Selectman Griffin: what does it mean Teflon; cooking on Teflon?

Mr. Herlihy: yes; a number of products that repel water, grease and oil; scotch guard; clothing; furniture; Teflon; firefighting phones; piece of paper that is in your pizza box.

Mr. Lawrence: bench-skill testing for PFOS treatment at Mill Road; evaluated granular activated carbon and ion exchange for removal of PFOS compounds:

Mill Road Wellfield – Bench Scale Testing for PFAs Treatment

- Recommendations and Conclusions

- Granular Activated Carbon (GAC) and Ion Exchange (IX) filters were both evaluated for PFAS removal
  - Both filters can remove most PFAS, but shorter chain PFAS breakthrough faster than expected
    - IX does not remove PFBA
  - GAC was more effective than IX
  - Faster breakthrough shortens filter run times. This would require more frequent replacement of filters and increase operating costs.
- A larger scale pilot test should be conducted to provide better estimates of filter performance and probably costs

Summary of Capital and Operating Costs and Ranges in Rate Increases

- Source Selection – reduce Regulated PFAS to 19 ppt
  - Capital Cost $0
  - Annual Operating Costs $0
  - Range in Rate Increase 0%
- Well 6 – Phase 1 – reduce Regulated PFAS to 11 ppt
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  - Range in Rate Increase 8% to 9%
- Well 6, 9 and 11 – reduce Regulated PFAS to 4 ppt
  - Capital Cost $2.4M
  - Annual Operating Costs $0.6M to $1.8M
  - Range in Rate Increase 14% to 35%

Regulated PFAS: drinking water standards for PFHxS, PFOA, PFOS and PFNA to be set by NH DES by January 2019.

Mr. Lawrence: hoping to get pilot test up and running.

Attorney Gearreald: in terms of the rate increase; Aquarion has made a pre-application for the drinking water trust fund grants that are available; follow up on that with the other steps.

Mr. Lawrence: yes, we were notified about that today; and will follow up with them; new process; did apply for a 50% grant, which was the potential.

Attorney Gearreald: if a grant is given the percentages of rate increases that are reflected in the two bullets would be cut in half if the full grant were given.

Mr. Lawrence: do not know if it would be in half, it would definitely have an impact.

Attorney Gearreald: the rating system that is used may be affected if EPA lowers the maximum contaminant level.

Mr. Lawrence: if you take NJ standards and add them up it gets back to 70; we meet the NJ standards; make sure things are done correctly; if we get a grant and we need to treat, that is what we will do; work towards the standards that toxicologists come up with.

Attorney Gearreald: doing say the pilot installation, will get you closer to being shovel ready, when things become clearer what the acceptable level will be; you will be ready.

Mr. Lawrence: yes; it will help us to determine which media and what the operating costs are going to be more refined; cannot accept the range; evaluate; what happens from a regulatory stand point is going to drive the decision we are going to make.

Attorney Gearreald: another source of funding, besides ratepayers or grants; EPA or DES focus on responsible parties for the contamination; forced to remediate; could reduce cost.

Mr. Lawrence: yes; following the lead of DES; hoping that they will remediate it and pull it back towards themselves and get rid of it, so that it does not continue to escalate.

Selectman Waddell: philosophical question; my rate increase is going to go between 14% to 35%; Aquarion is a profitable company; doing well; how much will you be eating too, or is it all being passed onto the customer?

Mr. Walsh: The way we are regulating; look at 2 categories of cost; expenses and investments in the infrastructure; base our rates on those; if our expenses go up $600,000 per year; next rate case gets built into the rates.

Mr. Lawrence: if we are able to have an appropriate responsible party; that particular entity pays for the replacement over a period of time; our customers were not paying for the replacement of that media; they built the facility as well; options; grants; responsible parties.

Selectman Waddell: all this will be on your website.

Mr. Lawrence: yes.

Selectman Woolsey: confirm what we talked about this morning; we discussed hydrants and hydrant maintenance and you will keep us posted; anytime Aquarion is doing a project, such as replacing a line and it appears there might be contaminants going into the water system, you will get a message out to warn them and what to do about it.

Mr. Walsh: Absolutely we will do that.

North Hampton Select Board Meeting
July 23, 2018

AQUARION
Water Company

John Herlihy, Vice-President, Water Quality & Environmental Management

Dan Lawrence, Director Engineering & Planning

Carl McMorran, Operations Manager

Agenda

- Well 22
- Mill Road Main Replacement
- Mill Road Water Treatment Plant
- PFAS

Per- and Poly-Fluoro-Alkyl Substances (PFAS)

- PFAS Monitoring
  - AWC Wells: stable PFAS levels
  - Continue minimizing PFAS levels through source selection strategy
  - Tap water PFAS levels remain below current and anticipated standards
- PFAS Health Standards Development
  - EPA, NHDES, NJ, MADEP, CTDPH activities
  - EPA Regional Community PFAS meeting
- Current regulatory uncertainty will be resolved when DES issues drinking water standards; expected by January 1, 2019
- Groundwater Pollution Abatement and Remediation
  - Car Wash discharge to groundwater has been stopped by NHDES
  - NHDES Private Well Study

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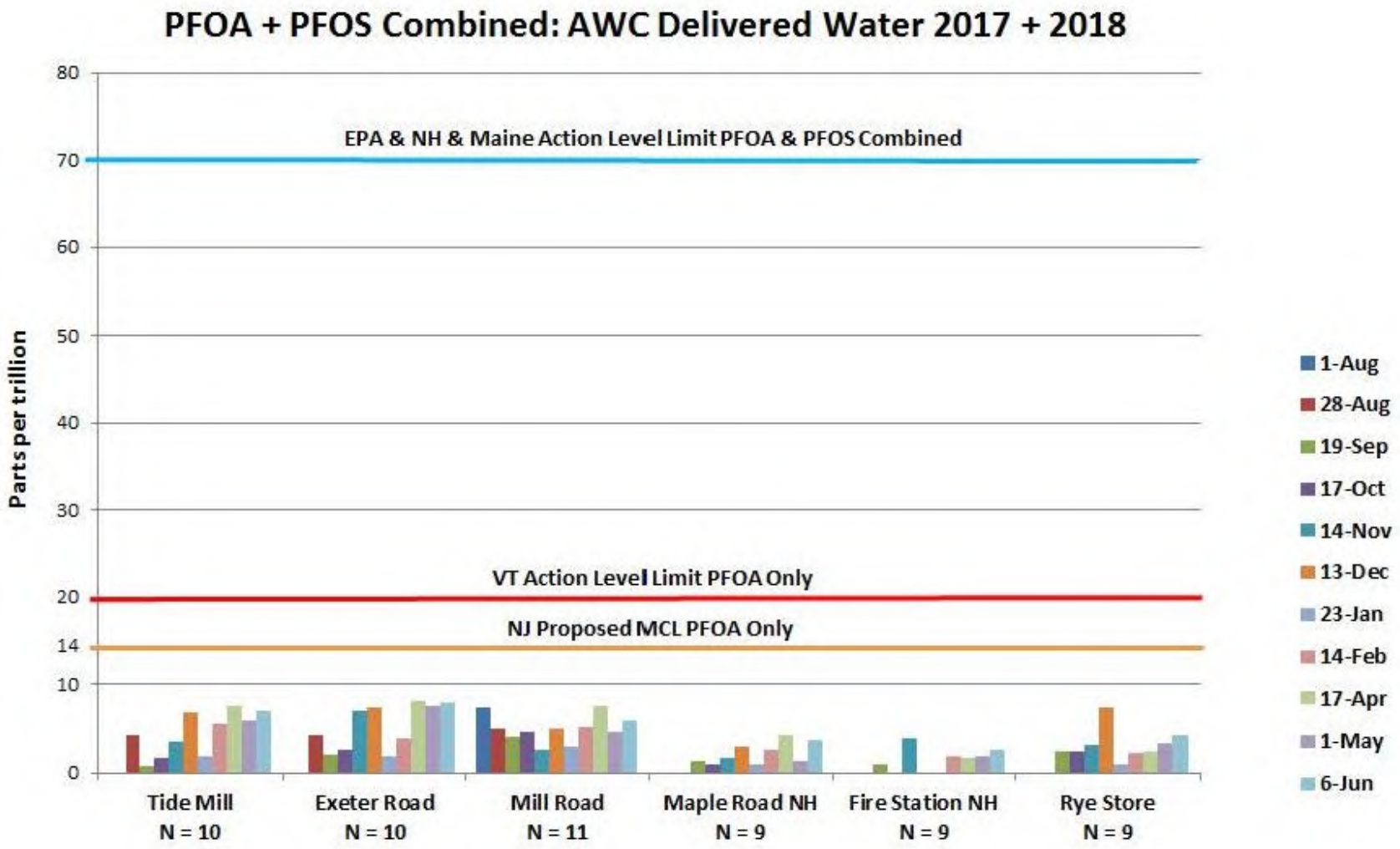
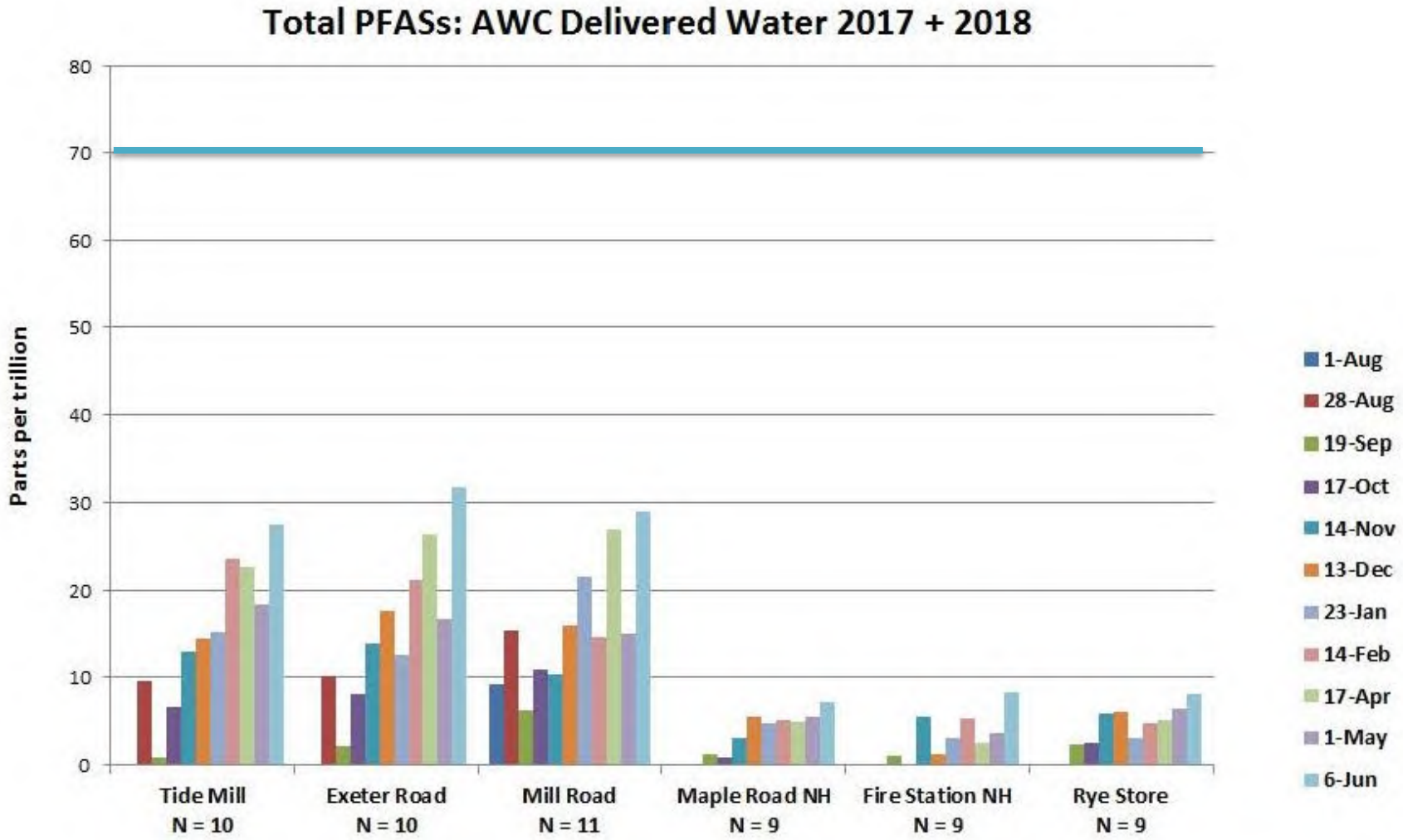
PFOA and PFOS levels in tap water are lower than any current drinking water standards.



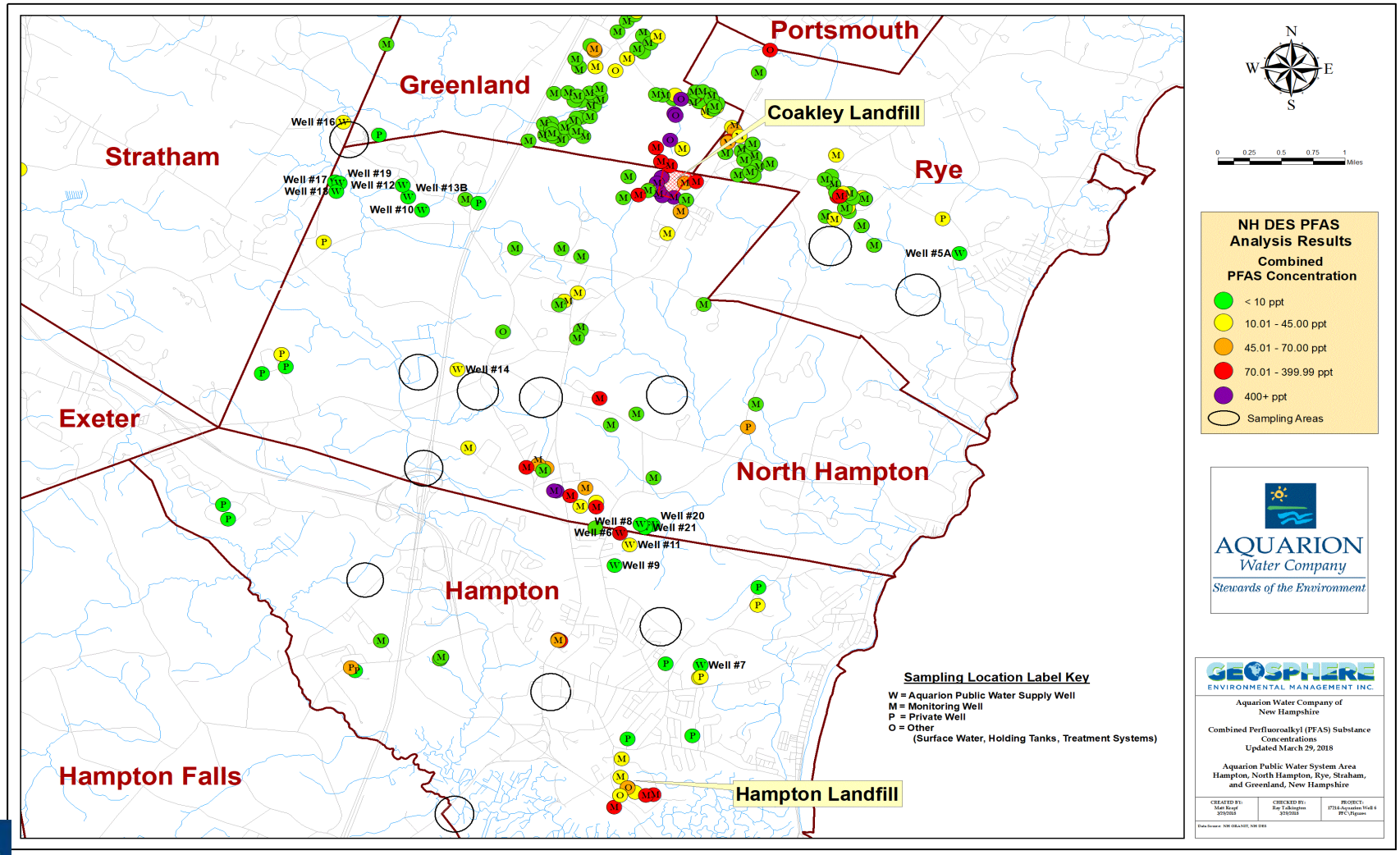
Per- and Poly-Fluoro-Alkyl Substances (PFAS)

Total PFAS levels in tap water are lower than 70 ppt



Per- and Poly-fluoroalkyl Substances (PFAS)

Green dots between Aquarion wells and Coakley Landfill show many wells that have little or no PFAS. There are other sources of PFAS along the Route 1 corridor.
Coakley Landfill is not contributing PFAS to any of Aquarion's wells.



Mill Road Wellfield – Bench Scale Testing for PFAS Treatment

- Recommendations and Conclusions
  - Granular Activated Carbon (GAC) and Ion Exchange (IX) filters were both evaluated for PFAS removal
    - Both filters can remove most PFAS, but shorter chain PFAS breakthrough faster than expected
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    - GAC was more effective than IX
    - Faster breakthrough shortens filter run times. This would require more frequent replacement of filters and increase operating costs
  - A larger scale pilot test should be conducted to provide better estimates of filter performance and probable costs

Mill Road Wellfield – Bench Scale Testing for PFAS Treatment

- Summary of Capital and Operating Costs and Ranges in Rate Increases
  - Source Selection – reduce Regulated PFAS to 15 ppt
    - Capital Cost $0
    - Annual Operating Costs $0
    - Range in Rate Increase 0%
  - Well 6 – reduce Regulated PFAS to 9 ppt
    - Capital Cost $3.7 M
    - Annual Operating Costs $0.1M to $0.2M
    - Range in Rate Increase 8% to 9%
  - Well 6, 9 and 11 – reduce Regulated PFAS to less than 4 ppt (quantification limit)
    - Capital Cost $6.1 M
    - Annual Operating Costs $0.6M to $1.8M
    - Range in Rate Increase 14% to 35%

Regulated PFAS: drinking water standards for PFHxS, PFOA, PFOS and PFNA to be set by NH DES by January 2019

North Hampton Select Board Meeting – July 23, 2018

Carl McMorran, John Herlihy and Dan Lawrence

12.2 Aquarion Water Company Quarterly Update – Carl McMorran

The Chair returned from recess and introduced Carl McMorran, Operations Manager of Aquarion Water.

Carl McMorran, John Herlihy and Dan Lawrence all took part in the presentation.

The complete power point presentation can be read here: https://www.northhampton-nh.gov/sites/northhamptonnh/files/uploads/aquarion07232018.pdf

Chair Maggiore stated someone had stated that the North Hampton Fire Department was the specific cause of contamination for wells located behind Joe's Meat Shoppe, however he believes a retraction has been made because it cannot be a statement of fact when there are commercial enterprises located in that area may or may not have contributed to the contamination.

Carl McMorran stated the chair is referring to comments Brandon Kernan made at the North Hampton Conservation Commission meeting. Carl stated he thinks Mr. Kernan's point was that a lot of fire stations are hot spots because of the [use of] fire fighting foam, and he doesn't feel he was pointing out North Hampton a s he is not aware of any sampling being done around the fire station other than the private well located out behind Joe's Meat Shoppe which is clearly associated with the automotive repair shop.

Chair Maggiore stated he wanted to make sure that was the case because he didn't want anyone in the public to think the fire department was the cause.

Chair Maggiore asked Mr. McMorran if he could provide what the standard of flushing lines and hydrants.

Mr. McMorran stated he would provide that information to the Select Board

Hampton Select Board Meeting – October 15, 2018

Agenda Item 4. Quarterly Update (Carl McMorran, Dan Lawrence and John Herlihy (starts at 1:38:45 on video))

Mr. McMorran: 2.65% water rate reduction due to a Federal Corporate Tax Reduction and Mill Road Main Replacement; current surcharge 7.08%; proposed surcharge 4.43%; contingent upon PUC approval; WICA (Water Infrastructure and Conservation Adjustment).

Mr. Herlihy: PFAS update; pump test on Well 22; put Well 6 back into service; below the 70 ppt limit; legislation passed to develop enforceable standards for PFAS; maximum contaminant levels; PFOA and PFOS levels remained stable in wells and treated water; PFAS levels increased in samples with Mill Road water; tap water PFAS levels remain below current anticipated standards; PFOA and PFOS below standards; DES holding a series of public meetings; continue to implement PFAS strategy; anticipate approval for using Well 22; continue to work with DES on identifying pollution sources; investigate PFAS removal treatment options.

Selectman Woolsey: been a pioneer as a private company.

Mr. Herlihy: commitment to water quality; enforceable standards; communication

Mr. Lawrence: working with NHEPA; sampling; other sources along Route 1 corridor. Right now Coakley Landfill is not contributing PFAS to any of Aquarion's wells; intermittent high levels; PFAS treatment; alternative analysis; bench scale testing; pilot scale testing; monitoring well installation and testing; remove contaminates; granulated activated carbon; exchange process; learning a lot through process; contained next to Well 6; no longer discharge from car wash; we get the data from DES.

Vice-chairman Barnes: this is happening everywhere; appreciate what you have done.

Selectman Waddell: you have been transparent; speaks highly; be sure they are getting a safe product.

Chairman Bridle: what is your intention of servicing the area where there are two red dots.

Mr. Lawrence: we cannot extend water mains ourselves; regulated utility; expansion assistance through developers; grants.

Vice-chairman Barnes: operations manager received an award; paper published; to Carl McMorran.

Selectman Woolsey: color coding on hydrants. Mr. McMorran: Well 22; pumping test data; permit from DES in 1st quarter 2019; operational next summer; replaced 4,000' from Pine Road to Atlantic Avenue.

North Hampton Select Board Meeting
October 22, 2018

AQUARION
Water Company

John Herlihy, Vice-President, Water Quality & Environmental Management

Dan Lawrence, Director, Engineering & Planning

Carl McMorran, Operations Manager

Agenda

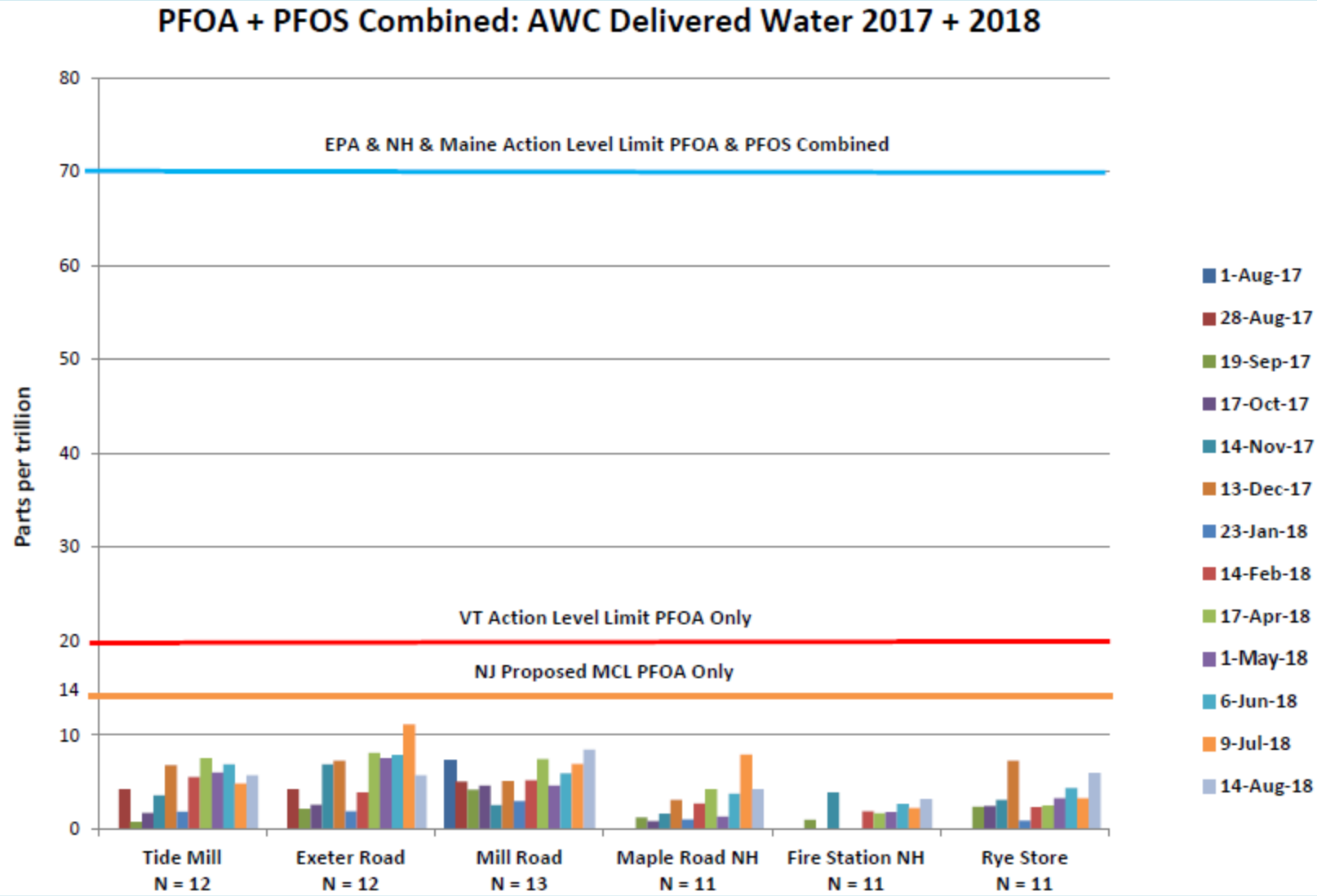
- **Water Rate Reduction**
- **PFAS**
- **Well 22**
- **Main Replacements**

Per- and Poly-Fluoro-Alkyl Substances (PFAS)

- PFAS Monitoring Results for July and August
  - Well 6 needed due to high summer demands
  - PFOA + PFOS levels remained stable in wells and treated water
  - Total PFAS levels increased in samples with Mill Road water
  - Tap water PFAS levels remain below current and anticipated standards
- PFAS Health Standards Development
  - NHDES to develop enforceable standards in 2019
  - PFOA, PFOS, PFNA, PFHxS
  - NHDES public meetings for input on development of MCLs
- PFAS Reduction Strategy
  - Minimize use of Well 6 (only 2+ months in 2018)
  - Maximize use of Well 22 in 2019
  - Work with DES on PFAS pollution investigations
  - Investigate PFAS removal treatment options

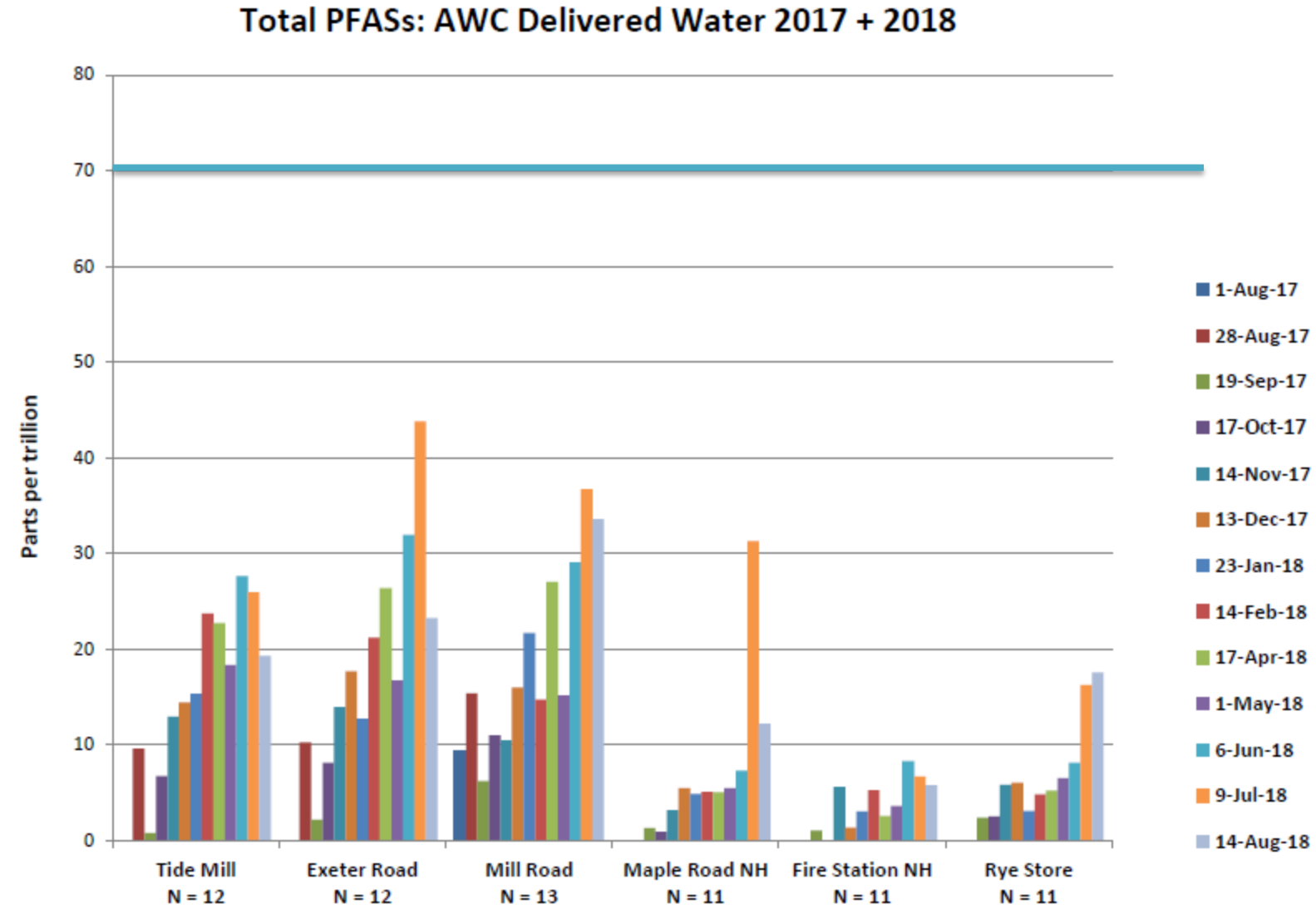
Per- and Poly-Fluoro-Alkyl Substances (PFAS)

PFOA and PFOS levels in tap water are lower than any current drinking water standards.



Per- and Poly-Fluoro-Alkyl Substances (PFAS)

Total PFAS levels in tap water are lower than 70 ppt



Per- and Poly-fluoroalkyl Substances (PFAS)

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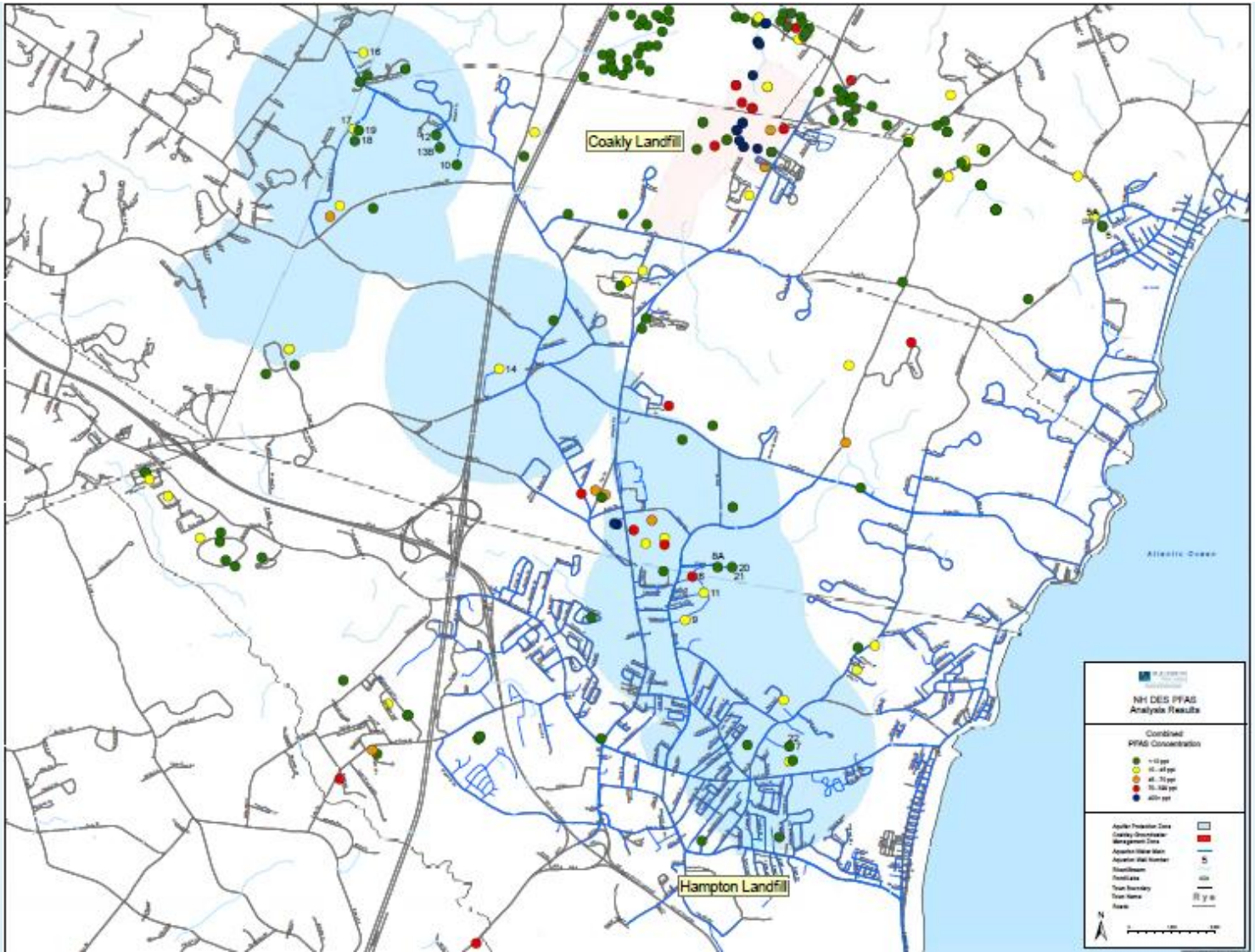
Coakley Landfill is not contributing PFAS to any of Aquarion's wells.



PFAs Treatment Evaluation

- Alternative Analysis
  - 2017
- Bench Scale Testing
  - 2018
- Pilot Scale Testing
  - 2018/2019
- Monitoring Well Installation and Testing
  - 2018/2019

North Hampton Select Board Meeting – October **22, 2018**

Carl McMorran, John Herlihy and Dan Lawrence

11.3 Aquarion Water Company Quarterly Update

Carl McMorran, John Herlihy and Dan Lawrence from Aquarion presented the Select Board with their quarterly update. A copy will be attached to the minutes.

Hampton Select Board Meeting
January 14, 2019

AQUARION
Water Company

John Herlihy, Vice-President, Water Quality & Environmental Management

Dan Lawrence, Director Engineering & Planning

Carl McMorran, Operations Manager

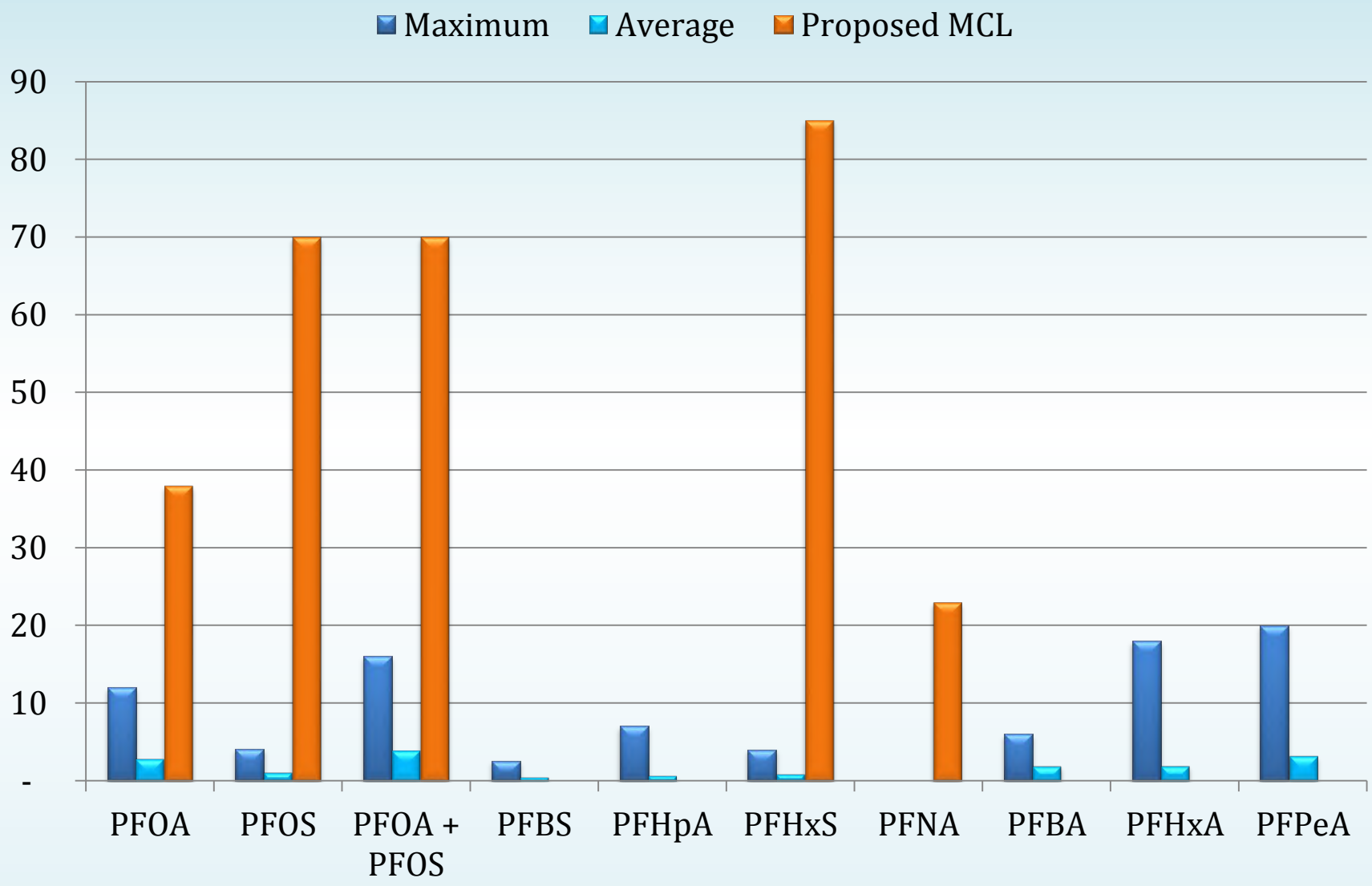
Agenda

- **PFAS Update**
  - **Monitoring**
  - **Treatment Evaluation**
- **Treatment Improvements**
- **Well 22 Large Groundwater Withdrawal Permit**
- **Main Replacement along Route 101**

PROGRESS on PFAS in 2018

- Minimized use of Well 6
- Continued monitoring raw and distribution system water
- Completed private well testing with NHDES
- Continued the PFAS treatment evaluation
- Development of a new source of supply (Well 22)
- Installed sentinel wells along Mill Road
- NHDES eliminated PFAS discharge from the carwash
- Monitored regulation development process
- Communicated regularly with town and state officials

PFAS Levels in Tap Water



Current PFAS Concentrations compared to Proposed Maximum Contaminant Levels

2019 PFAS Management Plan

- Minimize use of Well 6
- Continue PFAS testing of wells and tap water
- Initiate PFAS testing at sentinel wells
- Continue PFAS treatment evaluation
- Obtain DES approval of Well 22
- Continue to monitor the regulatory process
- Continue communication with town and state officials

Mill Road Treatment Analysis Update

- **Alternatives**
  - **Source Selection**
  - **Treatment: Removal by Filtration**
    - **Granular Activated Carbon (GAC)**
    - **Ion Exchange**
- **Testing**
  - **Bench Scale at North Carolina State University**
  - **Pilot Scale at Well 6**

Pilot Testing

Mill Road Treatment Analysis – Post Bench Scale

Parameter	No Treatment	Scenario 1 PFAS treatment of water from Well 6	Scenario 2 PFAS treatment of water from Wells 6, 8A, 9, 11
Treated water flow rate (gpm)	0	360	1,676
PFOA+ PFOS (ng/L)[1]	9 – 12	7	<4[2]
Sum of Regulated PFAS (ng/L) [1]	14 – 19	11	<4[2]
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Rate increase required[5]	**0%**	**8%-9%**	**14 %- 35%**

[1] Based on maximum concentration of PFAS in well waters; concentrations as entering the distribution system
[2] Method Reporting Limit (MRL) of 4 ng/L.
[3] Conceptual capital costs have an expected accuracy of -30%/+50%.
[4] Annual O&M costs for GAC are based on a one year replacement frequency.
[5] Actual rate increase required will depend on final capital and annual O&M costs.

Hampton Select Board Meeting – January 14, 2019

Agenda Item 4. Quarterly Update (Carl McMorran, Dan Lawrence and John Herlihy)

Mr. Herlihy: update on 2018 progress; PFAS; drinking water; plan for managing PFAS in 2019; minimized use of Well 6; continued sampling; 26 compounds tested; completed private well testing with NHDES; continued PFAS treatment evaluation; development of a new source of supply Well22; installed sentinel wells along Mill Road; NHDES eliminated PFAS discharge from the carwash; monitored regulation development process; communicated regularly with Town and State officials; PFOA, PFOS, PFOA + PFOS; PFBS; PFHpA; PFHxS; PFNA, PFBA, PFHxA; PFPeA compounds tested; standards proposed; water relative to standards proposed today; 2019 plan; minimize use of Well 6; continue PFAS testing of wells and tap water, initiate PFAS testing at sentinel wells; continue PFAS treatment evaluation; obtain DES approval of Well 22; continue to monitor the regulatory process; continue communication with Town and State officials.

Selectman Woolsey: concern with saline contamination; communicated concern on perimeters of well.

Vice-chairman Barnes: concerned about what you are doing, which is very good; got testing going; numbers on chart; asks Mindy Messmer questions; keeping numbers low; track regulations; numbers are lower than DES numbers; stay on top of it.

Mr. Herlihy: these numbers will be lower when we do not have to use Well 6 at all.

Selectman Griffin: had liver transplant; one thing they do is they teach you about things you should avoid; one of the things most important was about water; 3 categories; public water, bottled water and well water; they said the community water system is best as it is tested regularly; people that have wells should be tested often.

Chairman Bridle: Well 7 and Well 22 are not surface water wells; deep wells.

Mr. McMorran: Well 7 is a sand and gravel wells; 50-60' deep; Well 22 is 220' deep; education materials go out to everyone that lives in the aqua-protection zone; minimize potential contamination.

Mr. Lawrence: Mill Road Treatment Analysis; alternatives; source selection; treatment; removal by filtration; granular activated carbon (GAC); ion exchange; testing; bench scale at North Caroline State University; pilot scale at Well 6; pilot testing; narrow down operating cost; more information the better.

Mr. McMorran: water treatment upgrades Wells 7 & 22; working on withdrawal permit for Well 22; main replacement project along Route 101; environmental champions; May 9, 2019 event; will be looking for nominations.

Vice-chairman Barnes: statements placed on website stating [Coakley Landfill] is not responsible for contamination.

Mr. Herlihy: original statements were placed there because some were stating that Coakley was causing contamination in the Mill Road well; we said no they are not; not conclusive evidence

either way; more study is needed; at this point in time no evidence that we are aware that has proof [Coakley Landfill] contaminated wells; more testing will be done.

Vice-chairman Barnes: what is the capacity of Well 22 compared to Well 6.

Mr. McMorran: three times the capacity; will help meet the demands.

Mr. Lawrence: plan to replace our water main; get out of marsh; submitted permit applications; access permit; build this year; Hampton Beach water supply; critical main source

Next on agenda - Water Issues – Mindy Messmer[2]

Ms. Messmer: 46% of people in NH get their water from their own well; stricter standard for arsenic bill passed; reducing the rate of cancer; highest rate of breast, bladder, esophageal in NH; problems with water numbers; only testing for 26 PFAS chemicals; will be in the body for a long time; child and prenatal exposure; protect young children.

Selectman Woolsey: do you get reports from Aquarion.

Ms. Messmer: yes; still concerned with numbers that are higher; long time period to find out how chemicals should be regulated; share concern with protecting source water; technology to get chemicals out; DES rejected the technology; professional judgment not appropriate; lower standards; drinking water commission bill timed out; Rep. Cushing brought bill back in to reestablish commission; Coakley Landfill meetings are public; next meeting Wednesday at City Hall/Library; $17M has been spent; remedial system for CL; concerned about Wells 14 & 16 another source for low levels of PFAS; migrating from Coakley.

Vice-chairman Barnes: has there been anything about [Coakley Landfill] affecting wells. Ms. Messmer: letter that said radial flow occurs; goes in all directions from [Coakley Landfill]; investigating the south between [Coakley Landfill] and Hampton.

Vice-chairman Barnes: past bills; SB309 got through; HB1101.

Ms. Messmer: yes, responsible for rule making; HB1101 made it through.

Vice-chairman Barnes: Hampton will be looking for a Hampton representative for the cancer cluster commission; would like to see Mindy Messmer involved at-large appointment; not sure what seats are available on the commission; do you think Aquarion are justly doing what is in their ability to do.

Ms. Messmer: I think so; concerned about blending; prefer being proactive[3].

Attorney Gearreald: thank you Mindy for all your efforts; your continued involvement in this field is critical.

[2] State Represenative from New Castle, not Hampton
[3] i.e., should be installing treatment

North Hampton Select Board Meeting
February 11, 2019

AQUARION
Water Company

Dan Lawrence, Director Engineering & Planning

Carl McMorran, Operations Manager

Agenda

- 2017 Eversource Settlement Commitments
- PFAS Update
  - Monitoring
  - Treatment Evaluation
- Treatment Improvements
- Well 22
- Other Projects

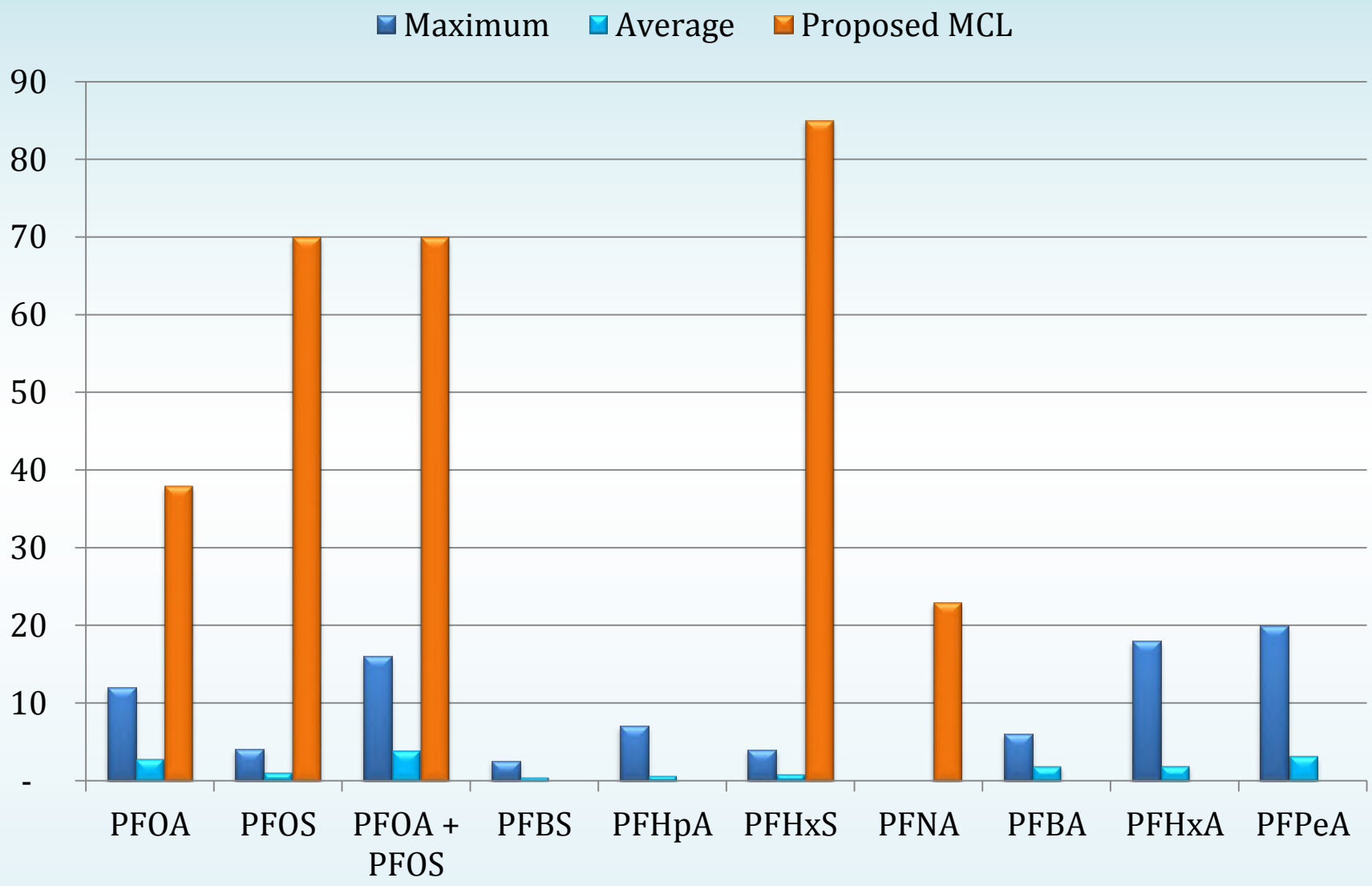
Eversource Settlement Commitments

- **Hydrant Maintenance**
  - **2018 Q4 report issued January 24, 2019**
- **Exeter Road Tank Project**
  - **Alternative Site Evaluations**
- **PFAS Investigations**
  - **PFAS Treatment Evaluation**
- **Well 22**

PFAS Management

- **Source Selection: Minimize tap water PFAS levels by minimizing use of Well 6**
- **PFAS testing of wells and tap water**
  - **Sentinel wells along Mill Road**
- **PFAS treatment evaluation**
- **Monitor PFAS regulatory process**

PFAS Levels in Tap Water



Current PFAS Concentrations compared to Proposed Maximum Contaminant Levels

PFA Treatment Analysis Update

- Alternatives for Mill Road Wells
  - Source Selection
  - Treatment: Removal by Filtration
    - Granular Activated Carbon (GAC)
    - Ion Exchange
- Testing
  - Bench Scale at North Carolina State University
  - Pilot Scale at Well 6

Pilot Testing

Mill Road Treatment Analysis – Post Bench Scale

Parameter	No Treatment	Scenario 1 PFAS treatment of water from Well 6	Scenario 2 PFAS treatment of water from Wells 6, 8A, 9, 11
Treated water flow rate (gpm)	0	360	1,676
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North Hampton Select Board Meeting – February 11, 2019

Carl McMorran and Dan Lawrence

Aquarion Water Quarterly Update

Chairman Maggiore stated that Operations Manager Carl McMorran and Director of Engineering & Planning Dan Lawrence of *Aquarion* would provide an update on Eversource Settlement Commitments made in 2017, PFAS monitoring and treatment evaluations, and on Well 22.

Operations Manager Carl McMorran updated Eversource Settlement Commitments and said the last 2018 quarterly report on Hydrant maintenance showed routine maintenance was done last year on the 149 hydrants in North Hampton. He said the Exeter Road Tank Project was looked at and alternate sites were evaluated, PFAS investigations continued with possible treatment options, and an update on Well 22 would be provided.

Mr. McMorran said under PFAS Management they were looking to minimize tap water PFAS levels by minimizing the use of Well 6 through source selection, and continue tap water and well monitoring. He said sentinel wells were put in along Mill Road to try to determine how PFAS was moving from known contamination sources on Lafayette Road. He said NHDES was also in the process of establishing some regulatory standards for some PFAS components.

Director of Engineering & Planning Dan Lawrence said he had done an analysis project in 2016-2017 which showed the media concentration and water quality in ground water needed to work together to select the best solution. He said they talked about granular activated carbon and ion exchange, and said a Bench Scale Test was done to determine the most appropriate media. He said they were working on a pilot at Well 6 alternating ion exchange and granular activated carbon in series, which would continue through March to try to estimate annual operating costs.

Mr. Lawrence said for the Exeter Road Tank they were looking at alternate sites and at putting an adjacent tank on the current site. He said they hoped decide this year and begin design and permitting, and begin construction in 2020. He said other projects included Water Treatment Upgrades and they were working on underground piping at the Mill Road WWTP and water treatment at Little River Road (Wells 7 and 22).

He said Well 22 required a large groundwater withdrawal permit and was important for sustainability of supply to increase the rate base and stabilize water rates.

Mr. McMorran provided a chart showing the relative capacity of Well 22 compared to other existing wells.

Discussion: Chairman Maggiore asked the meaning of “gallons used” on the chart and Mr. McMorran that was their way of accounting for water going in and out of their systems, with the larger numbers represented the well flushing in spring as part of [hydrant]-maintenance.

Selectwoman Kilgore asked when they would reconvene a prior meeting with Aquarion to finish the Hydrant Report review.

Town Administrator Kaenrath said it was a Water Commission meeting and he was unaware of any action by the Water Commission to review those documents.

Chairman Maggiore said the letter of agreement did not specify the need for signing off or approving and he would get back with the Water Commission.

Hampton Select Board Meeting
April 8, 2019

AQUARION
Water Company

John Herlihy, Vice-President, Water Quality & Environmental Management

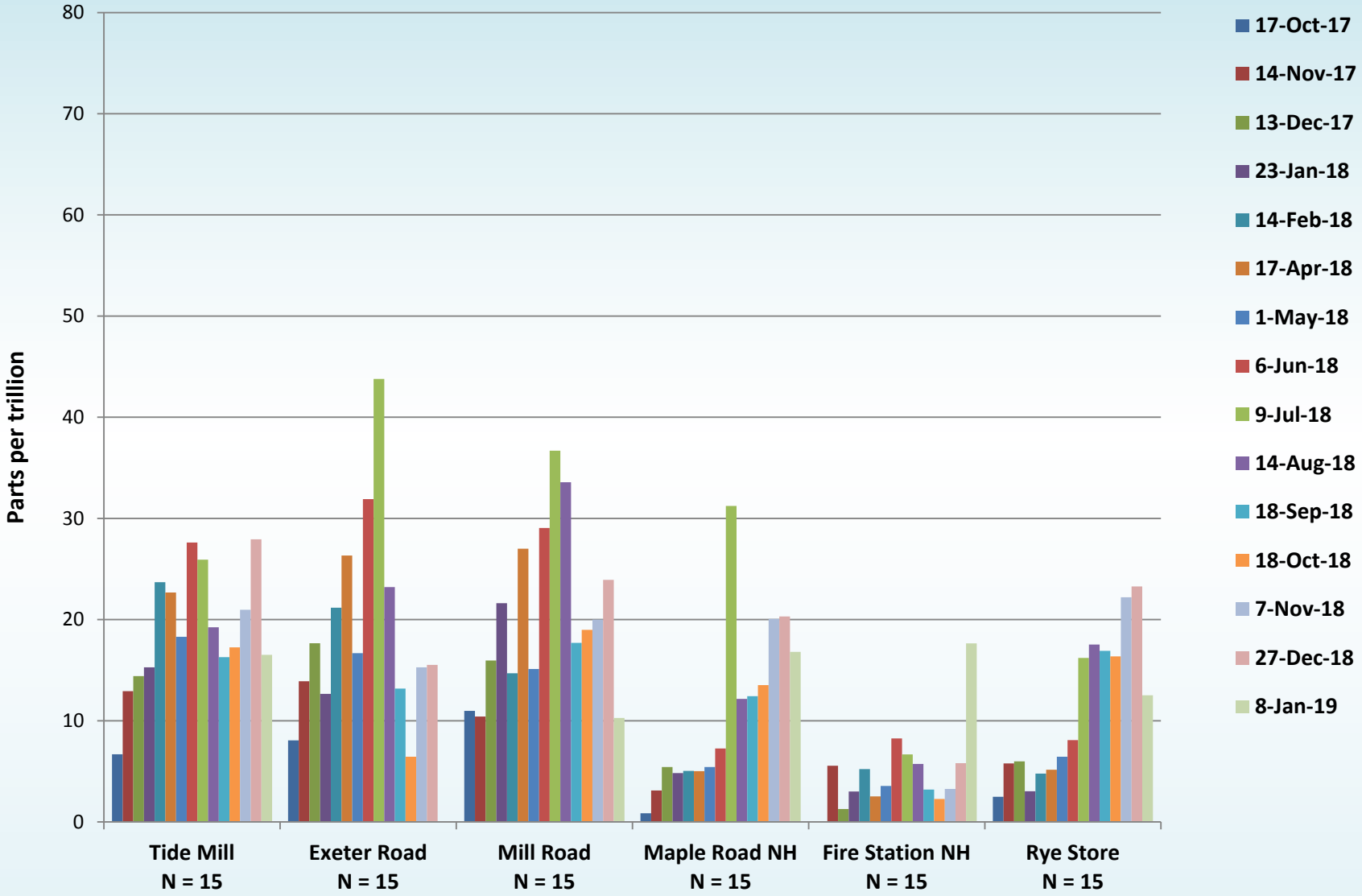
Mark Fois, Senior Engineer

Carl McMorran, Operations Manager

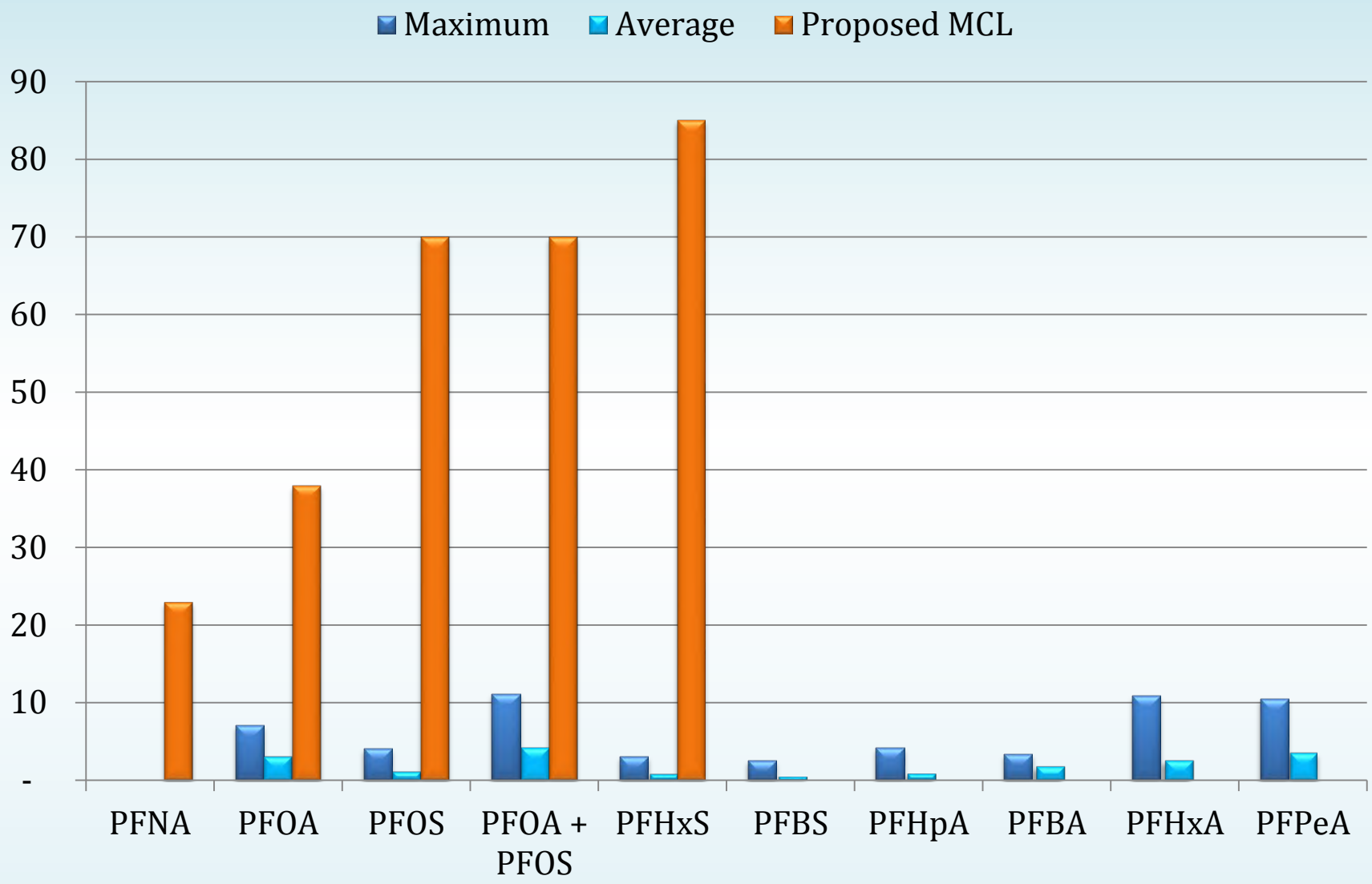
Agenda

- PFAS Update
- Projects
  - PFAS Treatment
  - Main Replacements
  - Well 22
  - New Tank

Total PFASs: AWC Delivered Water 2017 - 2019



PFAS Levels in Tap Water



Current PFAS Concentrations compared to Proposed Maximum Contaminant Levels

2019 PFAS Management Plan

- **Minimize use of Well 6**
- **Continue PFAS testing of wells and tap water**
- **Initiate PFAS testing at sentinel wells**
- **Continue PFAS treatment evaluation**
- **Obtain DES approval of Well 22**
- **Continue to monitor the regulatory process**
- **Continue communication with town and state officials**

Mill Road Treatment Analysis Update

- Alternatives
  - Source Selection
  - Treatment: Removal by Filtration
    - Granular Activated Carbon (GAC)
    - Ion Exchange
- Testing
  - Bench Scale at North Carolina State University
  - Pilot Scale at Well 6

Pilot Testing

Mill Road Treatment Analysis – Post Bench Scale

Parameter	No Treatment	Scenario 1 PFAS treatment of water from Well 6	Scenario 2 PFAS treatment of water from Wells 6, 8A, 9, 11
Treated water flow rate (gpm)	0	360	1,676
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Rate increase required[5]	**0%**	**8%-9%**	**14 %- 35%**

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Hampton Select Board Meeting – April 8, 2019

Agenda Item 4. Quarterly Update (Carl McMorran, John Herlihy and Mark Fois)

Mr. McMorran: PFAS update; projects.

Mr. Herlihy: PFAS; shows graph; monitoring for PFAS compounds; minimize usage of Well 6; low PFAS levels compared to the proposed maximum contaminant levels; no PFNA; levels could possible change.

Selectman Woolsey: Well 6 on-line.

Mr. Herlihy: it is off line 9 months of the year; only on in the summer.

Selectman Woolsey: is Well 22 on; levels; contamination?

Mr. McMorran: will get to that; permits pending; nothing in the way of salinity; few trace levels of PFAS, which you find everywhere.

Selectman Waddell: you are staying ahead of it; proactive; staying up with science; drinking water is well within the safety zone; on top of the situation, which is good.

Mr. McMorran: regulations; drive need to remove PFAS; low levels; pilot program; removal filtration; granular activated carbon; ion exchange (absorb PFAS/replace with other ions); carbon based resin; will be expense if going with treatment; being prepared. Working on treatment upgrades; Wells 7 & 22; get permit in; Route 101 main replacement project bids; summer project; off side of road; not significant impact on traffic; project Gentian, Meadow Pond, Greene Street; do storm drains at same time; partner with town; new tank project.

Mr. Fois: Exeter Road/Falcone Circle tank; built in 1983; holds 750,000 gallons of water; manage storage tank maintenance program; inspect tanks; rehabilitation; painting; assess replacement of tank if too old or expensive to rehabilitate; do not have enough storage of water in the system to meet all the needs; best site to host second new water tank; once new tank is done will take old tank off line to repaint/rehab; will solicit feedback from neighbors; permit process; on next quarterly update, should have more information.

Mr. McMorran: invitation to our Environmental Champions Event, May 9 at the Victoria Inn.

Selectman Woolsey: how long for construction of new tank?

Mr. Fois: 9-10 months; depending upon weather; budget for a full year; made of welded steel; come in sections; two classic ways to build tank.

Chairman Griffin: water line on Route 101; phrased if it comes in at a good price; what if it does not.

Mr. McMorran: make choice to do or not; think it is unlikely it will be excessively expensive.

Selectman Bridle: doing project in the summer; effect it has on the businesses on Church Street; only way out/Highland Avenue.

North Hampton Select Board Meeting
May 13, 2019

AQUARION
Water Company

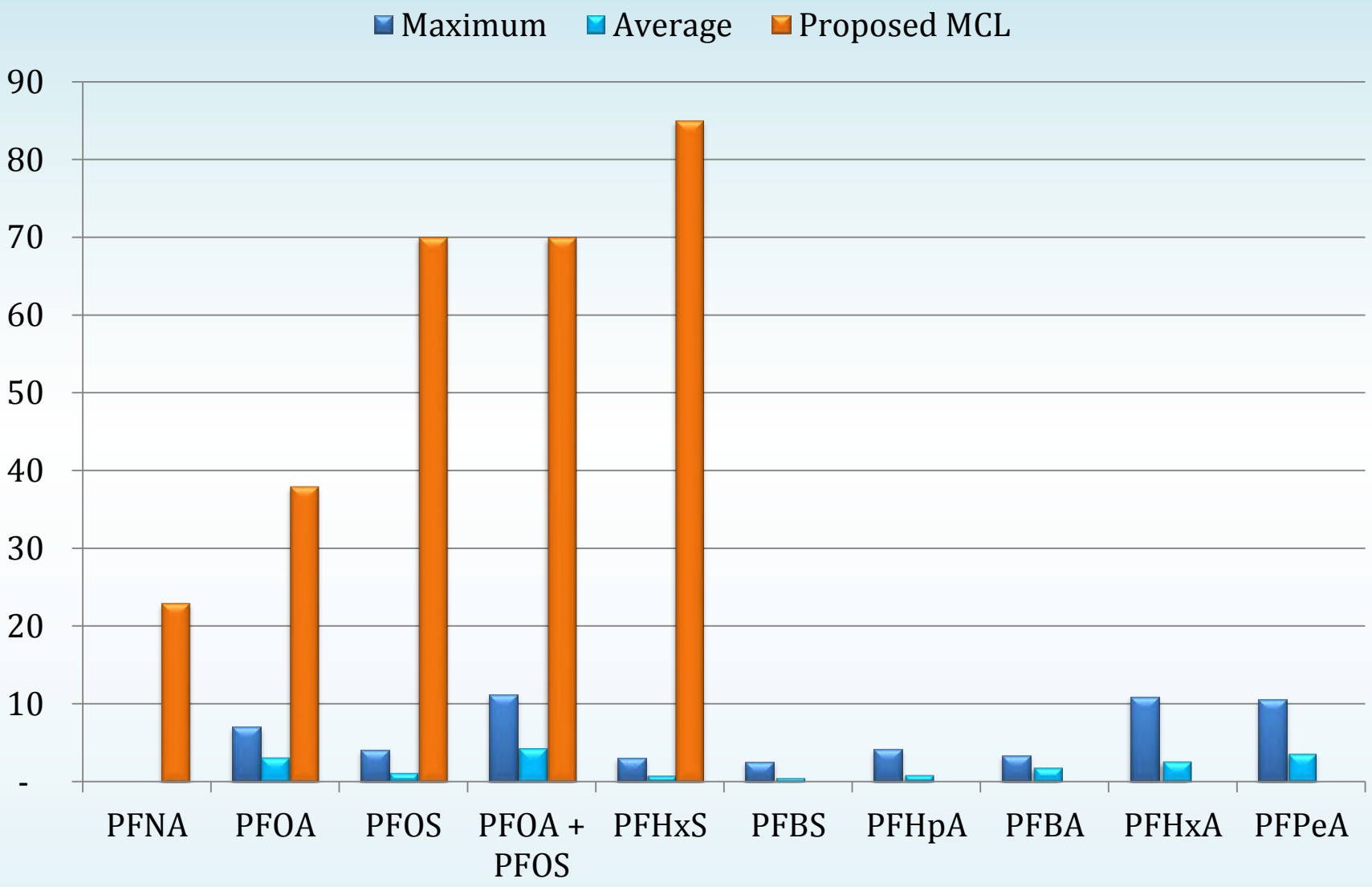
Dan Lawrence, Director Engineering & Planning

Carl McMorran, Operations Manager

Agenda

- Operations
- PFAS Update
- Projects
  - PFAS Treatment
  - Main Replacements
  - Well 22
  - New Tank

PFAS Levels in Tap Water



PFAS Concentrations are much lower than Proposed Maximum Contaminant Levels

2019 PFAS Management Plan

- **Minimize use of Well 6**
- **Continue PFAS testing of wells and tap water**
- **Initiate PFAS testing at sentinel wells**
- **Continue PFAS treatment evaluation**
- **Obtain DES approval of Well 22**
- **Continue to monitor the regulatory process**
- **Continue communication with town and state officials**

Mill Road Treatment Analysis Update

- Alternatives
  - Source Selection
  - Treatment: Removal by Filtration
    - Granular Activated Carbon (GAC)
    - Ion Exchange
- Testing
  - Bench Scale at North Carolina State University
  - Pilot Scale at Well 6

Pilot Testing

Mill Road Treatment Analysis – Post Bench Scale

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North Hampton Select Board Meeting – May 13, 2019

Carl McMorran and Dan Lawrence

Aquarion Water Quarterly Update

Carl McMorran of Aquarion said they would present an update of their ongoing work to provide safe, reliable drinking water to the community. He said they were wrapping up routine work on pumping and treatment systems to prepare for summer demand and were 80% through the installation of seasonal metrics, and were 1/3 through their [hydrant]-maintenance program.

Mr. McMorran said they were collecting a lot of data on PFAS on their website and were available for questions. He said the chart compares the observed distribution of levels of PFAS to proposed MCLs by NHDES, which were in the process of being formalized. He said a Public Hearing was held for input on what the numbers to be approved by the legislature should be. He said the chart shows the maximum and average levels they see in their system, and said the proposed MCLs only covered 4 of the compounds they detected.

Mr. McMorran said they had their own PFAS management plan to try to minimize the levels in the distribution system by minimizing the use of Well 6 which has the highest PFAS levels. He said they were continuing PFAS quarterly testing, initiating PFAS testing in sentinel wells and continuing PFAS treatments.

He said they were seeking approval from DES for Well 22 and would continue to watch the regulatory process and provide communication.

Dan Lawrence, Director of Engineering at Aquarion, said they were in the middle of evaluating a number of things. He said the Mill Pond Treatment Analysis update found Well 6 currently had the highest concentrations of PFAS and they were looking at how to treat it and the cost of treatment. He said they had done a bench scale, and said the pilot scale was ongoing to look at adjacent monitor wells to determine the length of time it takes to exhaust the medium. He said better defining what media to use and how long it will last would help refine yearly costs. He said Well 6 would stay off most of the year, and water treatment upgrades at Mill Road WTP would consolidate treatment for 6 wells.

Mr. Lawrence said the Little River WTP would treat wells 7 and 22 which would be consolidated into one common facility once Well 22 was permitted for treatment. He said a large groundwater withdrawal permit application was submitted to serve the communities in the long term to make sure there is adequate water supply. He said other projects included the Route 101 Water Main Replacement. As far as the “Exeter Tank”, he said they looked at solutions for additional storage and decided they needed another tank which would be located adjacent to the current tank.

North Hampton Select Board Meeting
August 12, 2019

AQUARION
Water Company

John Herlihy, Vice-President, Water Quality & Environmental Management

Carl McMorran, Operations Manager

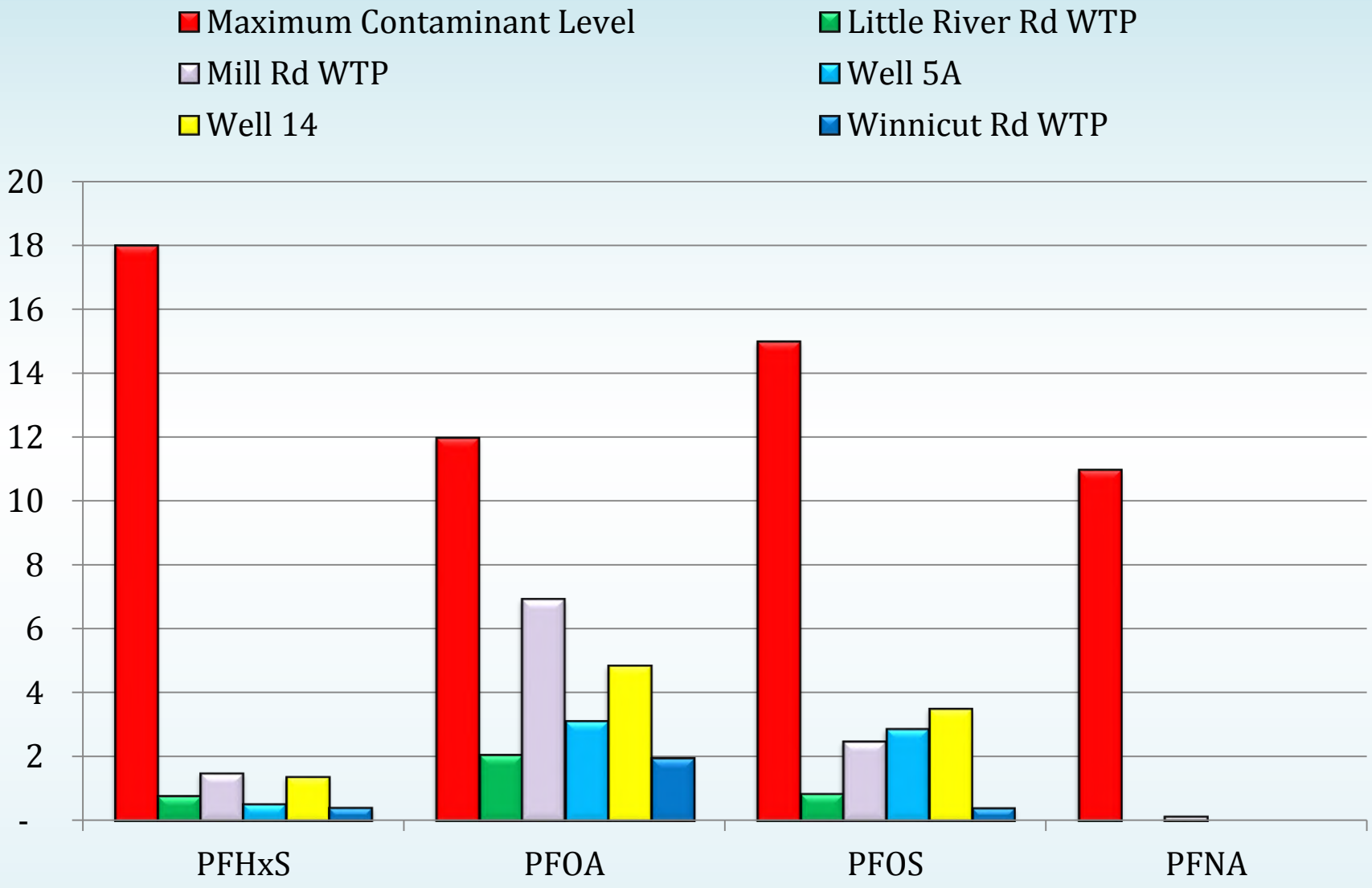
Agenda

- PFAS Update
- Projects
  - PFAS Treatment
  - Rt 101 Main Replacement
  - New Tank
  - Well 22
  - Operations

PFAS Regulations

- **Maximum Contaminant Levels – 4 compounds**
  - **PFHxS 18 parts per trillion**
  - **PFOA 12**
  - **PFOS 15**
  - **PFNA 11**
- **Compliance**
  - **Samples at Each Entry Point to the Distribution System**
  - **12-month Running Average**
    - **For Each Compound**
    - **For Each Entry Point**

PFAS Maximum Contaminant Levels



Compliance is Measured at Entry Points to Distribution System, Not Individual Wells

2019 PFAS Management Plan

- **Minimize use of wells with higher PFAS levels**
- **Continue PFAS testing of wells**
- **PFAS testing at sentinel wells**
- **Continue PFAS treatment evaluation**
- **Obtain DES approval of Well 22**
- **Continue to monitor the regulatory process**
- **Continue communication with town and state officials**

PFAS Treatment Analysis Update

- Alternatives
  - Source Selection
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  - Bench Scale at North Carolina State University
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North Hampton Select Board Meeting – August **12, 2019**

Carl McMorran and John Herlihy

Aquarion Water Quarterly Update

Carl McMorran, Operations Manager for Aquarion, said he and John Herlihy, Vice President for Water Quality & Environmental Management, would give updates on their mission to provide safe, reliable water service to residents. He said they would cover ongoing PFAS projects, the treatment plant on Mill Road, water main replacements, and their new tank project as well as highlights of operations.

Mr. John Herlihy said he had some good news that the State of New Hampshire had finalized regulations for PFAS, covering allowable levels of 4 PFAS compounds in public drinking water, source protection, and remediation. He said New Hampshire was one of a handful of states that had now set enforceable maximum contaminant levels for 4 PFAS compounds: PFHxS, PFOA, PFOS, and PFNA, in public drinking water. He said the regulations would take effect September 30, 2019 and every Public Water System will be required to test for those 4 compounds, and compliance would be determined after 4 quarters of monitoring.

Mr. Herlihy said compliance would be determined at the entry point of each source of supply to the distribution system, and said there were 5 entry points in Hampton with 3 wells and 2 well fields. He said the lower the number of parts per trillion of each compound, the more concerned the Health Agency is about toxicity. He said all the levels were significantly lower than those proposed by DES in December. He showed a graph representing the new limits and how North Hampton water measures up. He said he they expected this area to be in compliance in September as current levels were way below requested levels.

Chairman Maggiore asked if collecting at entry points would require any additional structures be put in place there.

Mr. McMorran said they already collected samples for testing at the entry points.

Mr. Herlihy said the management plan moving forward would be to minimize use of wells with higher PFAS levels, continue well testing and testing at sentinel wells, coordinate PFAS treatment evaluations, obtain DES approval of Well 22, and continue monitoring the regulatory process and communicating with Town and State officials.

Mr. Herlihy said they would stop testing in the distribution system as the levels could not be higher than at the 5 entry points. He said sentinel wells were constructed at Mill Road between production wells and sources of contamination, and said they would continue to get best information on costs for treatment if it is needed in the future. He said they applied for approval of Well 22 which would be a big producer, after which they can then reduce Well 6 use.

Chairman Maggiore asked if Well 22 would create another point of entry, and Mr. Herlihy said it would be combined with Well 7.

Mr. Herlihy said they would be hearing more about remediation and cleanup of areas of known PFAS contamination, and steps the State is taking to protect water supply. He said they would

continue to focus on management strategy and were now using source selection by minimizing use of Well 6 and bringing on Well 22. He said they were also examining treatment alternatives and performing bench-scale testing using carbon or ion-exchange, and said they could tell at what point in these volumes PFAS starts breaking through to determine operation costs and how often carbon or resin would need to be changed out. He said work on the pilot study would continue and they would continue to refine numbers.

Mr. Herlihy said with no treatment there would be no cost, and that Scenario 1 would be PFAS treatment of Well 6, and Scenario 2 would be PFAS treatment of Wells 6, 8A, 9, and 11. He said New Hampshire's standard used to be a total of 70 for PFOA + PFOS, and EPA still used that standard, and said total PFAS includes other PFAS compounds not yet regulated.

Selectman Miller asked when the study would be completed.

Mr. Herlihy said it would be wrapping up in October.

Selectman Miller said people believe that contaminants have entered Aquarion Water from the Coakley Landfill, but he had not seen any data showing that.

Mr. Herlihy said they consulted with a hydrologist and with the State of New Hampshire, who both indicated no possible connection.

Selectman Miller suggested the source might be closer than Coakley, but that contamination was already in the ground water and would need treatment even if the source was stopped.

Mr. Herlihy said there was already PFAS in the ground water and they did not know how long it would take to remove it.

Mr. Carl McMorran said they had recommenced the WTP construction on Mill Road and said the building was still on schedule to be in service by the end of the year. He said there would be a major main replacement project on a transition line across the marsh parallel to Route 101 this year. He said they had their 4th main break this year on the existing bypass main and decided to put in a temporary main for the summer. He said other major projects started this year were on Mill Road and Mace Road in Hampton.

Mr. McMorran said their new tank project was still going on as they needed to take the existing tank out of service for an extended period for rehabilitation and painting. He said they hoped to start construction next year and have it in service in 2021. He said the [hydrant] report was submitted for the second quarter, and they continued with meter reading replacements and doing locating work.

Hampton Select Board Meeting
October 7, 2019

AQUARION
Water Company

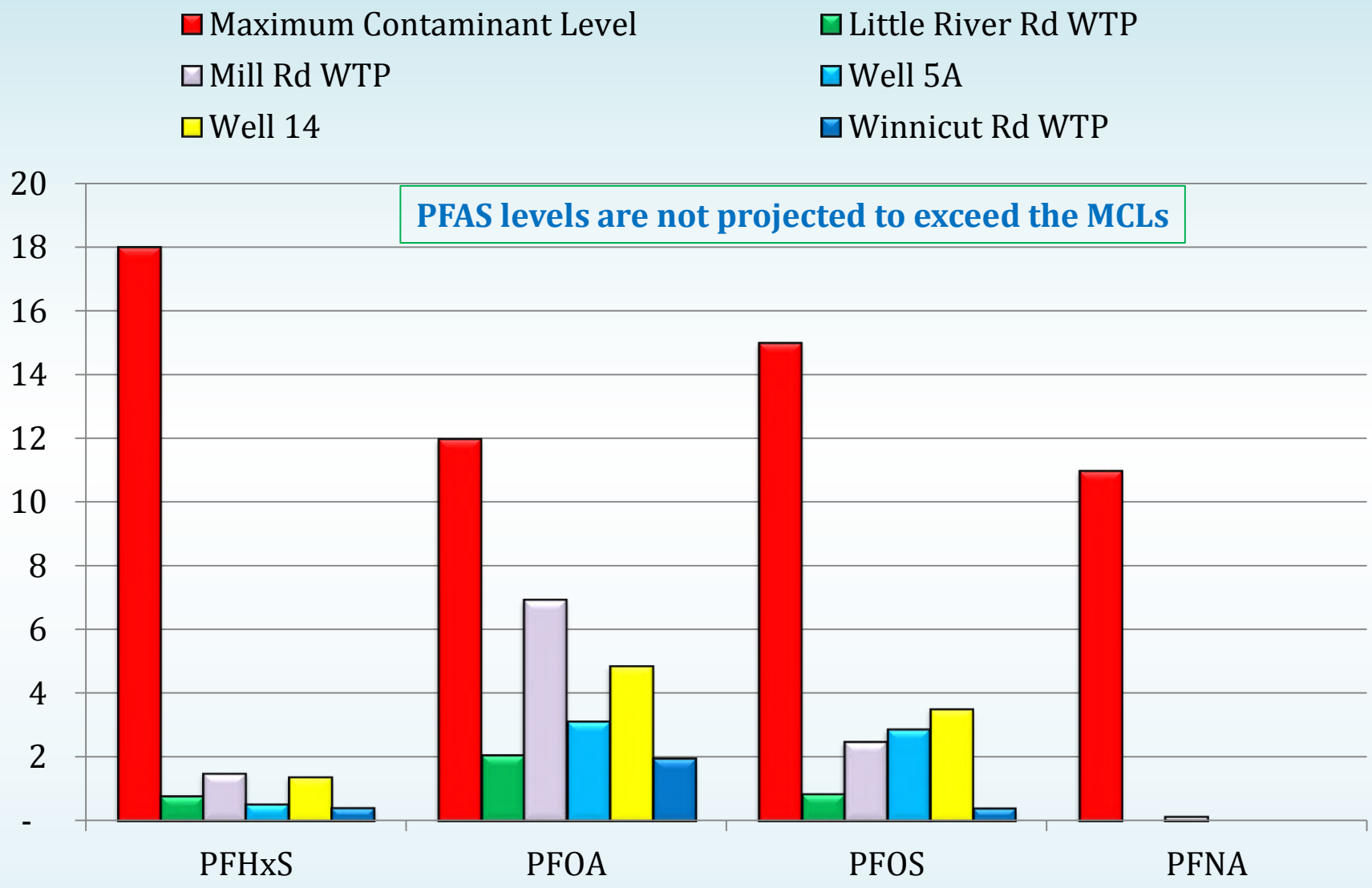
John Walsh, Vice-President, Operations

John Herlihy, Vice-President, Water Quality & Environmental Management

Dan Lawrence, Director of Engineering and Planning

Carl McMorran, Operations Manager

PFAS Maximum Contaminant Levels compared to Estimated Point of Entry Averages



Compliance is Measured at Entry Points to Distribution System, Not Individual Wells

PFAS Treatment Analysis Update

Mill Road Treatment Analysis – Post Pilot Scale

Parameter	No Treatment	Scenario 1 PFAS treatment of water from Well 6	Scenario 2 PFAS treatment of water from Wells 6, 8A, 9, 11
Treated water flow rate (gpm)	0	360	1,676
PFOA+ PFOS (ng/L)[1]	10	5	<4[2]
Sum of Regulated PFAS (ng/L) [1]	10	5	<4[2]
Total PFAS (ng/L)	57	50	42
Estimated capital cost[3]	**$0M**	**$4.1M**	**$6.7M**
Estimated annual O&M costs[4]	**$0M**	**$0.062 M - $0.101M**	**$0.129 M - $0.342M**
Rate increase required[5]	**0%**	**8%-9%**	**13 %- 16%**

[1] Based on maximum concentration of PFAS in well waters; concentrations as entering the distribution system
[2] Method Reporting Limit (MRL) of 4 ng/L.
[3] Conceptual capital costs have an expected accuracy of -20%/+30%.
[4] Annual O&M costs for GAC are based on a one year replacement frequency.
[5] Actual rate increase required will depend on final capital and annual O&M costs.

Hampton Select Board Meeting – October 7, 2019

Agenda Item 4. Quarterly Update (John Walsh, Carl McMorran, John Herlihy and Dan Lawrence)

Mr. Herlihy: briefed every one of the status of PFAS and the regulations that have become effective. He offered a power point chart of maximum contaminant levels. The regulation includes quarterly monitoring. He further detailed compliance.

Selectman Woolsey: asked about private well testing.

Mr. McMorran: stated that they provide funding, but the State does [sampling].

Selectman Woolsey: asked about the results.

Mr. McMorran: stated they found some but most were undetectable levels. There was a power point slide on PFAS treatment analysis.

Mr. Walsh: discussed the expense cost. He discussed the pilot report giving a summary using another power point chart, describing the chart particulars.

Selectman Woolsey: asked if they are testing wells 7 and 22 yet.

Mr. McMorran: stated yes and mentioned trace levels. He also mentioned all the information is on their website.

Selectman Waddell: asked currently they are below levels and do not need to do a treatment.

Mr.Walsh: answered no but it could change.

Selectman Waddell: He also asked if concentrations were changing

Mr. Herlihy: no

Mr. Walsh: discussed water main replacements, the Rt. 101 project, Mill Rd and Ann's Lane.

Mr. Herlihy: discussed the Falcone Circle tank, the Mill Rd Water Treatment plant, and Well 22 work.

Selectman Woolsey: stated she is getting comments from people on Falcone Circle regarding the tank, and asked if they had been in contact.

Mr. McMorran: stated yes, they recognize concerns and are addressing.

Selectman Bridle: also commented on the Falcone Circle concerns. He also mentioned the water boil order and that he appreciated all the work done on that

AQUARION
Water Company

North Hampton Select Board Meeting
December 9, 2019

Dan Lawrence, Director of Engineering and Planning

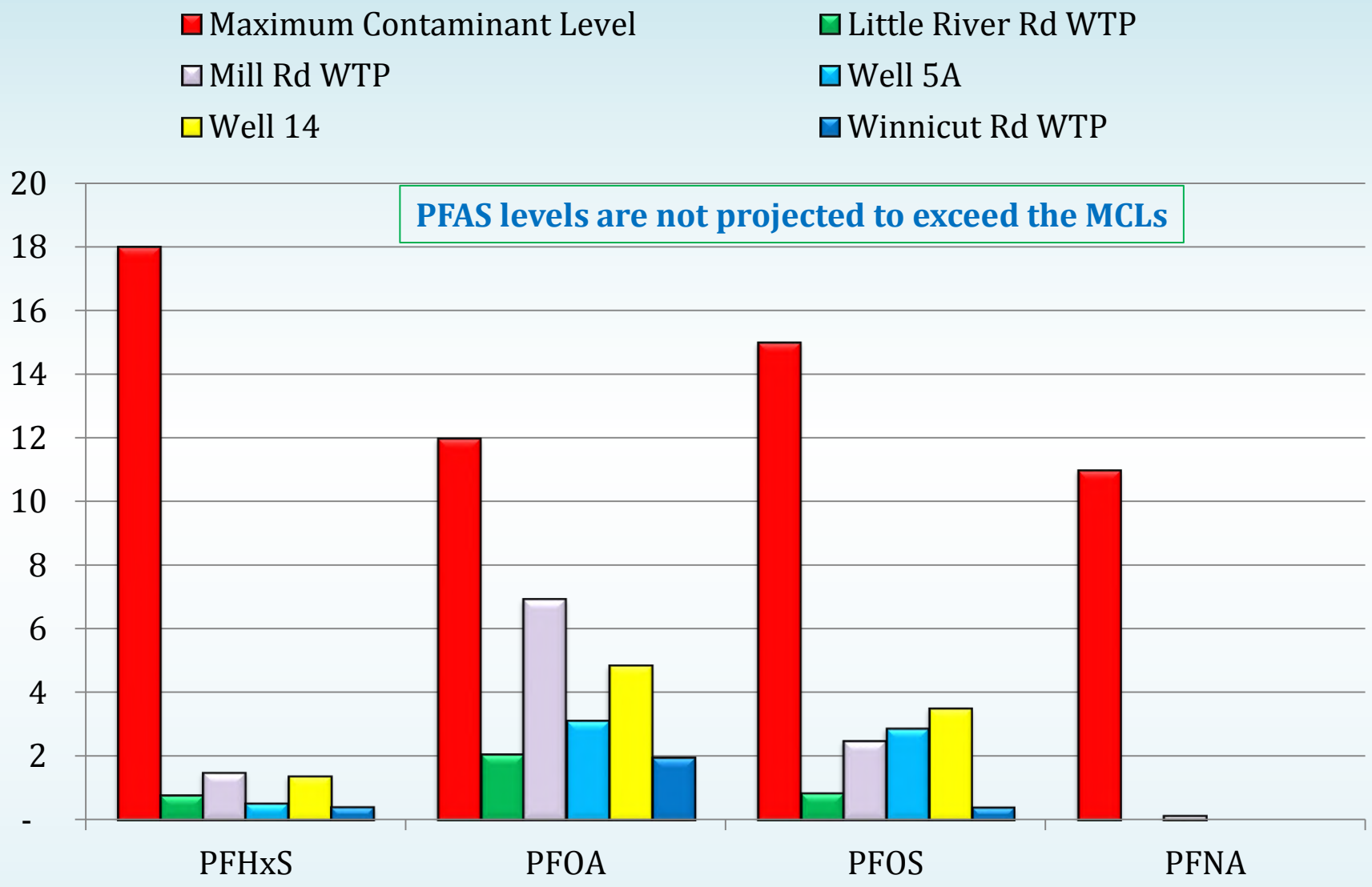
Carl McMorran, Operations Manager

AQUARION
Water Company

Agenda

- Operations and Maintenance
- PFAS
- Main Replacements
- Well 22
- New Exeter Road Tank
- Mill Road Water Treatment Plant

PFAS Maximum Contaminant Levels compared to Estimated Point of Entry Averages



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North Hampton Select Board Meeting – December 9, 2019

Carl McMorran and Dan Lawrence

Aquarion Water Quarterly Update

Mr. Carl McMorran, Manager of Operations at Aquarion Water, said with him is Dan Lawrence, Director of Engineering for Aquarion. He said he would present the quarterly update and speak about PFAS, main replacements, and some of the Capital Projects.

Mr. McMorran said as far as Operations & Maintenance, water production was approximately 690 million gallons in 2019; they addressed hydrants, valves and flushing in the Distribution System; serviced meters and customer calls; provided cross-contamination control to protect water systems; addressed water quality by treatment and taking samples. He said the water in North Hampton meets all safe drinking water standards. He provided a PFAS Update, and said if current compound levels for the 4 regulated compounds continues, there is no requirement for treatment based on the regulations. He said the regulations have been challenged and an injunction may change the scope of enforcement into next year.

Mr. Dan Lawrence said they have been doing a pilot since 2017 to understand costs of PFAS Treatment using columns, and the pilot was finished and a report submitted to the Town in September. He said the Table talks about 3 different options: PFAS with no treatment, PFAS treatment of water from Well 6, or PFAS treatment of water from Wells 6, 8A, 9, and 11. He said Well 6 is the source with the highest concentration of PFAS. With no treatment the cost would be zero, treating just Well 6 would be a Capital cost of approximately $4.1 Mil, and treating all of the wells and the well field, possibly by-passing the bedrock wells, would be a Capital cost of approximately $6.7 Mil.

Mr. Lawrence said they did a Main Replacement on Route 101 this year for the Town of Hampton, converting a 12-inch main to a 16-inch high density, and worked on Mill Road infrastructure which will continue into next year. He said they are increasing the transmission capacity in Hampton and working to install a second Water Storage Tank next to the existing one. He said Well 22 on Mill Road should be permitted any day, implemented next year, and is expected it to be in service in early 2020.

Selectwoman Kilgore asked if Well 22 was the Water Treatment Facility for the whole system and Mr. Lawrence said just for the Mill Road Well Field so they can combine Wells 9, 11, 6, 8A, and 21.

Chairman Maggiore asked how the Town is noticed when Aquarion does [hydrant] flushing

Mr. McMorran said they have their own Code Red Reverse 911 to immediate neighborhoods, let the Town know ahead of time, and notify the Fire Department.

Chairman Maggiore asked about the injunction, and Mr. McMorran said these standards are set of the State of New Hampshire and the controversy is that different states are setting different numbers.

Questions:

Selectman Miller asked if Aquarion can run their operation without Well 6, and Mr. McMorran said most of the time yes, but Well 22 will allow a substantial increase of production capacity.

Selectwoman Kilgore asked if they would consider only using Well 6 in an emergency when they have Well 22

Mr. McMorran said he did not want to shut down Well 6 and preferred to keep it in the mix.

Hampton Select Board Meeting
January 13, 2020

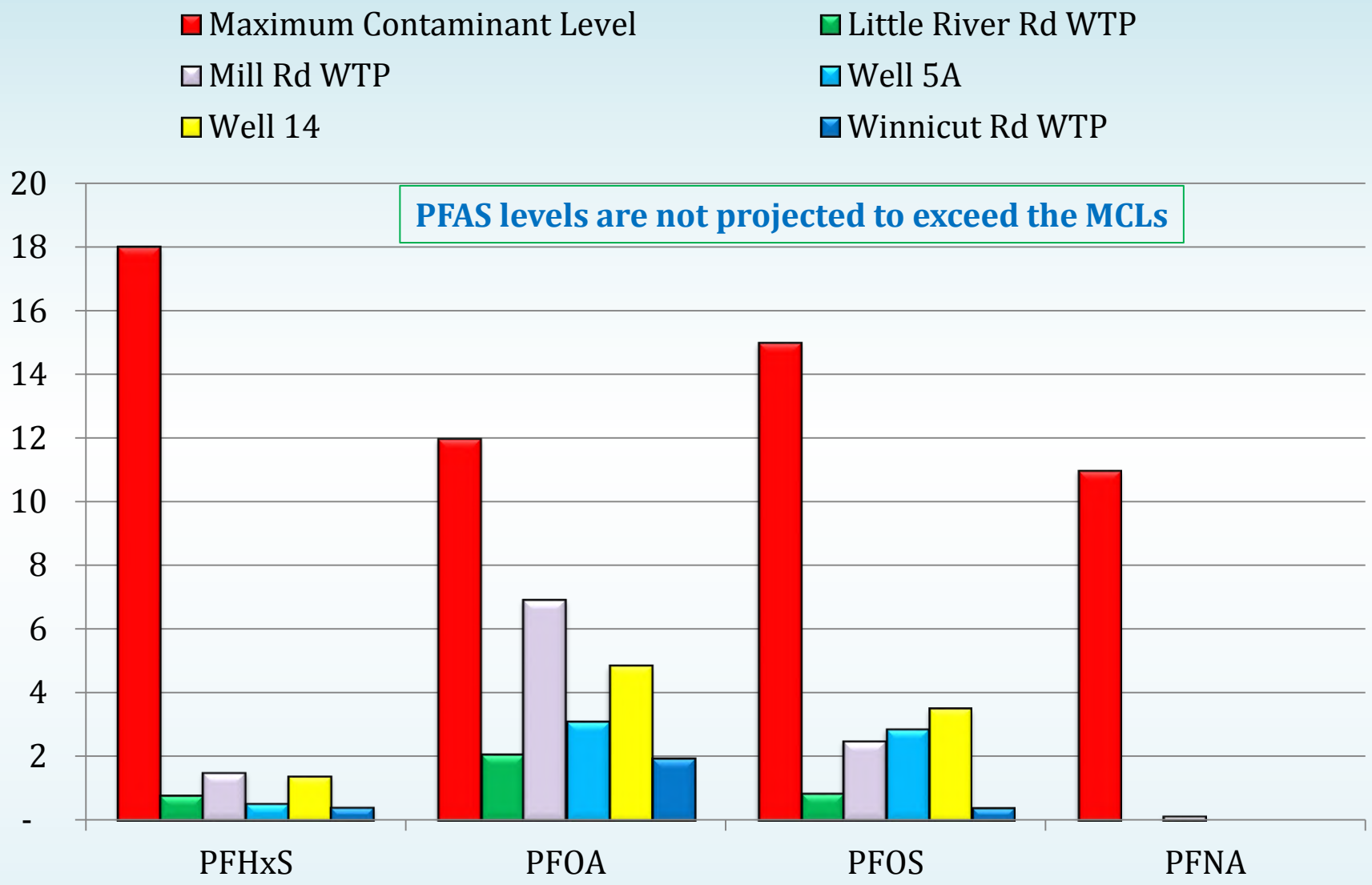
AQUARION
Water Company

Carl McMorran, Operations Manager

Yesher Larsen, Director of Water Quality

John Herlihy, Vice-President, Emeritus

PFAS Maximum Contaminant Levels compared to Estimated Point of Entry Averages



Compliance is Measured at Entry Points to Distribution System, Not Individual Wells

Hampton Select Board Meeting – January 13, 2020

Quarterly Update (Carl McMorran, John Herlihy and Yesher Larsen)

Mr. Herlihy: noted his retirement, but will work part time. He noted Mr. Larsen's qualifications. He noted a PFA's presentation, and discussed a lawsuit and stay of regulations, with new limits being on hold. He noted Aquarion will continue monitoring quarterly.

Mr. Larsen: discussed continued monitoring and quarter four of 2019, with not much change.

Mr. McMorran: discussed the main replacement program. He discussed the pipes, noting the oldest is 110 years, and with older pipes, come problems like breaks and leaks. He discussed pipe replacement, and Mill Road and Ann's Lane, as well as Mace Road. He discussed the new water treatment plant, it being close to starting up, and discussed permitting for well 22.

He discussed the new tank at Falcone Circle, will be going to the Zoning Board soon.

Selectman Woolsey: asked about a tour of the treatment plant

Mr. McMorran: there will probably be an open house when done

Selectman Woolsey: asked about fixing Mill Road, and the answer was it was alluded to and will be done. She asked about a plan to update pipes, and the answer was yes, noting their engineering dept. She noted watching the crew on Little River Rd and the nice job being done.

Selectman Waddell: asked if there is any problem with lead, and the answer was there are no lead pipes, but homes have them.

Mr. Herlihy: discussed a new proposed legislation regarding lead requirements, with monitoring.

Selectman Waddell: asked if we are well below the PFA's, and the answer was yes, noting all five are below the new lower limits. He asked if the recent water breaks were the older pipes, and the answer was yes. He asked about the older pipes being on the list and the answer was when a pipe breaks it gets closer to the top of the list.

Selectman Bridle: asked about expansion to the system, and the answer was there was some discussion about Mary Batchelder but has heard nothing lately.

Chairman Griffin: asked how far along was the tank at Falcone Circle, and the answer was it is in the design and permitting stage. He asked if the feeling was to keep the twin, even with the dissension, and the answer was it is the best way for reliable water service, and noted information on the website.

Mr. Herlihy: noted the existing tank must come out of service for maintenance and the only way for that is another tank. There was discussion about double tanks.

Selectman Woolsey: asked if there will be another meeting with the Falcone Circle residents, and the view was discussed. She asked if there were still sampling private wells and the answer was no.

Mr. Herlihy: noted it was DES that was doing that. She noted appreciating the outage notices.

Chairman Griffin: asked if the new tank was bigger and the answer was no, it is the same.

Selectman Waddell: noted the tank can be seen from all over, and stressed there has to be much information to the residents of the need for the tank.

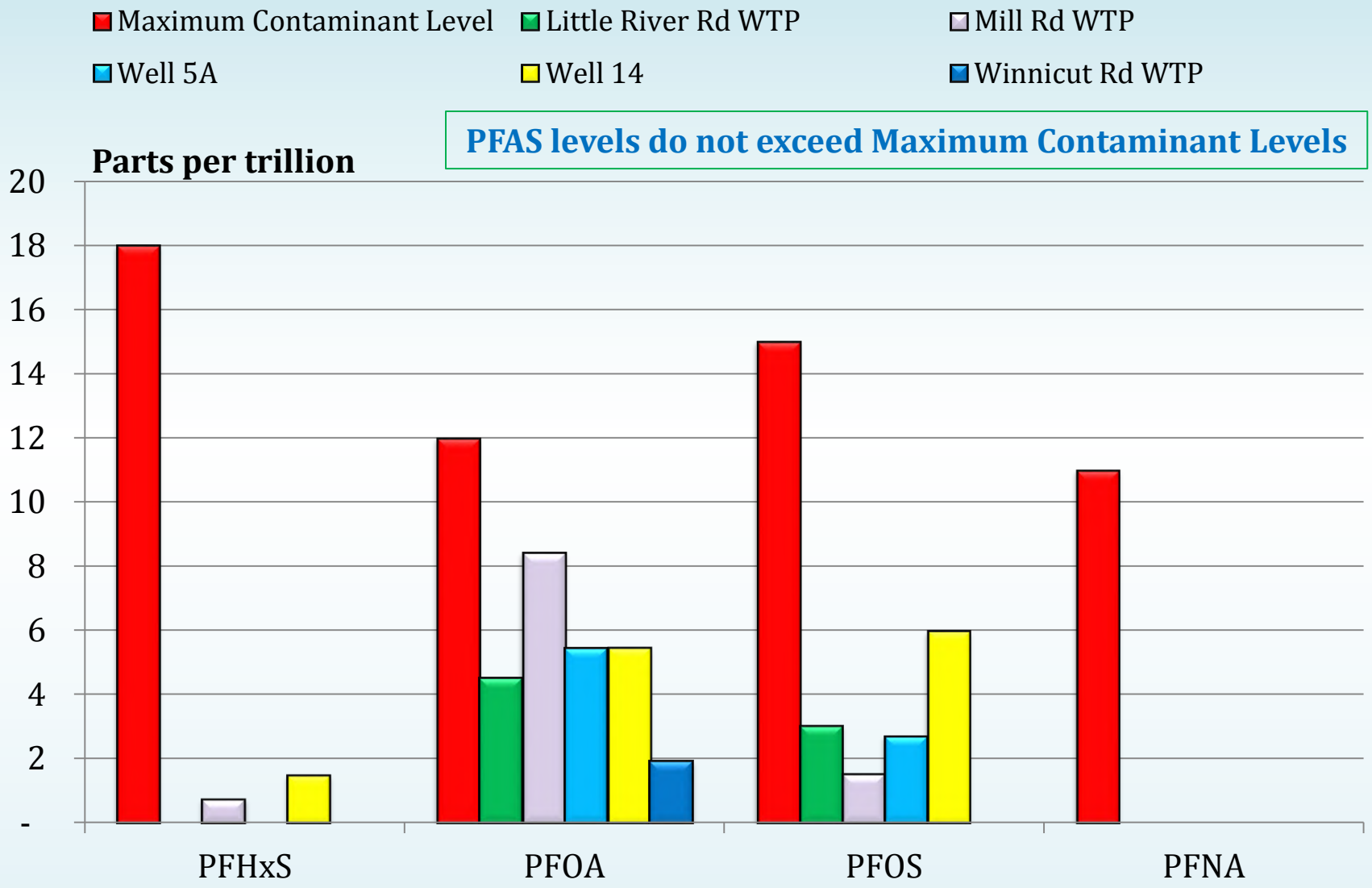
Chairman Griffin: thanked the Aquarion team for coming in and their presentation, and good luck was wished for Mr. Herlihy and his retirement.

AQUARION
Water Company

North Hampton Select Board Meeting
March 9, 2020

Dan Lawrence, Director of Engineering and Planning
Yesher Larsen, Director of Water Quality
Carl McMorran, Operations Manager

PFAS Compliance with Maximum Contaminant Levels



Compliance is Measured at Entry Points to the Distribution System, Not Individual Wells

North Hampton Select Board Meeting – March 9, 2020

Carl McMorran, Yesher Larsen and Dan Lawrence

Aquarion Water Quarterly Update

Operations Manager Carl McMorran, Director of Engineering Dan Lawrence, Director of Water Quality Yesher Larsen

Carl McMorran said the new Water Treatment Plant (WTP) on Mill Road is up and running as well as the chemical treatment and monitoring system. They received the permit from DES for Well 22 in January and are currently blending with Well 7 to meet arsenic requirements.

Well 14A is a replacement well for Well 14, which has a deteriorating well screen, to be in service this summer. Operations and maintenance include the Mill Road startup, water quality treatment and sampling, leak detection in the distribution system, and meter replacement on the service side.

Yesher Larsen said PFAS levels continue to be below the MCL (Maximum Containment Level) New Hampshire has set and are well below for different sources. He said New Hampshire is dropping their MCL for arsenic from 10 ppb (parts per billion) to 5 ppb on July 5, 2021, and said most of our sources are non-detects with Winnicut Road approximately 3 ppb historically. He said Well 22 has higher arsenic levels of 10-12 ppb and they were looking at blending for now with potential treatment later on.

Mr. McMorran said the ultimate plan is to put in arsenic removal to take it all out.

Mr. Larsen said Aquarion uses sodium hypochlorite (chlorine) for disinfection in the New Hampshire Systems, and they are meeting all State and Federal requirements and compliance requirements. He said they are striving for best-compliance practices and looking to meet 4-Log reduction, which is currently met at Mill Road, Well 7, and Well 5A and they are looking to meet on Well 14A and Winnicut Road by installing infrastructure upgrades over the next few years.

Dan Lawrence said they continue to focus on replacing older main with 16-inch ductile iron mains. He said they are working on the Mill Road Treatment Facility, and will finish work this year as well as handling all water-related services associated. He said the water tank system delivers water to customers in Rye, North Hampton and Hampton with 4 tanks in the system and they need to be able to support the system while taking a tank out of service. He said the water storage tank sets the pressure in the system, and because the tank in North Hampton has the highest elevation, they decided to locate a second tank next to the current tank in Falcone Circle.

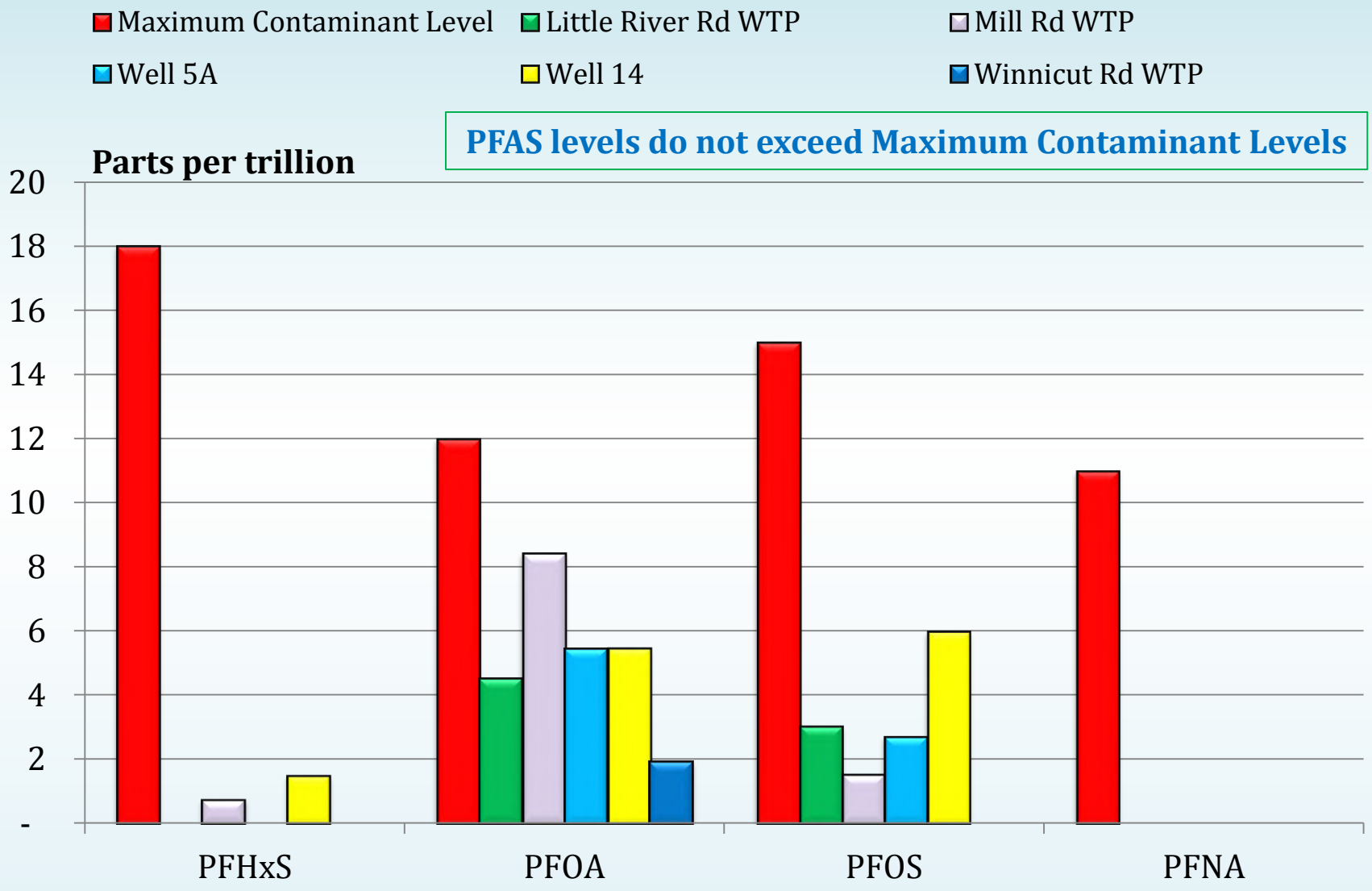
Mr. Lawrence said for the study analysis they looked at 3 locations and the water tank construction sequence, but their request for variance from the Zoning Board of Appeals was denied. He said Aquarion owns the property and it is commercially zoned, and they still need a tank in the system to provide pressure and fire protection for all 3 communities, and are considering their options.

AQUARION
Water Company

North Hampton Select Board Meeting
June 8, 2020

Carl McMorran, Operations Manager

PFAS Compliance with Maximum Contaminant Levels – October 2019 through May 2020



Compliance is Measured at Entry Points to the Distribution System, Not Individual Wells

North Hampton Select Board Meeting – June 8, 2020

Carl McMorran

Aquarion Water Quarterly Update

Carl McMorran, Operations Manager of Aquarion Water, said there have been no interruptions in water service or changes in water quality due to the impact of COVID-19. He said work schedules were adjusted to minimize contact with public, all non-emergency calls were suspended, and work shifted to maintenance items. Water Main replacements continue in coordination with Hampton sewer and drainage projects.

Mr. McMorran said Well 22 received a State permit and they are doing electrical upgrades to put the well back in service this summer but not at full capacity. Well 14A, replacement for Well 14, will start pumping tests this week and be in service by July. As far as water quality, PFAS is still a top issue but numbers remain pretty consistent and do not exceed maximum contaminant levels.

Hampton Select Board Meeting
September 28, 2020

AQUARION
Water Company

AQUARION
Water Company

Agenda

- Operations
  - Drought
- PFAS
- Capital Projects
  - Treatment Improvements
  - Main Replacements

2020 Operations – Water Quality

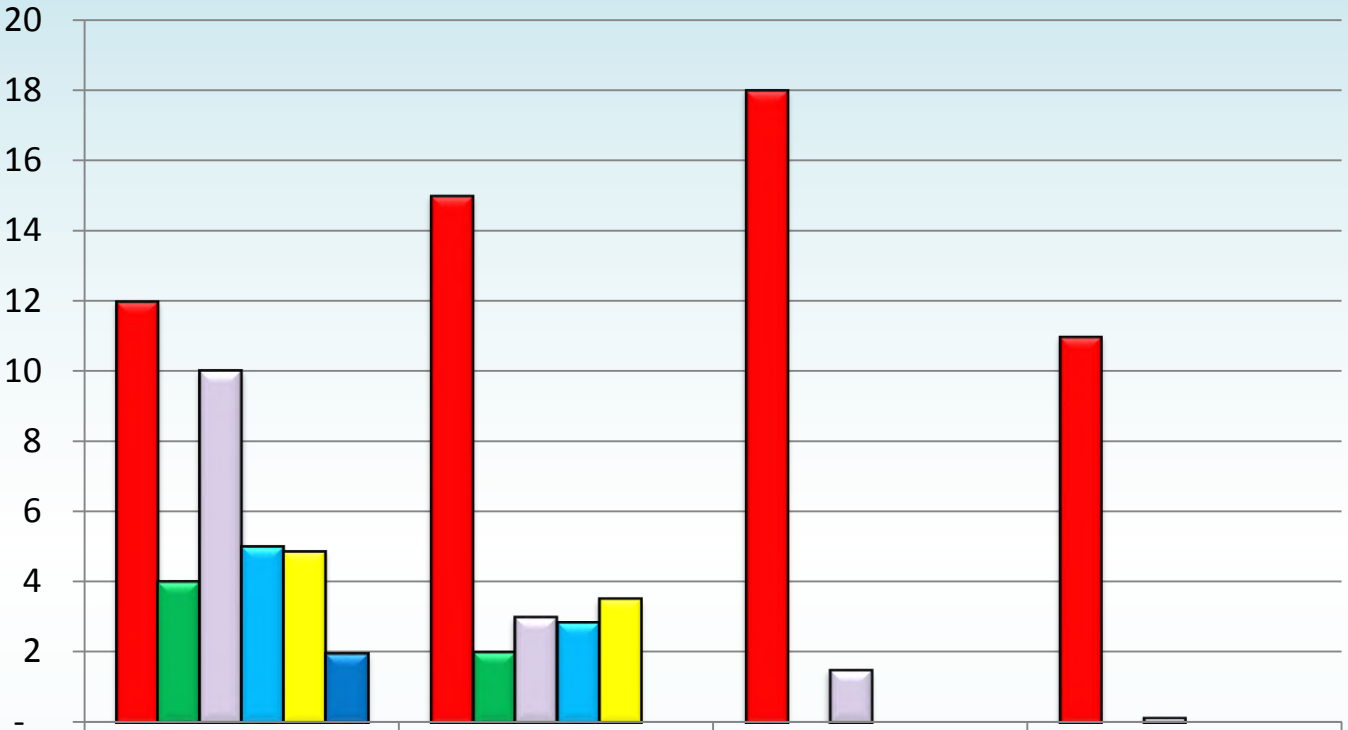
Lead and Copper

- No detectable levels of lead
- Trace levels of copper

PFAS

Observed PFAS Levels

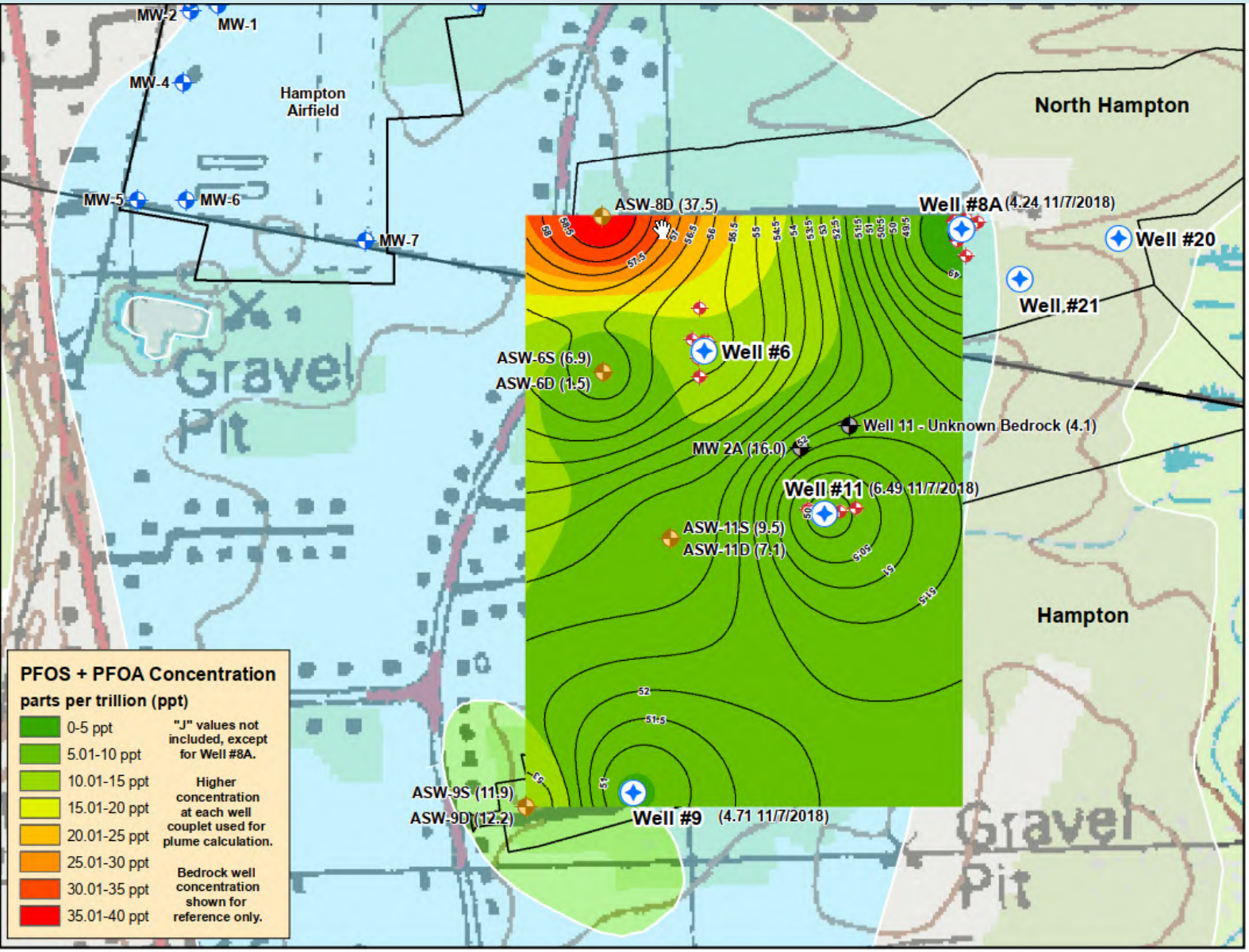
PFAS Levels Do Not Exceed MCLs

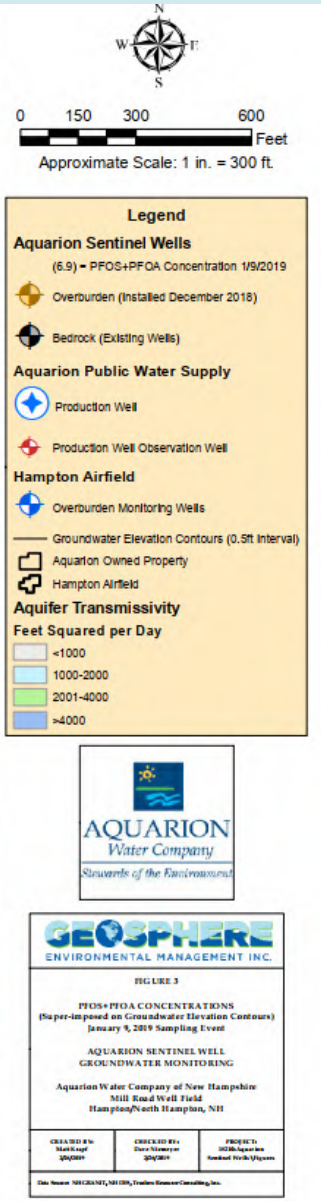


	PFOA	PFOS	PFHxS	PFNA
Max. Contaminant Level	12	15	18	11
Little River Rd WTP	4	2	-	-
Mill Rd WTP	10	3	1	0
Well 5A	5	3	-	-
Well 14	5	4	-	-
Winnicut Rd WTP	2	-	-	-

Compliance is Measured at Entry Points to Distribution System, Not Individual Wells

PFAS Monitoring at Mill Road Well Field





Treatment Improvements

- **PFAS Removal**
  - **2021 - Well 6**
- **Little River Water Treatment Plant**
  - **2022 - Disinfection and Corrosion Control**
  - **2023 – Arsenic Removal**

Tank Painting and Rehabilitation

- **2021 – Jenness Beach**
- **2022 – Glade Path Tank**
- **To Be Determined – Exeter Road Tank**

Hampton Select Board Meeting – September 28, 2020

Quarterly Update (Carl McMorran)

Mr. McMorran: noted he has not presented since before Covid, and offered an agenda using a power point presentation. He reminded all of their mission, safe and reliable water. He gave an overview of the system, discussing production facilities and the distribution system. He discussed operations with regard to Covid, noting high level being relatively unimpacted. He discussed working from home and social distancing, and noted suspended activities and maintenance production and distribution. He noted increased activity in marking pipes. He discussed the seacoast area being in a sever drought, but noting no restrictions at this time. He discussed they are doing routine flushing although it has been scaled back due to the drought, and noted how they inform residents.

He discussed water quality, lead and copper and PFAS, noting lead and copper sampling every year, and explained that process. He presented a chart of PFAS, noting still in compliance, but highlighting the issue on Mill Road, and what they are doing to address that, and discussing well 6 and treatment.

He discussed treatment improvements, well 6, and then Little River disinfection and corrosion control, and then arsenic removal. He discussed tank painting and rehabilitation, noting Jenness Beach, Glade Path, and then an option for the Exeter Road tank. He discussed water main replacements and showed a chart of the over 40,000 feet replaced in the last ten years. He discussed the High street project for next year, replacing about 3200 feet.

Selectman Bridle: asked if he noticed a reduction in usage over the summer, and the answer was that metered consumption was higher this year, noting so many more people at home. There was general discussion on the tourist aspect. Sel. Bridle noted the issue of some people in town not having water at all, and discussed Mary Batchelder Road[4].

Selectman Woolsey: discussed the second water tower that is needed and the answer was they are working on it. She noted the new blue water lines on Little River are very interesting. She asked about any problems on well 7, and the answer was no and they discussed. She noted appreciating the notices by email, and Mr. McMorran noted they are working on being better at notices and social media.

Chairman Waddell: noted the caller who asked about flushing and asked how long it will go on, and the answer was about a month, as long as they have the water, they are monitoring. He asked about notices and where will they be posted.

Mr. McMorran: reiterated all the different ways they are getting the word to people.

Chairman Waddell: asked if someone has a question they can call the office, and the answer was yes, and it goes to a call center to direct them.

Selectman Rage: asked about Locke Rd. to Pine Rd. getting paved now, and TM Sullivan explained about High Street. There was general discussion of High St. and paving.

[4] Main extension

Mr. McMorran: discussed working with DPW to get things done in coordination.

Selectman Barnes: commented on the water main list of feet done, noting they got something done in 2020, one of the few. She asked about the funding for that replacement and the answer was everything up to 2018 was WICA. She asked about what is being done in 2021 and the answer was two projects, the PFAS removal at well 6 and the High St. project. She asked that by treating well 6, it will help the other wells, and Mr. McMorran reshowed the Mill Road map chart and reiterated well 6 working as a remedial well and they are very optimistic. She asked about cost and he mentioned well less than 6 million but they are still in the pre-design stage, and noted possibly doing more wells. She clarified that this is proactive as we are within levels. She noted agreeing with Sel. Bridle and we need to work on getting water out west of Rt. 95, especially with all the development.

Chairman Waddell: asked about the topographical map of Mill Road and the red plume and where that PFAS was coming from.

Mr. McMorran: noted that the state is doing that and they found some hot spots on Rt. 1. He asked about getting the PFAS out and the answer was they are already in the ground. They further discussed the monitoring.

Chairman Waddell: asked if there would be legislation to recover funds if it is found out who is causing the PFAS, and the answer was the state had filed suit against manufacturers so it is certainly a possibility.

AQUARION
Water Company

Stewards of the Environment™

Update to
North Hampton Select Board
November 9, 2020

Carl McMorran, Operations Manager

Agenda

- Operations
  - Drought
- PFAS
- Capital Projects
  - Treatment Improvements
  - Main Replacements

2020 Operations – Water Quality

Lead and Copper

- No detectable levels of lead
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PFAS

Observed PFAS Levels

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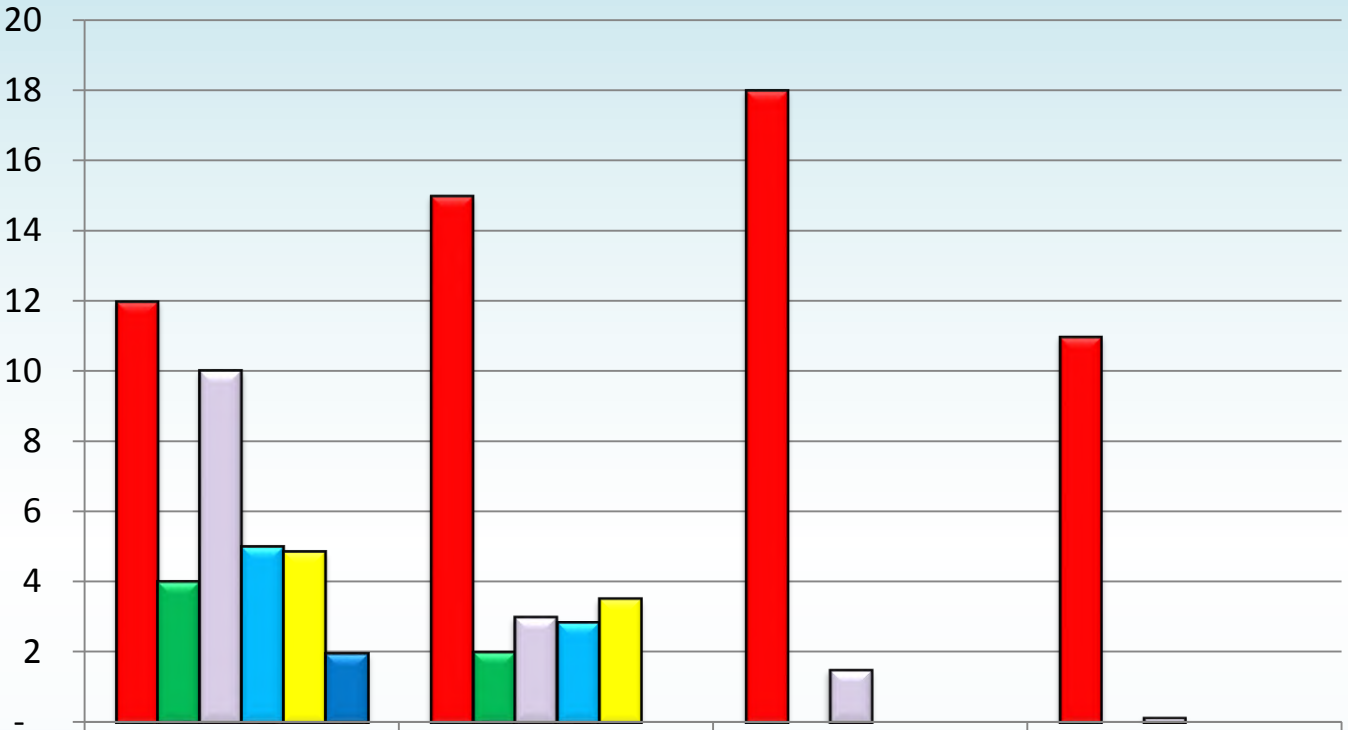

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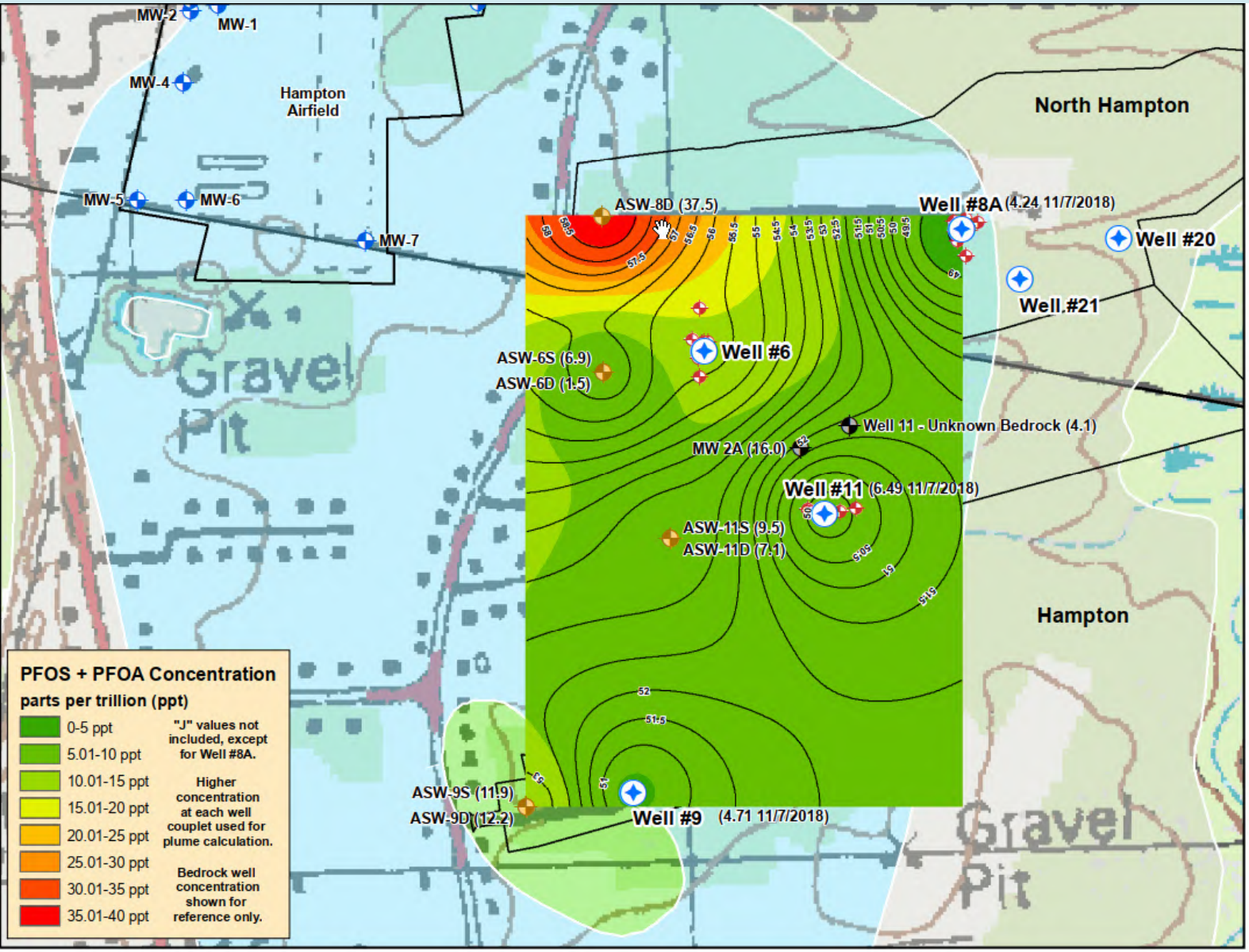

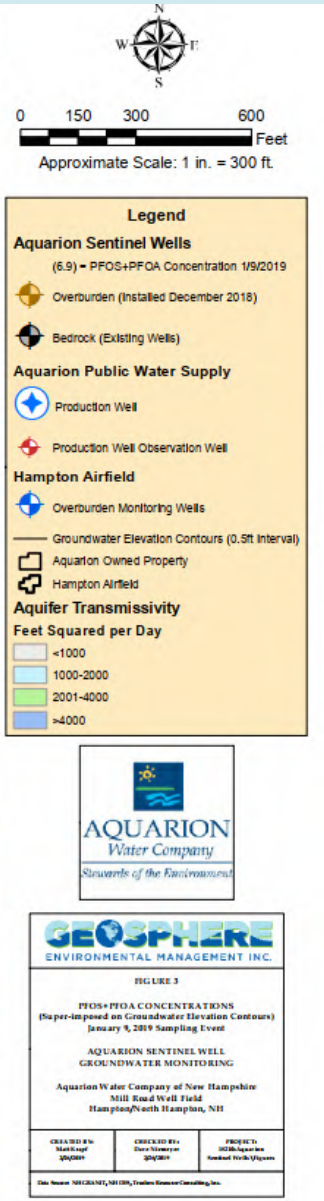

Treatment Improvements

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Tank Painting and Rehabilitation

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- **To Be Determined – Exeter Road Tank**

North Hampton Select Board Meeting – November 9, 2020

Carl McMorran

Aquarion Water Quarterly Update

Aquarion Water Operations Manager Carl McMorran reviewed operations, drought situation, PFAS, and Capital Projects and treatment improvements to continue to provide safe, reliable water service to the community. He said the distribution system for the 3 towns includes 17 wells, water consolidated into 1 of 5 treatment facilities, 4 storage tanks, 137 miles of water mains, 9,100 service connections, 602 hydrants, and 1, 400 valves for control. He said no water-use restrictions were imposed due to Well 22; PFAS in compliance except for rising PFOA levels at Mill Road, production backed off at Well 6 as a result.

Mr. McMorran said they will shift from main replacements to PFAS removal from Well 6 and install steel filter vessels, construction of Little River Facility to treat Wells 7 and 22 in 2022, arsenic removal in 2023, then tank painting and rehabilitation.

Hampton Select Board Meeting
February 22, 2021

AQUARION
Water Company

Carl McMorran
Operations Manager

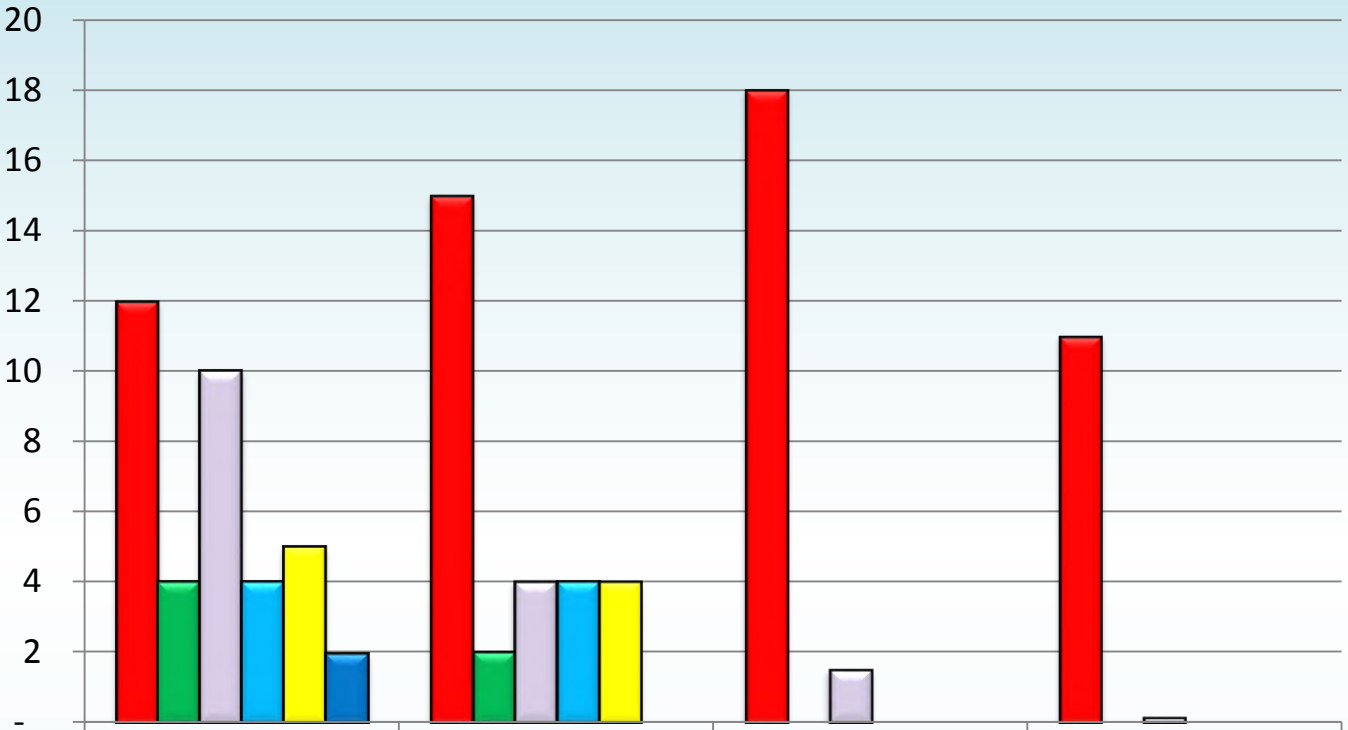
AQUARION
Water Company

Agenda

- Capital Projects
  - PFAS Treatment
  - High Street Main Replacement
- Staff Recognition

Observed PFAS Levels

PFAS Levels Do Not Exceed MCLs



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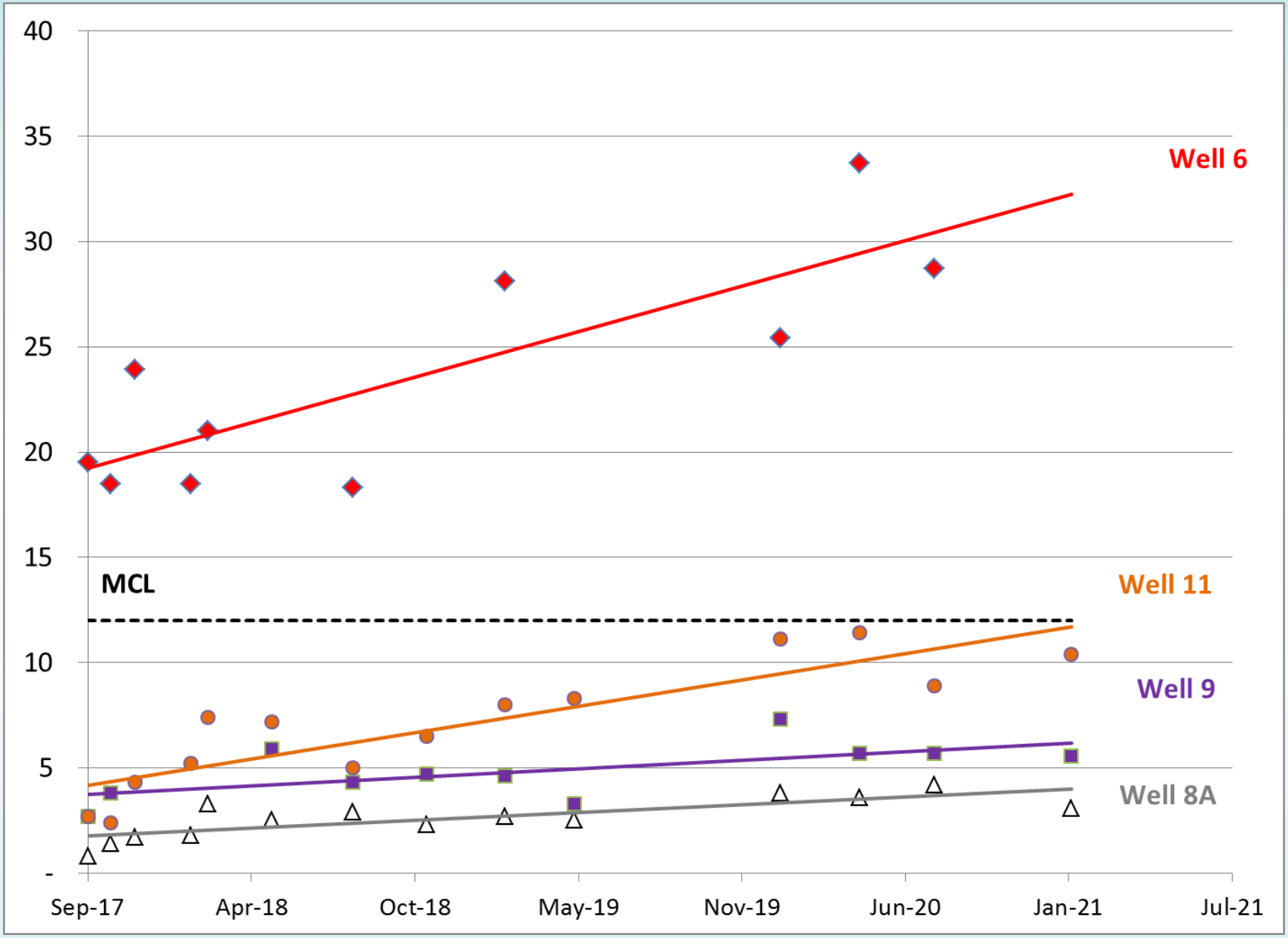


PFAS Treatment

- **Schedule**
  - **Treatment for Well 6**
  - **Renovation of existing building**
  - **Estimated Project Cost - $1.7 million**
    - **Bid in March**
  - **Feb 8 - 25% Grant approved by Drinking Water and Groundwater Trust Fund**

- **PFAS Remediation Loan Fund**
  - **Low interest loan**
  - **Possibility for 50% grant, depending upon a future settlement**
- **April 7 - Approval of both by Executive Council**
- **Construction April through June**
  - **GAC vessels to be delivered early May**
- **Operational by mid-summer**

Hampton Select Board Meeting – February 22, 2021

Quarterly Update (Carl McMorran)

Mr. McMorran: noted he has a slide presentation. He highlighted some of the major projects and began with PFAS monitoring, noting Mill Road Well Field, discussing implementing treatment. He noted treatment at Well #6, the renovation of the existing building, and discussed approval of a 25% grant. He discussed applying to the State PFAS remediation loan fund. He thanked the town for their letter of support. He commented if all comes together, it could be operational by mid-summer.

Selectman Barnes: asked that if without any treatment we are still below maximum contaminant levels and the answer was right. They further discussed Well 6. She noted anything not covered by grants or loans would go on the rate case and Mr. McMorran noted not the current one, rates in the future.

Chairman Waddell: asked about the PFAS and where it is coming from.

Mr. McMorran: a couple of hot spots along Rt, 1, background levels, but do not know of a specific party.

Town Manager Sullivan: asked that while backing off Well 6 for PFAS, do they anticipate any issue with meeting maximum flows as the season begins.

Mr. McMorran: noted difficult to say, but if the drought continues it could mean a water restriction.

Continued with the slides and discussed the High Street Main Replacement, noting Locke Rd. to Pine St. He noted replacing 3000 feet of pipe and it being a busy road, and will go to one lane of traffic. He noted their senior operator Glenn Eaton receiving the highest of honors from the NH Water Works Association and highlighted his many achievements.

Selectman Rage: noted having taken the tour to see the Aquarion system, noting it very impressive.

He asked about High Street and the bond article work if approved.

Mr. McMorran: discussed coordinating very closely with Public Works. They both discussed checking on Winnacunnet Rd. if it is to be done.

Selectman Bridle: noted it will be interesting to see how the summer goes. He and Mr. McMorran discussed drought conditions and seeing what happens in the next months.

Selectman. Barnes: asked about Well 22, if it is up and running completely and the answer was yes.

She asked with [Well] 22, they will still look at [Well] 6 going back up and the answer was yes. She noted it would be good to get it all done at one time if the road is approved. She asked about the increase in bills and Mr. McMorran noted no increases in WICA rates since two years ago. They discussed it would be more consumption, especially being at home more.

Sel. Bridle: asked about the new water tower on Exeter Road, and the answer was it is on hold while weighing all options and the tower there is ok for now.

Selectman Woolsey: noted seeing a presentation on flooding on CH 22. Town Manager Sullivan noted it was a replay of the HBAC symposium on planning issues for the master plan.

Mr. McMorran: noted not seeing that but they are evaluating and there is little or no risk of salt water intrusion.

Chairman Waddell: asked what our emergency plan is if our water system were to go down.

Mr. McMorran: the biggest risk is weather, noting power outages mean no pumping water. He discussed back up generators, and Town Manager Sullivan asked what percentage. They discussed a report on emergency preparedness. Chairman Waddell asked about bringing water in if water should ever become contaminated.

Mr. McMorran: noted it would be more about clearing up the situation, and discussed their controls and security.

Chairman Waddell: reiterated a report on emergency preparedness. There was general discussion on reverse 911, State and Aquarion's.

Selectman Barnes: noted that Mr. McMorran is the chief operator and also a Hampton resident, noted hoping for his support on Winnacunnet and High Street.

Mr. McMorran: there are cost savings when all is done together.

North Hampton Select Board Quarterly Update March 8, 2021

AQUARION Water Company

Carl McMorran
Operations Manager

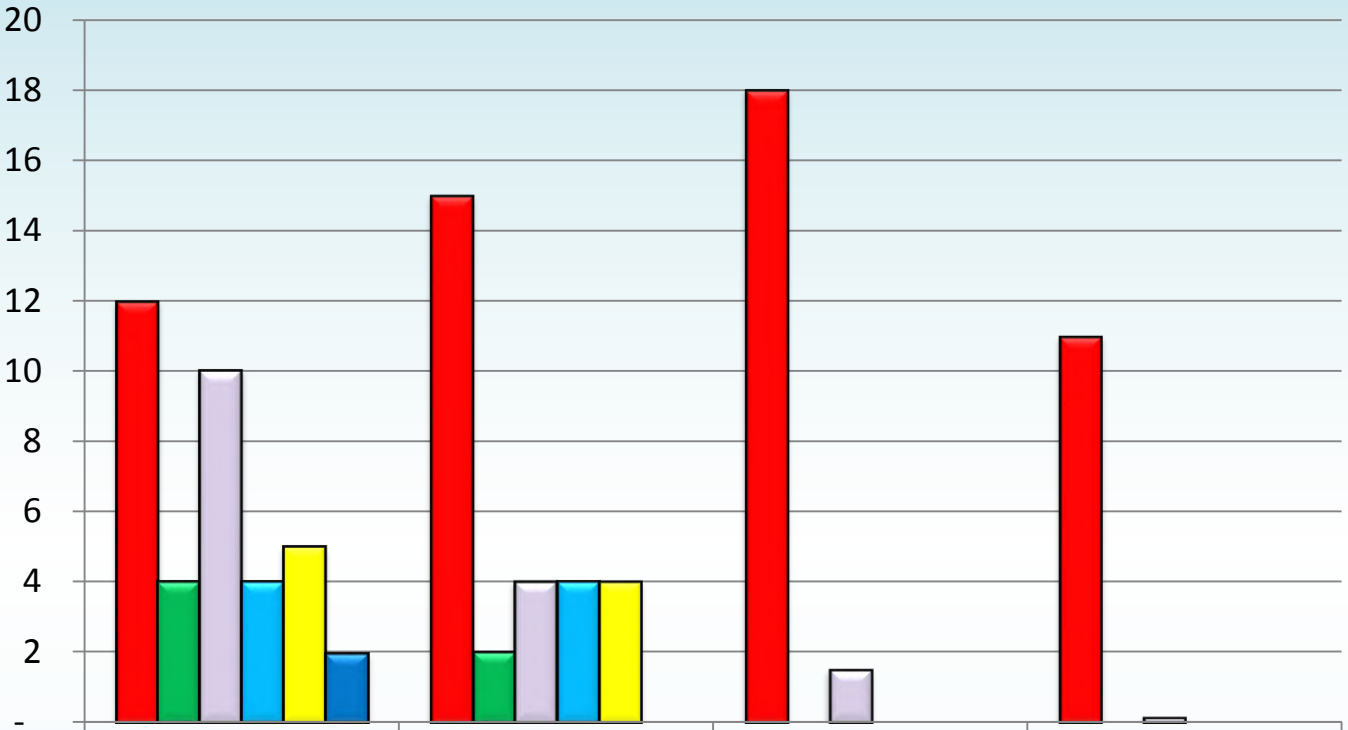
AQUARION
Water Company

Agenda

- Capital Projects
  - PFAS Treatment
  - High Street Main Replacement
- Staff Recognition

Observed PFAS Levels

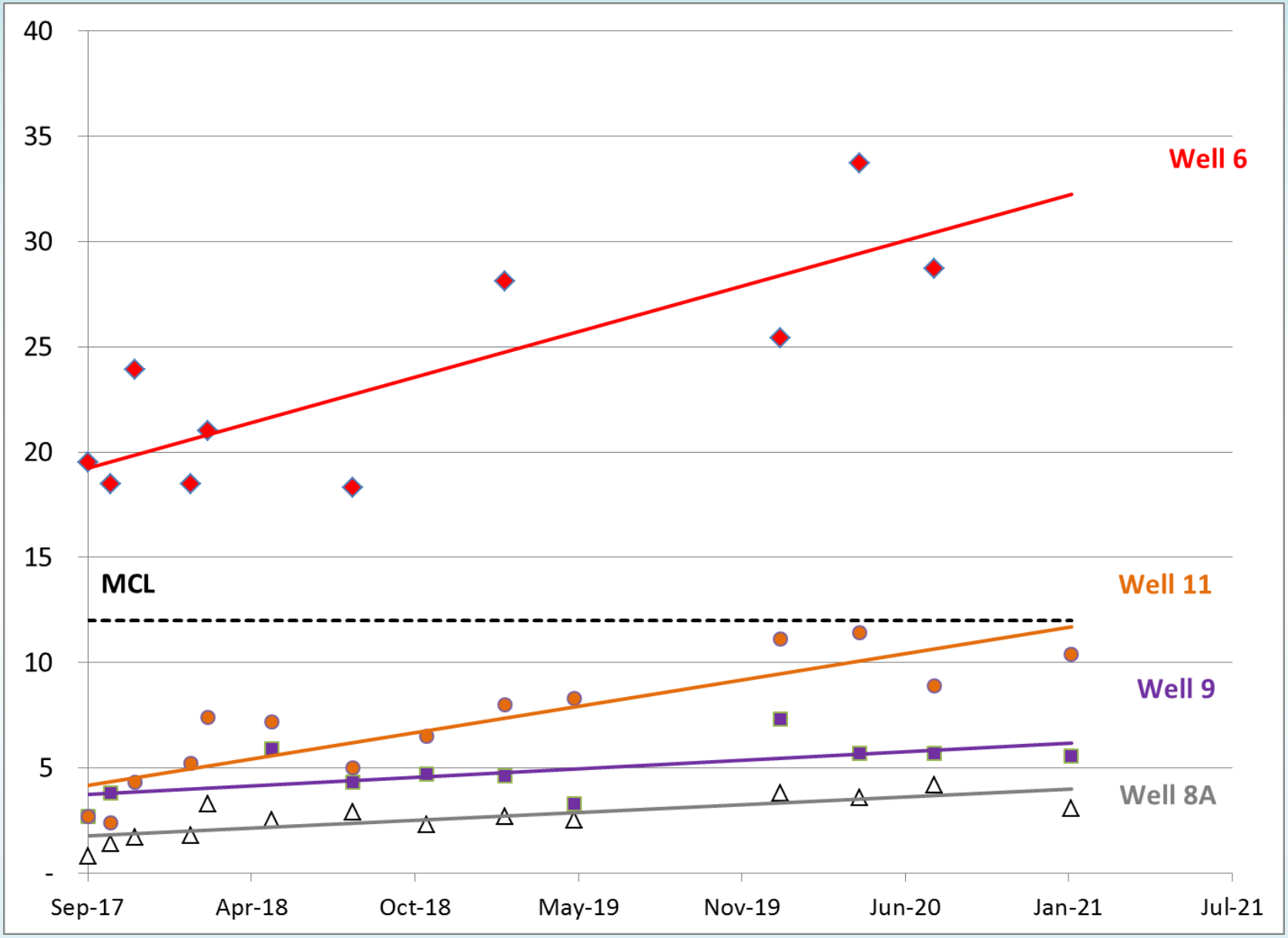
PFAS Levels Do Not Exceed MCLs



	PFOA	PFOS	PFHxS	PFNA
Max. Contaminant Level	12	15	18	11
Little River Rd WTP	4	2	-	-
Mill Rd WTP	10	4	1	0
Well 5A	4	4	-	-
Well 14	5	4	-	-
Winnicut Rd WTP	2	-	-	-

Compliance is Measured at Entry Points to Distribution System, Not Individual Wells

PFAS Monitoring at Mill Road Well Field



PFAS Treatment

- **Schedule**
  - **Treatment for Well 6**
  - **Renovation of existing building**
  - **Estimated Project Cost - $1.7 million**
    - **Bid in March**
  - **Feb 8 - 25% Grant approved by Drinking Water and Groundwater Trust Fund**

- **PFAS Remediation Loan Fund**
  - **Low interest loan**
  - **Possibility for 50% grant, depending upon a future settlement**
- **April 24 - Approval of both by Executive Council**
- **Construction April through June**
  - **GAC vessels to be delivered early May**
- **Operational by mid-summer**

North Hampton Select Board Meeting – March 8, 2021

Carl McMorran

Aquarion Water Quarterly Update

Aquarion Water Operations Director Carl McMorran said they had started maintenance to get ready for the spring season and were handling requests for seasonal meters. He said he would address the PFAS treatment project, High Street water main replacement, and staff recognition.

Mr. McMorran said the update on PFAS is similar to the previous chart shown at the last quarterly update showing most levels very low with the highest at Mill Road Treatment Plant where 6 wells come together. He said the others were so low the State has allowed reduction in monitoring frequency to once every 3 years, with Mill Road once per year for compliance sampling; non-compliance sampling will continue.

Mr. McMorran said they have been monitoring PFAS for over 5 years and have some sense of how they are trending with Well 6 appearing to steadily increase, Well 11 on the rise, and Well 9 also trending upward. He said capacity of these wells will need to be reduced in future to stay under MCL unless treatment is put in; and they are on schedule to put treatment in this spring initially with just Well 6. He said they are renovating an existing building and are looking at less than $2 Mil to do this project.

Mr. McMorran said they applied for a grant from State Drinking Water & Groundwater Trust Fund for 25% on a construction project. The State is also just starting a PFAS Remediation Loan Fund which they will also apply for. He said the State has filed suit against some PFAS manufacturers and any settlement could provide money for this project. They are currently on track to start construction in April; a map of the central part of the Aquarion system shows the main replacement summer project.

Mr. McMorran said a member of his staff Glenn Eaton received the Meritorious Achievement Award by the New Hampshire Water Works Association. He worked as lead on most of our production side operations and maintenance, worked for Aquarion for 32 years, and is retiring at the end of the month.

Mill Road PFC Treatment Analysis

Prepared for:

Aquarion Water Co. of New Hampshire

November 6, 2017

Tighe&Bond
Engineers | Environmental Specialists

Table of Contents

Executive Summary

Delivering safe drinking water is Aquarion Water Company's (Aquarion's) highest priority. Aquarion is monitoring and evaluating raw and treated water quality for potential compounds of concern, including perfluorinated compounds (PFCs). PFCs are a group of man-made compounds that have extensive industrial and consumer product applications including carpets, clothing, furniture, non-stick cooking surfaces, food packaging, and fire fighting foams. Due to their extensive use, most people have been exposed to PFCs. PFCs are persistent in the environment and are water soluble, resulting in PFCs being found in groundwaters and surface waters across the country. In recent years, the analytical techniques for PFCs in water have improved and they can now be detected at the very low concentration of nanograms per liter (ng/L), or parts per trillion. As a result, they are being more commonly detected in groundwater and drinking water supplies.

Perfluorooctanoic acid (PFOA) and Perfluorooctane-sulfonate (PFOS) are two of the most extensively produced and studied PFCs. The United States Environmental Protection Agency (USEPA) has developed a drinking water health advisory level of 70 ng/L for PFOA and PFOS, combined or individually, to protect the most sensitive populations from a lifetime of exposure with an appropriate margin of safety. USEPA established the health advisories for PFOA and PFOS based on the agency's assessment of the latest peer-reviewed science. New Hampshire has also adopted an Ambient Groundwater Quality Standard (AGQS) of 70 ng/L for PFOA and PFOS, combined or individually, to protect local groundwater supplies.

PFCs have been detected in 15 of the 16 wells supplying Aquarion's Hampton/North Hampton/Rye System (Figure ES-1 and Figure ES-2). With the exception of Well 6, the combined concentration of PFOA and PFOS found in the wells has been less than 8 ng/L, which is 11% of the health advisory level; in fact, the concentration of total PFCs does not exceed 20 ng/L in any of these wells or within the distribution system once the water from the wells blends together. Well 6 has had the highest concentrations of PFCs of any of Aquarion's wells with combined PFOA and PFOS concentration averaging 25 ng/L, and total PFC concentrations averaging 75 ng/L in 2017.

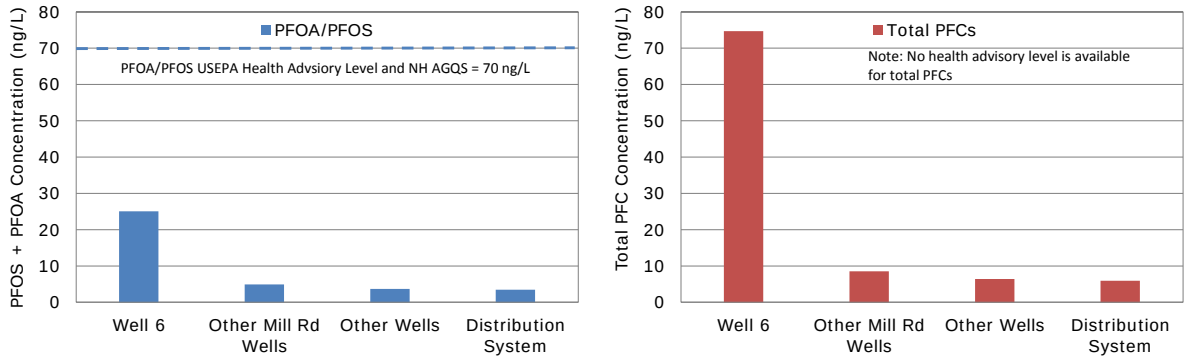


Figure ES-1 2017 Average PFOA/PFOS and Total PFC Concentrations in Aquarion Wells.
(Note: Other Mill Rd Wells = Wells 8A, 9, 11, 20, and 21; Other Wells = Wells 5A, 7, 10, 12, 13B, 14, 16, 17, 18, 19, Samples with non-detectable PFC concentrations were assumed to be zero)

Well 16
Well 17
Well 19
Well 12
Well 18
Well 13B
Well 10
Well 5A
Well 14
Well 8A
Well 20
Well 6
Well 21
Well 11
Well 9
Well 7

GREENLAND
NORTH HAMPTON
GREENLAND
RYE
STRATHAM
NORTH HAMPTON
RYE
NORTH HAMPTON
STRATHAM
EXETER
EXETER
HAMPTON
NORTH HAMPTON
HAMPTON
HAMPTON
HAMPTON FALLS

FIGURE ES-2
SITE OVERVIEW

LEGEND

- Well
- Town Boundary

LOCUS MAP

N

0 1,250 2,500
Feet
1:30,000

NOTES

1. Orthophotography courtesy of NH GRANIT (2010/2011).

Mill Road
Hampton & North Hampton
New Hampshire

November 2017

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Engineers | Environmental Specialists

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Aquarion is actively monitoring PFC concentrations in all of its wells and working to identify the potential sources of PFCs. PFCs encompass a broad range of compounds and health effect information for these compounds is continuing to evolve. As additional science becomes available, Aquarion will continue to evaluate the effects on drinking water. Aquarion is committed to working with the communities affected by PFCs to ensure that the appropriate steps are taken to reduce exposure to PFOA and PFOS in drinking water.

Aquarion has evaluated two alternatives to reduce exposure to PFCs in the Hampton System:

- Blend water from Well 6 with water from other wells in the Mill Road wellfield.
- Treat the water to remove PFCs.

Based on current PFC concentrations in the well water, it is estimated that blending will keep total PFC concentrations in the water from the Mill Road Wellfield below 30 ng/L (Table ES-1). This solution will not result in a rate increase because it will not require new facilities and will not increase annual operations and maintenance (O&M) costs.

To decrease PFC concentrations further, treatment of the well water will be necessary. Aquarion evaluated the alternatives for reducing PFC concentrations at the Mill Road Wellfield described below and summarized in Table ES-1. The evaluation identified Granular Activated Carbon (GAC) adsorption as the most cost-effective treatment technology for PFC removal.

- Treating just the water from well 6 (Scenario 1) is estimated to reduce total PFC concentrations in the water leaving the Mill Road Wellfield to 15 ng/L. This scenario is estimated to require a rate increase of approximately 5% because of the need to construct a treatment facility and increases in annual O&M costs.
- Treating the water from Well 6 and the other shallow, overburden wells in the wellfield (Scenario 2) is estimated to reduce total PFC concentrations in the water leaving the Mill Road Wellfield to below 4 ng/L. This scenario is estimated to result in a rate increase of approximately 16% because of the need to construct a larger treatment facility and more significant increases in annual O&M costs.
- Treating the water from all wells in the Mill Road Wellfield (including the two deep, bedrock wells) (Scenario 3) is not expected to add to the cost that would be incurred for Scenario 2.

Table ES-1
Summary of Estimated PFC Concentrations in the Water Entering the Distribution System from Mill Road Wells and Conceptual Costs Based on GAC Treatment

	Blending All Wells	Scenario 1 PFC treatment of water from Well 6	Scenario 2 PFC treatment of water from Wells 6, 8A, 9, 11	Scenario 3 PFC treatment of water from Wells 6, 8A, 9, 11, 20/21
PFOA/PFOS concentration entering the distribution system (ng/L)[1]	11	6	<4[2]	<4[2]
Total PFC concentration entering the distribution system (ng/L)[1]	30	15	<4[2]	<4[2]
Conceptual capital cost[3]	$0M	$1.9M	$5.8M	$5.7M
Conceptual annual O&M costs[4]	$0M	$0.1M	$0.3M	$0.3M
Rate increase required[5]	0%	5%	16%	16%

[1] Based on concentration of PFCs in well waters in 2017
[2] Method Reporting Limit (MRL) assumed to be 4 ng/L. MRL is the lowest concentration that can be reported with a reasonable degree of accuracy and precision
[3] Conceptual capital costs have an expected accuracy of -30%/+50%.
[4] Annual O&M costs for GAC are based on a one year replacement frequency.
[5] Rate increase is based on the conceptual capital and annual O&M costs for GAC treatment, actual rate increase required will depend on final capital and annual O&M costs.

If Aquarion and its customers are interested in pursuing one of the treatment scenarios described above, the recommended next step would be to conduct bench and/or pilot-scale testing to confirm treatment technology selection and performance of the treatment on the water from the Mill Road wells. The testing data will be used to refine the capital and annual O&M costs, develop a preliminary treatment design and update the estimated rate increase required. Aquarion is committed to coming back to the communities once this additional information and costs are available.

Section 1
Introduction

Delivering safe drinking water is Aquarion Water Company's (Aquarion's) highest priority. Aquarion is monitoring and evaluating raw and treated water quality for potential compounds of concern, including perfluorinated compounds (PFCs). PFCs are a group of man-made compounds that have extensive industrial and consumer product applications including carpets, clothing, furniture, non-stick cooking surfaces, food packaging, and fire fighting foams. Due to their extensive use, most people have been exposed to PFCs. PFCs are persistent in the environment and are water soluble, resulting in PFCs being found in groundwaters and surface waters across the country. In recent years, the analytical techniques for PFCs in water have improved and they can now be detected at the very low concentration of nanograms per liter, or parts per trillion. As a result, they are being more commonly detected in groundwater and drinking water supplies.

Perfluorooctanoic acid (PFOA) and Perfluorooctane-sulfonate (PFOS) are two of the most extensively produced and studied PFCs. The United States Environmental Protection Agency (USEPA) has developed a drinking water health advisory level of 70 ng/L for PFOA and PFOS, combined or individually, to protect the most sensitive populations from a lifetime of exposure with an appropriate margin of safety. USEPA established the health advisories for PFOA and PFOS based on the agency's assessment of the latest peer-reviewed science. New Hampshire has also adopted an Ambient Groundwater Quality Standard (AGQS) of 70 ng/L for PFOA and PFOS, combined or individually, to protect local groundwater supplies.

PFCs have been detected in 15 of the 16 wells supplying Aquarion's Hampton System Aquarion is taking the proactive step to evaluate potential alternatives for PFC treatment, as PFC concentrations have been identified by the NHDES within close proximity to the Mill Road Wells at concentrations above 50 ng/L, and has also been identified at the Coakley Landfill in North Hampton. The following analysis evaluates and provides conceptual level costs for PFC treatment alternatives.

1.1 Existing Operations

Aquarion currently operates six wells located along Mill Road that have been, or have the potential to be, impacted by elevated PFC concentrations, including PFOA and PFOS. Figure 1-1 presents the well locations and Table 1-1 summarizes the historical production data for each well.

Well 16
Well 17
Well 19
Well 12
Well 18
Well 13B
Well 10
Well 14
Well 5A
Well 8A
Well 20
Well 6
Well 21
Well 11
Well 9
Well 7

GREENLAND
NORTH HAMPTON

GREENLAND
RYE

STRATHAM
NORTH HAMPTON

RYE
NORTH HAMPTON

STRATHAM
EXETER

EXETER
HAMPTON

NORTH HAMPTON
HAMPTON

HAMPTON
HAMPTON FALLS

FIGURE 1-1
SITE OVERVIEW

LEGEND

- Well
- Town Boundary

LOCUS MAP

N

0 1,250 2,500
Feet
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NOTES

1. Orthophotography courtesy of NH GRANIT (2010/2011).

Mill Road
Hampton & North Hampton
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November 2017

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A-1000

Table 1-1
Mill Road Well Production Data (2011-2016)

Well	Consensus Yield (gpm)	Max Daily Flow Rate (gpm)	Avg Daily Flow Rate (gpm)
Well 6	300	360	111
Wells 8A, 20, 21 Combined Point of Entry	533	426	169
Well 8A	172	256	86
Well 20[1]	170	166	23
Well 21[1]	190	188	61
Well 9	294	630	194
Well 11	500	686	245

[1] Wells 20 and 21 are not operated concurrently.

Currently the Mill Road wells have five separate chemical treatment systems and points of entry to the distribution system (Wells 8A, Well 20 and 21 combined, Well 6, Well 9, Well 11). A project that will combine chemical storage and feed for all wells into a single facility located along the existing access road is being permitted for construction. It is anticipated that construction will be complete in summer 2018. The first phase of construction will include piping to combine wells 6, 8A, 20 and 21. Pipelines to connect wells 9 and 11 will be completed under a second phase. For the purpose of this evaluation, it was assumed that all wells are connected to the centralized chemical treatment facility.

1.2 Regulations

Currently, there is no USEPA Maximum Contaminant Level (MCL) for PFCs. However, the USEPA has a published Health Advisory Level of 70 ng/L for PFOA and PFOS combined. Many states have also adopted PFOA and PFOS regulations (Table 1-2). New Hampshire has adopted an Ambient Groundwater Quality Standard (AGQS) of 70 ng/L for PFOA and PFOS, combined (N.H. Admin. Rules, Env-Or 603.03) but does not have a drinking water maximum contaminant level for PFCs. Public Water systems must comply with AGQS, if the contaminants are found in their sources of drinking water.

Table 1-2
Example PFC Regulations

State / Agency	PFC Regulation
USEPA	PFOA and PFOS combined: 70 ng/L Health Advisory Level for Drinking Water
Vermont	PFOA: 20 ng/L Health Advisory Level for Drinking Water
NJ	PFOA: 40 ng/L Drinking Water Guidance Level PFOA: 14 ng/L Drinking Water Maximum Contaminant Level (Proposed)
NH	PFOA and PFOS combined: 70 ng/L Ambient Groundwater Quality Standard
Maine	PFOA and PFOS combined: 70 ng/L Drinking Water Maximum Exposure Guidelines

1.3 Background Water Quality

Aquarion monitored PFCs under the Unregulated Contaminant Monitoring Rule (UCMR) in 2014 and 2015 and has subsequently been voluntarily monitoring PFCs in the Hampton System wells. PFCs have been detected in 15 of the 16 wells supplying Aquarion's Hampton/North Hampton/Rye System (Figure ES-1 and Figure ES-2). With the exception of Well 6, the combined concentration of PFOA and PFOS found in the wells has been less than 8 ng/L, which is 11% of the health advisory level; in fact, the concentration of total PFCs does not exceed 20 ng/L in any of these wells or within the distribution system once the water from the wells blends together. Well 6 has had the highest concentrations of PFCs of any of Aquarion's wells with combined PFOA and PFOS concentration averaging 25 ng/L, and total PFC concentrations averaging 75 ng/L in 2017.

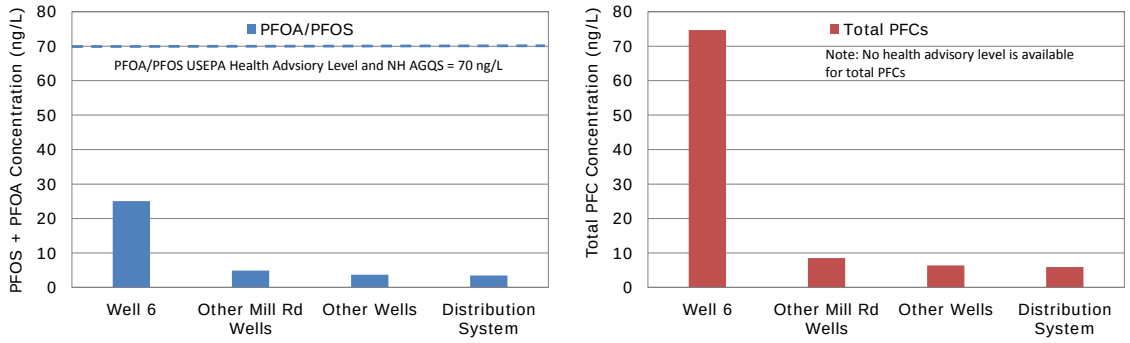

Figure 1-2 2017 Average PFOA/PFOS and Total PFC Concentrations in Aquarion Wells.
(Note: Other Mill Rd Wells = Wells 8A, 9, 11, 20, and 21; Other Wells = Wells 5A, 7, 10, 12, 13B, 14, 16, 17, 18, 19, Samples with non-detectable PFC concentrations were assumed to be zero)

The Mill Road Wells have had detections of 7 different PFCs in the overburden wells (i.e., well 6, 8A, 9, 11) (Table 1-3 and 1-4). The bedrock wells (wells 20 and 21) have only had two PFC compounds detected. PFCs consist of fluorinated carbon chains of varying lengths (Table 1-3). PFC treatment technologies are generally more effective at removing the longer chain carbons (Dickson and Higgens, 2016). Perfluoroalkyl carboxylates with 7 or more carbons and perfluoroalkyl sulfonates with 6 or more carbons are considered long chain PFCs. Shorter carbon chain PFCs can be effectively removed but annual operations and maintenance (O&M) costs for media replacement are higher.

Table 1-3
Detected PFCs in Mill Road Wells

Name	Abbreviation	Number of Carbons
Perfluorooctanoic acid	PFOA	8
Perfluorooctane-sulfonate	PFOS	8
Perfluorononanoic acid	PFNA	9
Perfluoroheptanoic acid	PFHpA	7
Perfluorohexane-sulfonate	PFHxS	6
Perfluorohexanoic acid	PFHxA	6
Perfluorobutane-sulfonate	PFBS	4

Detected PFC concentrations in the Mill Road wells have been less than 40 ng/L for individual compounds (Table 1-4), with total PFC concentrations ranging from 1 to 88 ng/L per well. PFOA and PFOS concentrations have below the USEPA Heath Advisory Level and NH AGQS of 70 ng/L. Currently, the source of the PFCs, and potential for increasing concentrations, is not known and is being evaluated by the New Hampshire Department of Environmental Services (NHDES) and Aquarion.

Table 1-4

Historical PFC Concentrations in Mill Rd Well[1]

	PFOA	PFOS	PFOA + PFOS	PFHpA	PFBS	PFHxS	PFNA	PFHxA	Total PFCs[2]
Well 6									
16-Sep-2014	ND < 20 ng/L	ND < 40 ng/L	ND	ND < 10 ng/L	ND < 90 ng/L	ND < 30 ng/L	ND < 20 ng/L	NT	ND
14-Apr-2015	ND < 20 ng/L	ND < 40 ng/L	ND	12	ND < 90 ng/L	ND < 30 ng/L	ND < 20 ng/L	NT	12
25-Jul-2016	6	ND < 10 ng/L	6	4	ND < 10 ng/L	ND < 10 ng/L	ND < 2 ng/L	10	20
6-Jun-2017	20	5	25	16	4	4	1	38	88
1-Aug-2017	17.9	6.11	24.01	8.6	2.65	3.71	ND < 4 ng/L	25.1	64.07
24-Aug-2017	22.3	4.25	26.55	12.5	4.24	3.16	ND < 4.44	30.2	76.65
24-Aug-2017	19.5	4.98	24.48	11.4	3.60	3.87	ND < 4.19	28.2	71.55
19-Sep-2017	19.5	5.59	25.09	11.1	3.22	2.52	ND < 4.30	31.1	73.03
Well 8A									
16-Sep-2014	ND < 20 ng/L	ND < 40 ng/L	ND	ND < 10 ng/L	ND < 90 ng/L	ND < 30 ng/L	ND < 20 ng/L	NT	ND
7-Apr-2015	ND < 20 ng/L	ND < 40 ng/L	ND	ND < 10 ng/L	ND < 90 ng/L	ND < 30 ng/L	ND < 20 ng/L	NT	ND
25-Jul-2016	2	ND < 10 ng/L	2	1	ND < 10 ng/L	ND < 10 ng/L	ND < 2 ng/L	1	4
1-Aug-2017	1.35	1.96	3.31	ND < 4 ng/L	ND < 4 ng/L	2.41	ND < 4 ng/L	ND < 4 ng/L	5.72
24-Aug-2017	4.46	2.00	6.46	ND < 4.24	ND < 4.24	2.11	ND < 4.24	ND < 4.24	8.57
20-Sep-2017	2.10	1.76	3.86	ND < 4.22	ND < 4.22	ND < 4.22	ND < 4.22	ND < 4.22	3.86
Well 20									
25-Jul-2016	1	ND < 10 ng/L	1	ND < 2 ng/L	ND < 10 ng/L	ND < 10 ng/L	ND < 2 ng/L	ND < 2 ng/L	1
24-Aug-2017	1.45	ND < 4.38	1.45	ND < 4.38	ND < 4.38	1.85	ND < 4.38	ND < 4.38	3.30
Well 21									
25-Jul-2016	ND < 2 ng/L	ND < 10 ng/L	ND	ND < 2 ng/L	ND < 10 ng/L	ND < 10 ng/L	ND < 2 ng/L	ND < 2 ng/L	ND
20-Sep-2017	ND < 4.4	ND < 4.4	ND	ND < 4.4	ND < 4.4	ND < 4.4	ND < 4.4	ND < 4.4	ND < 4.4
Well 9									
16-Sep-2014	ND < 20 ng/L	ND < 40 ng/L	ND	ND < 10 ng/L	ND < 90 ng/L	ND < 30 ng/L	ND < 20 ng/L	NT	ND
10-Mar-2015	ND < 20 ng/L	ND < 40 ng/L	ND	ND < 10 ng/L	ND < 90 ng/L	ND < 30 ng/L	ND < 20 ng/L	NT	ND
25-Jul-2016	3	ND < 10 ng/L	3	1	ND < 10 ng/L	ND < 10 ng/L	ND < 2 ng/L	3	7
6-Jun-2017	5	3	8	2	2	1	0.6	3	16.6
24-Aug-2017	4.46	3.18	7.64	ND < 4.32	ND < 4.32	1.51	ND < 4.32	ND < 4.32	9.15
19-Sep-2017	2.74	3.23	5.97	ND < 4.10	ND < 4.10	1.32	ND < 4.10	ND < 4.10	7.29
Well 11									
16-Sep-2014	ND < 20 ng/L	ND < 40 ng/L	ND	ND < 10 ng/L	ND < 90 ng/L	ND < 30 ng/L	ND < 20 ng/L	NT	ND
10-Mar-2015	ND < 20 ng/L	ND < 40 ng/L	ND	ND < 10 ng/L	ND < 90 ng/L	ND < 30 ng/L	ND < 20 ng/L	NT	ND
25-Jul-2016	3	ND < 10 ng/L	3	1	ND < 10 ng/L	ND < 10 ng/L	ND < 2 ng/L	4	8
6-Jun-2017	6	2	8	4	2	2	ND < 2 ng/L	8	24
24-Aug-2017	3.13	2.33	5.46	ND < 4.28	ND < 4.28	1.71	ND < 4.28	ND < 4.28	7.17
19-Sep-2017	2.67	0.87	3.54	ND < 4.24	ND < 4.24	ND < 4.24	ND < 4.24	4.44	7.98

[1] ND = below method detection limit; NT = not tested.

[2] ND samples are excluded from the total PFC calculations.

General water quality parameters can also impact the treatment performance of the evaluated treatment technologies. Table 1-5 summarizes the water quality for the Mill Road wells. Due to limited available data, the historical maximum is presented for each well as a conservative estimate of water quality parameters that impact treatment performance. Additional sampling for key water quality parameters is recommended prior to designing the selected treatment facility.

Table 1-5

Historical Water Quality Parameters[1, 2]

Parameter	Well 6	Well 9	Well 11	Well 8A	Well 20/21
pH	6.9	6.9	7.4	7.7	8.7
Alkalinity (mg/L as $CaCO_3$)	58	53	89	84	120
Total Hardness (mg/L as CaCO3)	98	89	136	125	110
TOC (mg/L)	-	-	0.8	-	1.1
Conductivity (µS/cm)	440	410	387	480	790
Nitrate (mg/L as N)	3.3	2.4	1.8	2.3	0
Sulfate (mg/L)	17	22	42	58	190
Chloride (mg/L)	160	99	65	57	130
Calcium (mg/L)	29	25	40	36	26
Magnesium (mg/L)	6	6	9	9	10
Iron (mg/L)	-	-	-	-	0.3
Manganese (mg/L)	-	-	-	-	0.18
Uranium (µg/L)	<1	0.3	1	-	-
Chlorate (mg/L)	63	72	70	0	-
Arsenic (mg/L)	-	-	-	0.003	-
Chromium (mg/L)	0.27	0.46	0.29	-	-

[1] Water quality is based on maximum historical concentrations (2002 – 2017) for conservative equipment sizing due to limited available data

[2] A flow weighted average was calculated for each scenario based on the wells selected for treatment in each scenario.

1.4 Treatment Scenarios

As shown in Table 1-4, PFC concentrations vary between the wells, with the highest concentration in Well 6. Wells 6, 8A, 9, and 11 are overburden wells, while Wells 20 and 21 are deeper bedrock wells. PFC concentrations in Wells 20 and 21 have primarily been below the PFC method detection limits with the exception of two PFC compounds. Four scenarios were evaluated for reducing the levels of PFCs at the Mill Road Well field:

- Blending: The Mill Road wells are combined and blended prior to the point of entry to the distribution system.
- Scenario 1: Treat Well 6 (highest concentration well)
- Scenario 2: Treat Wells 6, 8A, 9, and 11 (all overburden wells)
- Scenario 3: Treat Wells 6, 8A, 9, 11, 20 and 21 (all wells)

Design flow rates for each scenario were based on the maximum daily production for each well in Table 1-1.

A specific treated water quality goal was not selected for this evaluation. PFOA and PFOS concentrations are all below the USEPA Health Advisory Level and NH AGQS. Potential future state or federal regulations for PFCs are unknown. The available treatment technologies can remove the PFCs present to below the Method Reporting Limit (MRL) for PFCs. The MRL is the lowest concentration that can be reported with a reasonable degree of accuracy and precision. MRLs for the PFCs detected in the Mill Road Wells are approximately 4 ng/L.

Higher concentrations of PFCs have been detected by NHDES in close proximity to the Mill Road Well. To evaluate the impact of potential increases in concentrations, safety factors of 2 and 4 were applied to the current PFC concentrations to bracket potential increases in PFC concentrations. Predictions for future PFC concentrations are not available at this time and will depend on the PFC source. Table 1-6 presents the assumed raw water quality and PFC concentrations for each treatment scenario.

Table 1-6

Treatment Scenario Design Assumptions

	Scenario 1 Well 6			Scenario 2 Wells 6, 8A, 9, 11			Scenario 3 Wells 6, 8A, 9, 11, 20/21		
Design flow rate (gpm)	360			1,930			2,120		
Avg daily flow (gpm)	111			636			719		
Background water quality									
pH	6.9			7.2			7.3		
Alkalinity (mg/L as $CaCO_3$)	58			71			75		
Total Hardness (mg/L as $CaCO_3$)	98			112			112		
TOC (mg/L)	1.1			1.1			1.1		
Conductivity (µS/cm)	440			417			450		
Nitrate (mg/L as N)	3.3			2.3			2.1		
Sulfate (mg/L)	17			33			47		
Chloride (mg/L)	160			93			96		
Calcium (mg/L)	29			33			32		
Magnesium (mg/L)	6.0			7.5			7.7		
Iron (mg/L)	0.00			0.00			0.03		
Manganese (mg/L)	0.00			0.00			0.02		
Uranium (mg/L)	1.0			1.0			1.0		
Chlorate (mg/L)	63			60			69		
Arsenic (mg/L)	0.003			0.003			0.003		
Chromium (mg/L)	0.3			0.3			0.4		
Influent PFC concentrations									
	Hist. Max	**SF = 2**	**SF = 4**	**Hist. Max**	**SF = 2**	**SF = 4**	**Hist. Max**	**SF = 2**	**SF = 4**
PFOA (ng/L)	22.3	44.6	89.2	8.5	17.0	34.0	7.9	15.8	31.5
PFOS (ng/L)	6.11	12.2	24.4	3.3	6.6	13.1	3.0	6.0	12.0
PFHpA (ng/L)	16	32.0	64.0	5.2	10.4	20.7	4.7	9.5	18.9
PFBS (ng/L)	4.24	8.5	17.0	2.2	4.3	8.6	2.0	3.9	7.8
PFHxS (ng/L)	4	8.0	16.0	2.3	4.5	9.1	2.2	4.5	8.9
PFNA (ng/L)	1	2.0	4.0	0.4	0.8	1.5	0.3	0.7	1.4
PFHxA (ng/L)	38	76.0	152.0	11.0	22.1	44.1	10.0	20.1	40.2
Total PFCs	*91.7*	*183.3*	*366.6*	*32.8*	*65.6*	*131.2*	*30.2*	*60.4*	*120.8*

SF = safety factor

Section 2
Treatment Evaluation

Three main treatment technologies have been shown to be effective for PFC treatment (Dickenson and Higgins, 2016; Dudley et al., 2015; Campos et al. 2017)

- Granular Activate Carbon (GAC)
- Anion Exchange (IX)
- High pressure membrane filtration (nanofiltration and reverse osmosis)

High pressure membrane filtration has been shown to be highly effective for PFC removal. However, membrane filtration is typically cost prohibitive and generates a concentrated waste brine stream that must be managed and reduces available water from the wellfield. The Mill Road facility would not have the ability to easily dispose of the brine and, as such, membranes were not considered for this evaluation.

GAC and IX have been shown to be effective for a range of PFCs. Both have the ability to remove PFC to less than the MRL with breakthrough rates being dependent on the PFCs present and background water quality parameters. Table 2-1 summarizes some of the consideration for GAC and IX treatment for PFCs and the following sections present conceptual sizing information.

Table 2-1
Comparison of GAC and IX for PFC Treatment

	Advantages	Considerations
GAC	• Proven technology at full-scale • Simple operation • GAC can be re-activated and reused	• Competition from background organics • Breakthrough driven by short chain PFCs
IX	• Simple operation • Potential for higher PFC capacity than GAC • Lower Empty Bed Contact Times • Lower vessel heights	• Limited full-scale data on PFC treatment • Competition from other anions • Single pass resin must be disposed of in a land fill or incinerated • Higher head loss than GAC • Breakthrough driven by short chain PFCs

2.1 GAC

GAC has been used extensively in drinking water and remediation treatment due to its ability to adsorb a range of trace contaminants, such as volatile organic compounds. GAC media would be housed in a steel pressure vessel that prevents the need for repumping of the well water (Figure 2-1). For treatment of the Mill Road wells, the GAC vessels would be housed in a building to protect them from the elements and to prevent freezing. When water is passed over the GAC media, the contaminants are adsorbed by the media, which removes them from the water. Once the capacity of the media to adsorb PFCs has been exhausted, the contaminant concentration in the treated water begins to increase and the GAC media is replaced with fresh media. The spent media can be landfilled or regenerated. During regeneration, the media is exposed to high heat, which removes any adsorbed contaminants and allows the media to be reused. For facilities the size of Mill Road, vendors would replace the GAC with new media and regenerate the spent media off-site for future use. GAC will remove a range of compounds and competing compounds in the water can reduce its effectiveness for PFC removal. Organic matter, which is typically low in groundwater, are the compounds that most often compete with PFCs for adsorption sites. GAC has also been shown to be an effective treatment option for PFCs. GAC is generally more effective for longer chain PFCs, such as PFOA and PFOS, with breakthrough occurring faster for the shorter chain PFCs (Figure 2-2). PFBA, the first PFC to breakthrough in Figure 2-2, has not been detected at Mill Road. GAC is effective for removing the PFCs that have been detected in the Mill Road wells. In the example presented on Figure 2-2, PFHxA was the first of the PFCs detected in the Mill Road Wells to breakthrough. PFOA and PFOS demonstrated longer breakthrough times. The bed volumes to breakthrough directly impacts the replacement frequency and annual O&M costs. Annual O&M costs would be higher for treated water quality goals targeting all PFCs vs treatment targeting PFOA and PFOS. Table 2-2 provides the conceptual sizing information for each scenario and the sections below provide additional details on key design criteria.

Figure 2-1 Example GAC Vessels (Photo provided by Evoqua).

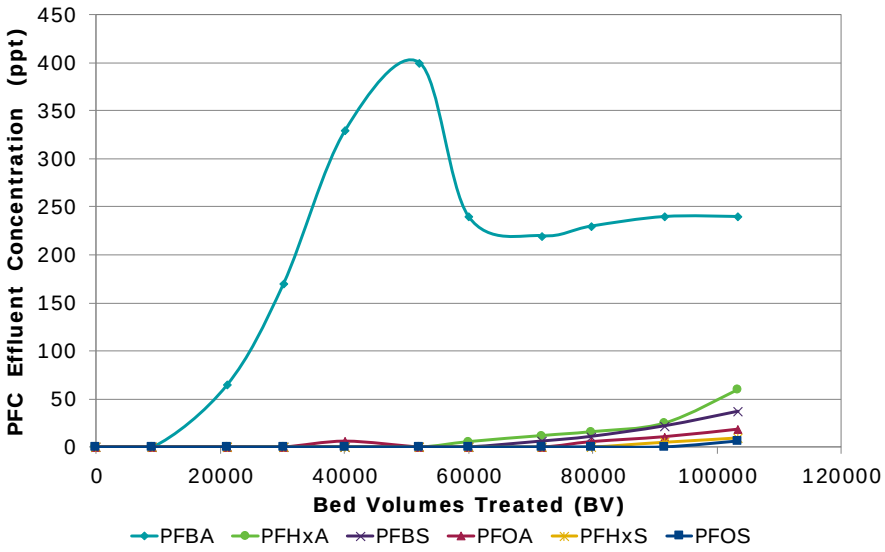

Figure 2-2 Example PFC Removal using Calgon Carbon F400 12x40 GAC and 10 min EBCT. 200 ng/L spiked concentration for each compound (Franco and Forrester, 2017)

Table 2-2

Conceptual GAC Sizing for Treatment Scenarios

	Scenario 1 Well 6	Scenario 2 Wells 6, 8A, 9, 11		Scenario 3 Wells 6, 8A, 9, 11, 20/21	
	20,000 lb Vessels	20,000 lb Vessels	40,000 lb Vessels	20,000 lb Vessels	40,000 lb Vessels
Design flow rate (gpm)	360	1,930		2,120	
Avg daily flow rate (gpm)	111	636		719	
Vessel operation	Lead/lag	Lead/lag		Lead/lag	
Number of vessel pairs	1	4	2	4	2
Total number of vessels	2	8	4	8	4
Vessel diameter (ft)	10	10	12	10	12
Hydraulic loading rate (gpm/ft^2)	4.6	6.2	8.5	6.8	9.4
Media/vessel (lbs)	20,000	20,000	40,000	20,000	40,000
Standard pressure rating (psi)	125	125		125	
Volume of media per vessel, (gallons)	5,128	5,128	10,256	5,128	10,256
Design EBCT (min) per vessel	14.2	10.6		9.7	
Media size (units)	12x40	12x40		12x40	
Head loss per lead/lag pair at design flow (psi)[1]	6 psi	8 psi	19 psi	8 psi	19 psi
Changeout frequency (yr)	1 - 2	1 - 2		1 - 2	
BV to media changeout (based on 1 year changeout frequency)	> 37,000	> 48,000		> 44,000	
Initial PFC to breakthrough	PFHxA	PFHxA		PFHxA	
Initial fill backwash duration (min)	30	30		30	
Backwash flow rate	650	650	940	650	940
Initial fill backwash volume	19,500	19,500	28,200	19,500	28,200
GAC delivery truck drain volume	10,000	10,000	20,000	10,000	20,000
Minimum backwash storage volume	29,500	29,500	48,200	29,500	48,200
Backwash storage tank size (gal)	34,000	34,000	50,000	34,000	50,000
Approximate building footprint	30' x 45'	50' x 80'	50' x 55'	50' x 80'	50' x 55'
Minimum building clearance height	25'	25'	30'	25'	30'

[1] Well pump replacement was assumed to account for the head loss through the GAC vessels.

2.1.1 Hydraulic Loading Rate and Empty Bed Contact Time

For GAC treatment, equipment sizing is based on acceptable hydraulic loading rates and target Empty Bed Contact Time (EBCT). If hydraulic loading rates are too high, channeling can occur within the GAC media, which reduces treatment efficiency. Hydraulic loading rates should be less than 9.5 gpm/ft^2. The evaluated systems were also sized to achieve a minimum of 10 minutes of EBCT at the design flow rates. The design EBCT was selected based on experience at other full-scale facilities. EBCT becomes the limiting design factor for the Mill Road facility as hydraulic loading rates are limited to 5-8 gpm/ft^2 in order to achieve 10 minutes of EBCT.

2.1.2 Vessel Configuration

For both the GAC and IX systems, the vessels can be operated in parallel or in series. In a parallel operation, the water flows through one vessel with 10 minutes of EBCT. In a series operation, the water flows through the lead vessel that would be the primary vessel for treatment. After the lead vessel, the water flows through the lag vessel. The lag vessel would be able to remove any PFCs that were in the effluent of the lead vessel. Both the lead and lag vessels are identically sized for 10 minutes of EBCT. Once the media in the lead vessel is exhausted, the lag vessel would become the lead and the media would be replaced. The series configuration results in higher capital costs for the additional vessels and building footprint, but provides the following benefits:

- Reduced annual operations and maintenance (O&M) costs by increasing the utilization of the media. With series operations, the lead vessel is typically changed out when the effluent PFC concentrations are 50% of the influent concentrations or 50% of the target effluent concentration. With a parallel system, the media would have to be changed out prior to any PFC breakthrough to meet the treated water quality goals.
- Increased reliability for meeting the treated water quality goals. PFC monitoring can be reduced due to the lag vessel offering treatment if PFCs breakthrough the lead vessel.
- Ability to change out the media in the lead vessel without decreasing the treatment capacity as the flow can be fully treated in the lag vessel during media changeouts.
- Increased operational flexibility for scheduling media changeouts.

For this evaluation, sizing and costs are based on series operation for increased treated water quality protection and reduced annual O&M costs.

GAC vessels come in standard sizes. Typical sizing for a facility of the Mill Road Wellfield flow rate would consist of either 10' or 12' diameter vessels with either 20,000 lbs or 40,000 lbs of carbon. The 10' diameter vessels have higher head loss due to the deeper media, but have reduced backwash residuals handling requirements. Backwash flow rates are based on the GAC surface area. For the higher flow rates of Scenarios 2 and 3, 40,000 lb vessels can also be considered (Table 8). 20,000 lb vessels were assumed for Scenario 1 due to the lower flow rate (360 gpm). With 40,000 lb vessels, the number of trains can be reduced from 4 to 2, which reduces the facility footprint by approximately 1,250 ft^2 and also reduces equipment capital costs. GAC vessel costs would be reduced by ~$280,000 using the 40,000 lb vessels. However, the 40,000 lb vessels increase the required building height, backwash storage volume, and head loss compared to the 20,000 lb vessels. GAC replacement frequency and costs would be identical for either the 20,000 lb or 40,000 lb vessel options as the carbon usage rate would remain the same. For this evaluation, 10' diameter 20,000 lb vessels were assumed for a conservative cost

estimates. Additional options for sizing to optimize capital and annual O&M costs should be considered during preliminary design.

2.1.3 GAC Replacement

As the adsorption capacity of the GAC media is exhausted, PFCs will begin to break through and will require replacement of the GAC media. PFC breakthrough and media replacement is a function of:

- GAC base material and characteristics
- PFC adsorption characteristics (e.g., shorter chain PFCs tend to breakthrough faster)
- PFC concentrations
- Treatment flow rates and associated bed volumes treated
- Background organics that compete for adsorption sites
- Treated water quality goal

The GAC media selection can have a large impact on treatment performance. The optimum GAC media is a function of the PFC present and background water quality. The information presented in the memorandum is based on a bituminous coal carbon and enhanced coconut shell carbons that have been shown to be effective at full-scale PFC treatment facilities. A more detailed analysis of GAC media selection can be performed during bench-scale testing and design to optimize annual O&M costs.

Based on the low level influent concentrations, the GAC manufacturers were unable to predict differences in media change-out frequency between the two influent PFC concentrations without bench-scale testing to evaluate performance with the site-specific water quality. If Aquarion elects to proceed with PFC treatment, this bench testing is recommended to be performed on the selected technology during the preliminary design. GAC replacement frequencies were estimated based on media replacement frequencies from other full-scale PFC treatment facilities for estimating the expected media replacement frequency.

Full-scale groundwater facilities have shown greater than 1 year of operation between changeouts, with some up to 18-24 months depending on background organics and target PFC concentrations. Pease Tradeport, located in Portsmouth, NH, is an example facility that treats groundwater with similar PFC concentrations to Aquarion's wells. The Pease Tradeport Facility currently operates a demonstration facility that utilizes two 20,000 lbs GAC vessels in series with a flow of 472 gpm. The facility has a design EBCT of 10 mins. GAC has been effective at removing all PFCs to concentrations below the reporting limit within the lead vessel for all PFCs present after 1 year of operation (Table 2-3) and 26,644 bed volumes treated (City of Portsmouth, 2017). PFC breakthrough has yet to occur to determine changeout frequency.

Table 2-3

GAC Effectiveness for Pease Tradeport in Portsmouth, NH[1]

PFC	Mill Rd Maximum Concentration (ng/L)	Pease Tradeport Maximum Raw Water Concentration	Pease Tradeport Lead Vessel Treated Water Concentration after ~26.6k BV
PFOS	6	27	Not Detected
PFOA	2	9	Not Detected
PFHpA	16	6	Not Detected
PFBS	4	9	Not Detected
PFHxS	4	38	Not Detected
PFNA	1	ND	Not Detected
PFHxA	38	18	Not Detected

[1] City of Portsmouth, 2017

2.1.4 Backwashing

Backwashing is required during the initial GAC media installation and during each media replacement. The backwash removes GAC fines that can be created during transport and also stratifies the GAC bed. Backwash during operation is unlikely but may be required depending on the increase in differential pressure across the bed due to particulates in the well water. North Hampton does not have a sewer system that can be used for discharge of the backwash water. For this evaluation, it was assumed that the backwash water will be stored in a 34,000 gallon tank for settling and recycled to the head of the plant. The tank will require periodic cleaning to remove accumulated fines. Backwash tank clean-out frequency would depend on GAC changeout frequency. For backwashing, potable water is typically supplied from the distribution system. Cartridge filters will be used on the backwash recycle line to prevent recycling of GAC fines. Alternatively, since GAC replacement is only expected every 1-2+ years, a temporary baker or frac tank could be brought in during GAC replacement with the water either recycled or taken off-site.

2.2 Anion Exchange

Anion Exchange (IX) is an emerging treatment technology for PFC treatment with potential to remove long and short chain PFCs (Dickenson and Higgins, 2016; Dudley et al., 2015; Campos et al. 2017). IX has been used extensively for drinking water treatment for other contaminants such as perchlorate, nitrate and hardness. However, full-scale installations of stand-alone IX for PFCs are limited. In an anion exchange process, the target contaminant is exchanged on the resin for a non-toxic compound. In this case, PFCs would be exchanged for chloride ions. IX resins are operated similar to GAC and can use the same pressure vessels as GAC media. Figure 2-3 illustrates a typical IX system design and Table 2-4 provides the conceptual sizing information for each scenario. The sections below provide additional details on key design criteria.

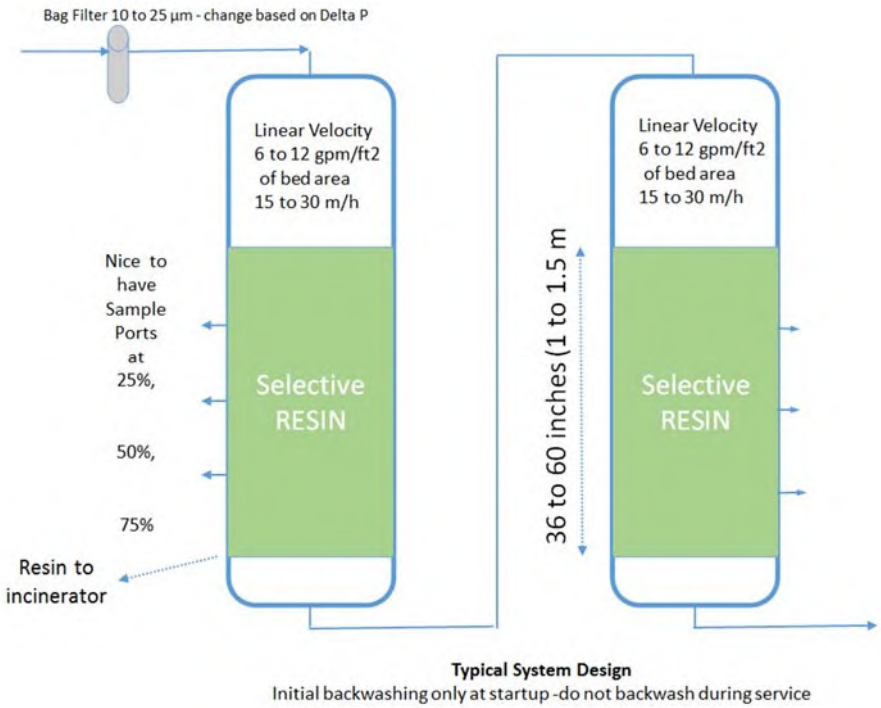

Figure 2-3 Typical IX System Design (Provided by Purolite)

Table 2-4
Conceptual Anion Exchange Sizing

	Scenario 1 Well 6	Scenario 2 Wells 6, 8A, 9, 11	Scenario 3 Wells 6, 8A, 9, 11, 20/21
Design flow rate (gpm)	360	1,930	2,120
Avg daily flow rate (gpm)	111	636	719
Vessel operation	Lead/lag	Lead/lag	Lead/lag
Number of vessel pairs	1	2	2
Total number of vessels	2	4	4
Vessel diameter (ft)	7	10	12
Hydraulic loading rate (gpm/ft^2)	9.4	12.3	9.4
lbs of media/vessels	6,064	16,272	17,704
Design EBCT (min) per vessel	3	3	3
Media volume per vessel (gal)	1,080	2,895	3,180
Head loss per lead/lag pair at design flow (psi)[1]	20	29	20
Estimated bed volumes to media changeout	64,000	84,000	84,000
Changeout frequency (yr) (avg flow)	1.2	1.5	1.4
Initial PFC to breakthrough	PFHxA	PFHxA	PFHxA
Backwash flow rate (gpm)	58	118	170
Backwash volume (gal)	2,160	5,790	6,360
Truck draining volume (gal)	6,480	17,370	19,080
Total storage volume (gal)	8,640	23,160	25,440
Building footprint	25' x 40'	50' x 40'	50' x 40'
Building clearance height	11'	11'	12'

[1] Well pump replacement was assumed to account for the head loss through the IX vessels.

2.2.1 Hydraulic Loading Rate and Empty Bed Contact Time

For IX treatment, the required EBCT is much lower than for GAC. IX vendors recommended a design EBCT of 3 minutes based on their pilot and operational experience. Hydraulic loading rates can be higher for IX (up to 12 gpm/ft^2), which reduces the number of vessels compared to GAC.

2.2.2 Resin Changeout

IX resins can be single pass or regenerable. Regenerable resins are currently being evaluated with use of a sodium chloride brine in a methanol solution to remove PFCs from the resin and replace them with chloride ions. Regenerable resins are still in development and would require additional equipment for the storage and disposal of regeneration solution that would have high concentrations of PFCs. This evaluation was based on the use of single pass resins. Single pass resins are removed and landfilled or incinerated once their capacity has been exhausted.

IX resins have the potential to have a higher capacity for PFCs than GAC and can achieve treatment at lower EBCTs. IX resin capacity is also PFC specific with many shorter chain PFCs breaking through faster than the longer chain PFCs, similar to GAC Changeout frequency is dependent on the treatment goal. If the treatment goal is total PFC, the

manufacturer predicted bed volumes to changeout range from 64,000 to 84,000. If the treatment goal is PFOA and PFOS, the predicted bed volumes to changeout range from 140,000 to 195,000. The IX resin media is approximately 5 times more expensive than GAC media. The information presented in this analysis is based on resin type PFA694E as manufactured by Purolite. Additional resins are available, but the manufacturers were not able to provide estimates for PFC breakthrough without testing. Bench-scale testing would be required to better define the expected changeout frequency.

IX resin capacity is not effected by background organics but it is affected by background concentrations of other anions in the water. Perchlorate, chlorate, nitrate, and sulfate, to the extent present in the Mill Road Wells, will also be exchanged and increase the frequency of required resin replacement.

2.2.3 Backwashing

The IX resin will require backwashing after initial fill to stratify the bed, similar to GAC. However, the backwash volumes are lower for IX. As with the GAC alternative, it was assumed that the IX backwash water will be supplied from the distribution system and will be stored onsite with recycling to the head of the plant. Backwashing during operation is not recommended for IX systems. Bag filters are recommended upstream of the IX vessels to prevent head loss buildup through the beds due to particulate from the wells.

2.3 Point of Entry Concentrations

Through the current well consolidation project, the Mill Road well collector pipelines are being centralized and combined into one Point-of-Entry (POE) into the distribution system. These planned upgrades allow for blending of water from the treated and untreated wells prior to entering the distribution system. Table 2-5 presents the anticipated blended water concentrations for all PFCs under the three treatment scenarios and with no treatment. For the blending calculations, it was assumed that treated PFC concentrations are less than the MRL for all PFCs. If the treated water PFC concentration are higher, the blended concentrations will also be higher. The analysis assumes that the all wells are in operation.

When Wells 9 and 11 are combined at the Mill Rd WTP, the blended water PFC concentrations are estimated to be approximately 11 ng/L for PFOA and PFOS combined and approximately 30 ng/L for total PFCs based on maximum historical concentrations per well. If PFC concentrations increase, the blended water concentrations will increase correspondingly (Table 2-6 and 2-7).

By only treating Well 6 (Scenario 1), which has the highest historical PFC concentrations, the blended water total PFC concentration is estimated to be below 20 ng/L and the PFOA/PFOS concentration would be approximately 6 ng/L. However, if PFC concentrations double in the untreated wells, the blended water concentrations are estimated to increase to 30 ng/L for total PFCs (Table 2-6). If PFC concentrations increases, treatment of additional wells (Scenario 2 or 3), would likely be needed to maintain similar PFC concentrations.

If all of the overburden or all wells are treated (Scenarios 2 and 3), the blended water concentrations for all PFCs as well as PFOA and PFOS can be maintained below the MRLs under current or increased PFC concentrations as 91 to 100% of the flow will be treated.

Table 2-5

Estimated Treated and Point of Entry PFC Concentrations Based on 2017 PFC Concentrations

	Blending All Wells	Scenario 1 Well 6	Scenario 2 Wells 6, 8A, 9, 11	Scenario 3 Wells 6, 8A, 9, 11, 20/21
Treated water flow rate (gpm)	0	360	1,930	2,120
GAC or IX treated water PFOA/PFOS concentration (ng/L)	N/A	<4[1]	<4[1]	<4[1]
GAC or IX treated water total PFC concentration (ng/L)	N/A	<4[1]	<4[1]	<4[1]
Untreated flow rate (gpm)	2,120	1,760	188	0
Untreated PFOA/PFOS concentration (ng/L)	11	5	<4[1]	<4[1]
Untreated total PFC concentration (ng/L)	30	18	<4[1]	<4[1]
Combined flow rate (gpm)	**2,120**	**2,120**	**2,120**	**2,120**
Combined PFOA/PFOS concentration at the POE (ng/L)	**11**	**6**	**<4[1]**	**<4[1]**
Combined total PFC concentration at the POE (ng/L)	**30**	**15**	**<4[1]**	**<4[1]**

[1] Assumed MRL of 4 ng/L

Table 2-6

Estimated Treated and Point-of-Entry PFC Concentrations Based on a 2 Times Safety Factor on 2017 Raw Water PFC Concentrations

	Blending All Wells	Scenario 1 Well 6	Scenario 2 Wells 6, 8A, 9, 11	Scenario 3 Wells 6, 8A, 9, 11, 20/21
Treated water flow rate (gpm)	0	360	1,930	2,120
GAC or IX treated water PFOA/PFOS concentration (ng/L)	N/A	<4[1]	<4[1]	<4[1]
GAC or IX treated water total PFC concentration (ng/L)	N/A	<4[1]	<4[1]	<4[1]
Untreated flow rate (gpm)	2,120	1,760	188	0
Untreated PFOA/PFOS concentration (ng/L)	22	10	<4[1]	<4[1]
Untreated total PFC concentration (ng/L)	60	36	<4[1]	<4[1]
Combined flow rate (gpm)	**2,120**	**2,120**	**2,120**	**2,120**
Combined PFOA/PFOS concentration at the POE (ng/L)	**22**	**12**	**<4[1]**	**<4[1]**
Combined total PFC concentration at the POE (ng/L)	**60**	**30**	**<4[1]**	**<4[1]**

[1] Assumed MRL of 4 ng/L

Table 2-7

Estimated Treated and Point-of-Entry PFC Concentrations Based on a 4 Times Safety Factor on 2017 Raw Water PFC Concentrations

	Blending All Wells	Scenario 1 Well 6	Scenario 2 Wells 6, 8A, 9, 11	Scenario 3 Wells 6, 8A, 9, 11, 20/21
Treated water flow rate (gpm)	0	360	1,930	2,120
GAC or IX treated water PFOA/PFOS concentration (ng/L)	N/A	<4[1]	<4[1]	<4[1]
GAC or IX treated water total PFC concentration (ng/L)	N/A	<4[1]	<4[1]	<4[1]
Untreated flow rate (gpm)	2,120	1,760	188	0
Untreated PFOA/PFOS concentration (ng/L)	44	20	<4[1]	<4[1]
Untreated total PFC concentration (ng/L)	120	72	<4[1]	<4[1]
Combined flow rate (gpm)	**2,120**	**2,120**	**2,120**	**2,120**
Combined PFOA/PFOS concentration at the POE (ng/L)	**44**	**24**	**<4[1]**	**<4[1]**
Combined total PFC concentration at the POE (ng/L)	**120**	**60**	**<4[1]**	**<4[1]**

[1] Assumed MRL of 4 ng/L

2.4 Treatment Uncertainties

Conceptual sizing and costs provided in this evaluation were based on assumptions for treatment goals, background water quality, and manufacturer provided media changeout frequency estimates. Actual costs may vary depending on several treatment uncertainties:

- **Influent PFC concentration:** the source of the PFC contamination is currently under investigation and the PFC distribution is not well understood. If concentrations increase, the higher influent concentrations can be treated with the evaluated technologies but will result in more frequent media changeouts and the potential need to treat additional wells.
- **Site-specific water quality**: Background water quality parameters can compete for the adsorption or exchange sites on the GAC or IX resin and result in higher or lower changeout frequencies for the selected media. Bench-scale testing can be conducted to optimize the media selections and refine estimates for changeout frequencies.
- **Method Reporting Limit:** Advances in analytical techniques can decrease the MRL for the PFCs found in the Mill Road wells. For example, MRLs ranged from 20 to 90 ng/L in 2014 but have decreased to approximately 4 ng/L for all PFCs in 2017. Future advances in analytical techniques may further decrease the MRLs and may therefore require more frequent media changeouts to stay below them.

To better determine the impacts of higher influent concentrations and the site-specific water quality, bench or pilot-scale testing of the evaluated technologies would be required.

Section 3
PFC Water Treatment Plant Siting

The PFC WTP will be located within the Mill Road Wellfield prior to the combined POE for the wells. Treatment will require a new WTP to protect the GAC or IX vessels with adequate delivery truck access for media changeouts. The WTP footprint will depend on the number of wells treated and the selected treatment technology (Table 3-1). New yard piping will also be required to connect the wells to the WTP and combine the treated water with any untreated water prior to disinfection and corrosion control treatment.

Table 3-1
Estimated PFC WTP Footprint

	Scenario 1 Well 6	Scenario 2 Wells 6, 8A, 9, 11	Scenario 3 Wells 6, 8A, 9, 11, 20/21
GAC treatment	30' x 45'	50' x 80'	50' x 80'
IX treatment	25' x 40'	50' x 40'	50' x 40'

Siting of the WTP will be determined during detailed design pending selection of the number of wells for treatment and the treatment technology. For the purposes of this evaluation, all capital costs in the following section are based on the facility being located on the south side of the existing access road.

Section 4
Conceptual Cost Opinions

Conceptual Opinions of Probable Construction Costs (OPCC) were developed for the three treatment scenarios based on GAC and IX treatment. The OPCCs are consistent with AACE International Class IV cost estimates. Class IV costs estimates have a typical expected accuracy range of -30%/+50% and are typically for treatment evaluations and feasibility studies. The OPCC were based on equipment costs obtained from GAC and IX manufacturers with cost multipliers utilized to account for ancillary items. The presented costs are based on the following assumptions:

- Lead/Lag vessel configuration
- Recycling of backwash water with a permanent backwash tank
- Treatment will be housed within a metal building to accommodate the required vessel height clearances.
- Treatment facility will be located to the adjacent to the WTP on the south side of the access road
- Well pump upgrades required to account for added head loss
- Cost multipliers
    - Process piping = 15% of equipment costs
    - Electrical = 12% of equipment costs
    - Instrumentation and Controls = 12% of equipment costs
    - General conditions = 15%
    - Contingency = 30%
    - Design Engineering = 12%
    - Construction Phase Engineering = 12%
    - Aquarion Internal Costs = 5%
- Annual O&M costs
    - Labor = $85/hr (burdened rate)
    - Power = $0.11/kWh
    - GAC = $1.75/lb (including disposal)
    - IX = $8.50/lb (including disposal)
    - Assumes total PFC concentration <MRL

Table 4-1 provides OPCC, and expected range of construction costs, for each treatment scenario and technology based on the sizing and budgetary information provided by the manufacturers. Capital costs were similar for Scenarios 1 and 2 for GAC and IX. GAC had the lowest estimated OPCC for treatment of all wells (Scenario 3). Table 4-2 provides conceptual annual O&M costs. Annual O&M costs are driven by the assumed replacement frequencies for the media (Table 2-2 and 2-4). Due to the uncertainty in the GAC replacement frequency, two annual O&M costs are presented to bracket the likely replacement cost. Bench-scale testing would be required to provide more site-specific media replacement frequencies. Table 4-3 provides a comparison of the anticipated rate impacts of the treatment scenarios. The analysis is based on total revenue requirements and is expressed as a percentage assuming an even distribution of increase across all rates and customers. The range in rate increases is based on the expected accuracy of the OPCC. The rate analysis also assumed an annual GAC replacement frequency. Bench-scale testing is required to refine the capital and annual O&M costs. Rate increases could be reduced if grants or other funding sources are available.

Based on the conceptual costs, GAC is the most cost-effective alternative for PFC treatment at Mill Road. GAC is also the only proven PFC treatment technology with operational experience in southern NH. However, IX OPCs were estimated to be within the range of the expected accuracy of the OPCC for GAC. IX could potential be a cost-effective alternative but additional testing is required to confirm media replacement frequencies.

Table 4-1

Conceptual Opinion of Probable Construction Costs[1]

	GAC	IX
Scenario 1 - Well 6	$1,890,000	$1,920,000
Scenario 2 - Wells 6, 8A, 9, 11	$5,750,000	$5,630,000
Scenario 3 - Wells 6, 8A, 9, 11, 20/21	$5,730,000	$6,340,000

[1] Conceptual Capital Costs have an expected accuracy of -30%/+50%.

Table 4-2

Conceptual Annual Operations and Maintenance Costs

	GAC		IX
Annual O&M	2 yr Changeout Frequency	1 yr Changeout Frequency	1.2 -1.5 yr Changeout Frequency
Scenario 1 - Well 6	$73,000	$90,000	$126,000
Scenario 2 - Wells 6, 8A, 9, 11	$254,000	$324,000	$381,000
Scenario 3 - Wells 6, 8A, 9, 11, 20/21	$255,000	$325,000	$409,000

Table 4-3

Rate Increase Analysis[1, 2]

	GAC	IX
Scenario 1 - Well 6	5%	5%
Scenario 2 - Wells 6, 8A, 9, 11	16%	16%
Scenario 3 - Wells 6, 8A, 9, 11, 20/21	16%	18%

[1] Rate increase includes capital and annual operations and maintenance costs. Annual O&M costs for GAC based on one year replacement frequency.

[2] Rate increase is based on the conceptual capital costs for GAC treatment, actual rate increase required will depend on final capital and annual O&M costs.

Section 5
Conclusions and Recommendations

PFCs do not currently have a USEPA drinking water maximum contaminant level. Two PFCs, PFOA and PFOS, have a USEPA Health Advisory Level and a NH AGQS of 70 ng/L combined or individually. PFCs have been detected in several of Aquarion's Mill Road wells. All PFOS and PFOA concentrations in the Mill Road wells have been below the USEPA Health Advisory Level and NH AGQS.

Aquarion has evaluated two alternatives to reduce exposure to PFCs in the Hampton System:

- Blend water from Well 6 with water from other wells in the Mill Road wellfield.
- Treat the water to remove PFCs.

Based on current PFC concentrations in the well water, it is estimated that blending will keep total PFC concentrations in the water from the Mill Road Wellfield below 30 ng/L (Table 5-1). This solution will not result in a rate increase because it will not require new facilities and will not increase annual O&M costs.

To decrease PFC concentrations further, treatment of the well water will be necessary. Aquarion evaluated the alternatives for reducing PFC concentrations at the Mill Road Wellfield described below and summarized in Table 5-1. The evaluation identified GAC adsorption as the most cost-effective treatment technology for PFC removal.

- Treating just the water from well 6 (Scenario 1) is estimated to reduce total PFC concentrations in the water leaving the Mill Road Wellfield to 15 ng/L. This scenario is estimated to require a rate increase of approximately 5% because of the need to construct a treatment facility and increases in annual O&M costs.
- Treating the water from Well 6 and the other shallow, overburden wells in the wellfield (Scenario 2) is estimated to reduce total PFC concentrations in the water leaving the Mill Road Wellfield to below 4 ng/L. This scenario is estimated to result in a rate increase of approximately 16% because of the need to construct a larger treatment facility and more significant increases in annual O&M costs.
- Treating the water from all wells in the Mill Road Wellfield (including the two deep, bedrock wells) (Scenario 3) is not expected to add to the cost that would be incurred for Scenario 2.

Table 5-1

Summary of Estimated PFC Concentrations in Water Entering the Distribution System from Mill Road Wells and Conceptual Costs Based on GAC Treatment

	Blending All Wells	Scenario 1 PFC treatment of water from Well 6	Scenario 2 PFC treatment of water from Wells 6, 8A, 9, 11	Scenario 3 PFC treatment of water from Wells 6, 8A, 9, 11, 20/21
Treated water flow rate (gpm)	0	360	1,930	2,120
PFOA/PFOS concentration entering the distribution system (ng/L)[1]	11	6	<4[2]	<4[2]
Total PFC concentration entering the distribution system (ng/L)[1]	30	15	<4[2]	<4[2]
Conceptual capital cost[3]	$0M	$1.9M	$5.8M	$5.7M
Conceptual annual O&M costs[4]	$0M	$0.1M	$0.3M	$0.3M
Rate increase required[5]	0%	5%	16%	16%

[1] Based on concentration of PFCs in well waters in 2017
[2] Method Reporting Limit (MRL) assumed to be 4 ng/L. MRL is the lowest concentration that can be reported with a reasonable degree of accuracy and precision
[3] Conceptual capital costs have an expected accuracy of -30%/+50%.
[4] Annual O&M costs for GAC are based on a one year replacement frequency.
[5] Rate increase is based on the conceptual capital and annual O&M costs for GAC treatment, actual rate increase required will depend on final capital and annual O&M costs.

Both GAC and IX have been shown to be effective for treating PFOA and PFOS. Shorter chain PFC will be the first PFCs to breakthrough treatment. GAC is estimated to have the lowest capital and annual O&M costs based on this conceptual evaluation. Bench and/or pilot-scale testing is recommended to verify treatment performance and media replacement frequency.

The presented annual O&M costs are based on experience at other groundwater PFC treatment facilities. To better estimate media changeout frequencies, bench or pilot-scale testing is recommended to evaluate the selected treatment technology for the site-specific mix of PFCs and background water quality at the Mill Road wellfield. Bench-scale testing can be completed by the manufacturers or by independent 3rd parties, such as universities. For GAC, bench-scale testing is typically performed using rapid small-scale column tests (RSSCTs) or accelerated column tests (ACTs). Both tests are able to rapidly assess GAC performance using reduced water volumes and can simulate 1 to 2 years of full-scale operation in a matter of weeks. RSSCTs and ACTs typically require between 55 and 110 gallons of water sample per media tested.

The results of the bench-scale testing can be used to refine the full-scale annual O&M costs to determine the optimum treatment technologies. Depending on the results of the testing, a combination of GAC and IX resin could potentially be evaluated to optimize

annual O&M costs. Due to the similar operational strategies of single pass IX and GAC, the vessels could be designed to accommodate either media to provide for future flexibility.

Full-scale applications for stand-alone IX treatment for PFCs are also limited. If IX treatment is selected, pilot-scale testing could be considered in addition to bench-scale testing.

Background water quality data is also limited for some of the parameters that can affect PFC treatment performance. Aquarion is undertaking monthly sampling on all wells for the following parameters:

- Total organic carbon
- Perchlorate
- Chlorate
- Nitrate
- Sulfate

Section 6
References

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APPENDIX A
Conceptual Capital and Annual O&M Costs Estimates

Tighe&Bond

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST
Project: **Scenario 1 - IX**

Estimate Type: ☑ Conceptual ☐ Preliminary Design ☐ Design Development ☐ Construction ☐ Change Order _____% Complete

Prepared By: JRC
Date Updated: 11/3/2017
T&B Project No.: A1000-83A

Spec. Section	Description	Qty	Units	Material/Installed Cost $/Unit	Material/Installed Cost Total	Installation $/Unit	Installation Total	Total
DIVISION 2 - SITE WORK								
	16" Pipe	0	LF	$150	$0		$0	$0
	6 - 8" Pipe	780	LF	$100	$78,000		$0	$78,000
	WTP Site Clearing	5,700	SF	$7	$39,900		$0	$39,900
	Process Piping (15% of Div 15)	1	LS	$70,770	$70,770		$0	$70,770
	Site Security	1	LS	$50,000	$50,000		$0	$50,000
	Backwash Tank Pad	21	CY	$1,100	$23,005		$0	$23,005
	Bituminous Concrete	556	SY	$35	$19,444		$0	$19,444
	Stormwater Management	1	LS	$25,000	$25,000		$0	$25,000
SUBTOTAL - DIVISION 2								**$306,119**
DIVISION 4 - MASONRY/BUILDINGS								
	IX Building	1,000	SF	$125	$125,000		$0	$125,000
SUBTOTAL - DIVISION 4					**$125,000**			**$125,000**
DIVISION 15 - MECHANICAL								
	34,000 gallon Bolted Steel Tank	1	LS	$44,000	$44,000			$44,000
	30 gpm Centrifugal Backwash Recycle Pumps	2	EA	$3,000	$6,000	$2,400	$4,800	$10,800
	30 gpm Cartridge Filters	2	EA	$1,000	$2,000	$800	$1,600	$3,600
	IX Contactors (Lead/Lag Pair with Valves)	1	LS	$304,000	$304,000	$91,200	$91,200	$395,200
	Replacement Well Pumps	1	LS	$13,000	$13,000	$5,200	$5,200	$18,200
SUBTOTAL - DIVISION 15					**$369,000**			**$471,800**
DIVISION 16 - ELECTRICAL								
	Electric Service & Conduits (12% of Div 15)	1	LS	$56,616	$56,616		$0	$56,616
	Instrumentation and Controls (12% of Div 15)	1	LS	$56,616	$56,616		$0	$56,616
SUBTOTAL - DIVISION 16					**$113,232**		**$0**	**$113,232**
SUBTOTAL								**$1,016,151**
General Conditions - Division 1 (15%)								$152,400
Contingency (30%)								$304,800
Total Construction Cost								**$1,473,400**
Design Engineering Services (12%)								$176,808
Construction Phase Engineering Services (12%)								$176,808
Construction and Design Subtotal								**$1,827,016**
Aquarion Internal Costs (5%)								$91,351
Total Project Cost								**$1,920,000**

Annual O&M

No.	O&M Category	Item Description	Quantity	Units	Unit Cost	Total Cost
1	**Energy**	Electricity	12936	kWh	$ 0.11	$ 1,423
2	**Media**	IX Media	5119	lb	$ 8.50	$ 43,512
3	**Consumables**	Cartridge Filters	6	EA	$ 10	$ 59
4	**Analytical**	Treatment Performance and Compliance Monitoring	1	LS	$ 22,500	$ 22,500
5	**Labor**	Treatment Plant Operator	0.25	FTE	$ 85	$ 44,200
6	**Replacement Parts (1% of Capital Cost)**	Replacement Part	1	LS	$ 14,734	$ 14,700
		GRAND TOTAL ANNUAL O&M				**$ 126,000**

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST
Project: **Scenario 2 - IX**

Tighe&Bond

Estimate Type: ☑ Conceptual ☐ Preliminary Design ☐ Design Development ☐ Construction ☐ Change Order ____% Complete

Prepared By: JRC
Date Updated: 11/3/2017
T&B Project No.: A1000-83A

Spec. Section	Description	Qty	Units	Material/Installed Cost $/Unit	Material/Installed Cost Total	Installation $/Unit	Installation Total	Total
DIVISION 2 - SITE WORK								
	16" Pipe	317	LF	$150	$47,550		$0	$47,550
	6 - 8" Pipe	430	LF	$100	$43,000		$0	$43,000
	WTP Site Clearing	20,400	SF	$7	$142,800		$0	$142,800
	Process Piping (15% of Div 15)	1	LS	$248,415	$248,415		$0	$248,415
	Site Security	1	LS	$60,000	$60,000		$0	$60,000
	Backwash Tank Pad	21	CY	$1,100	$23,005		$0	$23,005
	Bituminous Concrete	1,667	SY	$35	$58,333		$0	$58,333
	Stormwater Management	1	LS	$25,000	$25,000		$0	$25,000
SUBTOTAL - DIVISION 2								**$648,103**
DIVISION 4 - MASONRY/BUILDINGS								
	IX Building	2,250	SF	$125	$281,250		$0	$281,250
SUBTOTAL - DIVISION 4					**$281,250**			**$281,250**
DIVISION 15 - MECHANICAL								
	34,000 gallon Bolted Steel Tank	1	LS	$44,000	$44,000			$44,000
	100 gpm Centrifugal Backwash Recycle Pumps	2	EA	$5,500	$11,000	$4,400	$8,800	$19,800
	100 gpm Cartridge Filters	2	EA	$1,750	$3,500	$1,400	$2,800	$6,300
	IX Contactors (Lead/Lag Pair with Valves)	1	LS	$1,150,000	$1,150,000	$345,000	$345,000	$1,495,000
	Replacement Well Pumps	5	LS	$13,000	$65,000	$5,200	$26,000	$91,000
SUBTOTAL - DIVISION 15					**$1,273,500**			**$1,656,100**
DIVISION 16 - ELECTRICAL								
	Electric Service & Conduits (12% of Div 15)	1	LS	$198,732	$198,732		$0	$198,732
	Instrumentation and Controls (12% of Div 15)	1	LS	$198,732	$198,732		$0	$198,732
SUBTOTAL - DIVISION 16					**$397,464**		**$0**	**$397,464**
SUBTOTAL								**$2,982,917**
General Conditions - Division 1 (15%)								$447,400
Contingency (30%)								$894,900
Total Construction Cost								**$4,325,200**
Design Engineering Services (12%)								$519,024
Construction Phase Engineering Services (12%)								$519,024
Construction and Design Subtotal								**$5,363,248**
Aquarion Internal Costs (5%)								$268,162
Total Project Cost								**$5,630,000**

Annual O&M

No.	O&M Category	Item Description	Quantity	Units	Unit Cost	Total Cost
1	**Energy**	Electricity	118478	kWh	$ 0.11	$ 13,033
2	**Media**	IX Media	22345	lb	$ 8.50	$ 189,933
3	**Consumables**	Cartridge Filters	6	EA	$ 10	$ 59
4	**Analytical**	Treatment Performance and Compliance Monitoring	1	LS	$ 90,000	$ 90,000
5	**Labor**	Treatment Plant Operator	0.25	FTE	$ 85	$ 44,200
6	**Replacement Parts (1% of Capital Cost)**	Replacement Part	1	LS	$ 43,252	$ 43,300
		GRAND TOTAL ANNUAL O&M				**$ 381,000**

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST
Project: **Scenario 3 - IX**

Tighe&Bond

Estimate Type: ☑ Conceptual ☐ Preliminary Design ☐ Design Development ☐ Construction ☐ Change Order ____% Complete

Prepared By: JRC
Date Updated: 11/3/2017
T&B Project No.: A1000-83A

Spec. Section	Description	Qty	Units	Material/Installed Cost $/Unit	Material/Installed Cost Total	Installation $/Unit	Installation Total	Total
DIVISION 2 - SITE WORK								
	16" Pipe	370	LF	$150	$55,500		$0	$55,500
	6 - 8" Pipe	0	LF	$100	$0		$0	$0
	WTP Site Clearing	20,400	SF	$7	$142,800		$0	$142,800
	Process Piping (15% of Div 15)	1	LS	$292,485	$292,485		$0	$292,485
	Site Security	1	LS	$60,000	$60,000		$0	$60,000
	Backwash Tank Pad	21	CY	$1,100	$23,005		$0	$23,005
	Bituminous Concrete	1,667	SY	$35	$58,333		$0	$58,333
	Stormwater Management	1	LS	$25,000	$25,000		$0	$25,000
SUBTOTAL - DIVISION 2								**$657,123**
DIVISION 4 - MASONRY/BUILDINGS								
	IX Building	2,250	SF	$125	$281,250		$0	$281,250
SUBTOTAL - DIVISION 4					**$281,250**			**$281,250**
DIVISION 15 - MECHANICAL								
	34,000 gallon Bolted Steel Tank	1	LS	$44,000	$44,000			$44,000
	100 gpm Centrifugal Backwash Recycle Pumps	2	EA	$5,500	$11,000	$4,400	$8,800	$19,800
	100 gpm Cartridge Filters	2	EA	$1,750	$3,500	$1,400	$2,800	$6,300
	IX Contactors (Lead/Lag Pair with Valves)	1	LS	$1,362,000	$1,362,000	$408,600	$408,600	$1,770,600
	Replacement Well Pumps	6	LS	$13,000	$78,000	$5,200	$31,200	$109,200
SUBTOTAL - DIVISION 15					**$1,498,500**			**$1,949,900**
DIVISION 16 - ELECTRICAL								
	Electric Service & Conduits (12% of Div 15)	1	LS	$233,988	$233,988		$0	$233,988
	Instrumentation and Controls (12% of Div 15)	1	LS	$233,988	$233,988		$0	$233,988
SUBTOTAL - DIVISION 16					**$467,976**		**$0**	**$467,976**
SUBTOTAL								**$3,356,249**
General Conditions - Division 1 (15%)								$503,400
Contingency (30%)								$1,006,900
Total Construction Cost								**$4,866,500**
Design Engineering Services (12%)								$583,980
Construction Phase Engineering Services (12%)								$583,980
Construction and Design Subtotal								**$6,034,460**
Aquarion Internal Costs (5%)								$301,723
Total Project Cost								**$6,340,000**

Annual O&M

No.	O&M Category	Item Description	Quantity	Units	Unit Cost	Total Cost
1	**Energy**	Electricity	102501	kWh	$ 0.11	$ 11,275
2	**Media**	IX Media	25,261	lb	$ 8.50	$ 214,719
3	**Consumables**	Cartridge Filters	6	EA	$ 10	$ 59
4	**Analytical**	Treatment Performance and Compliance Monitoring	1	LS	$ 90,000	$ 90,000
5	**Labor**	Treatment Plant Operator	0.25	FTE	$ 85	$ 44,200
6	**Replacement Parts (1% of Capital Cost)**	Replacement Part	1	LS	$ 48,665	$ 48,700
		GRAND TOTAL ANNUAL O&M				**$ 409,000**

Tighe&Bond

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST
Project: **Scenario 1 - GAC**

Estimate Type: ☑ Conceptual ☐ Preliminary Design ☐ Design Development ☐ Construction ☐ Change Order _____% Complete

Prepared By: JRC
Date Updated: 11/3/2017
T&B Project No.: A1000-83A

Spec. Section	Description	Qty	Units	Material/Installed Cost $/Unit	Material/Installed Cost Total	Installation $/Unit	Installation Total	Total
DIVISION 2 - SITE WORK								
	16" Pipe	0	LF	$150	$0		$0	$0
	6 - 8" Pipe	780	LF	$100	$78,000		$0	$78,000
	WTP Site Clearing	5,700	SF	$7	$39,900		$0	$39,900
	Process Piping (15% of Div 15)	1	LS	$64,140	$64,140		$0	$64,140
	Site Security	1	LS	$50,000	$50,000		$0	$50,000
	Backwash Tank Pad	21	CY	$1,100	$23,005		$0	$23,005
	Bituminous Concrete	556	SY	$35	$19,444		$0	$19,444
	Stormwater Management	1	LS	$25,000	$25,000		$0	$25,000
SUBTOTAL - DIVISION 2								**$299,489**
DIVISION 4 - MASONRY/BUILDINGS								
	GAC Building	1,350	SF	$125	$168,750		$0	$168,750
SUBTOTAL - DIVISION 4					**$168,750**			**$168,750**
DIVISION 15 - MECHANICAL								
	34,000 gallon Bolted Steel Tank	1	LS	$44,000	$44,000			$44,000
	30 gpm Centrifugal Backwash Recycle Pumps	2	EA	$3,000	$6,000	$2,400	$4,800	$10,800
	30 gpm Cartridge Filters	2	EA	$1,000	$2,000	$800	$1,600	$3,600
	GAC Contactors (Lead/Lag Pair with Valves)	1	LS	$270,000	$270,000	$81,000	$81,000	$351,000
	Replacement Well Pumps	1	LS	$13,000	$13,000	$5,200	$5,200	$18,200
SUBTOTAL - DIVISION 15					**$335,000**			**$427,600**
DIVISION 16 - ELECTRICAL								
	Electric Service & Conduits (12% of Div 15)	1	LS	$51,312	$51,312		$0	$51,312
	Instrumentation and Controls (12% of Div 15)	1	LS	$51,312	$51,312		$0	$51,312
SUBTOTAL - DIVISION 16					**$102,624**		**$0**	**$102,624**
SUBTOTAL								**$998,463**
General Conditions - Division 1 (15%)								$149,800
Contingency (30%)								$299,500
Total Construction Cost								**$1,447,800**
Design Engineering Services (12%)								$173,736
Construction Phase Engineering Services (12%)								$173,736
Construction and Design Subtotal								**$1,795,272**
Aquarion Internal Costs (5%)								$89,764
Total Project Cost								**$1,890,000**

Annual O&M (1 year changeout Frequency)

No.	O&M Category	Item Description	Quantity	Units	Unit Cost	Total Cost
1	**Energy**					
		Electricity	8029	kWh	$ 0.11	$ 883
2	**Media**					
		GAC Media	20000	lb	$ 1.75	$ 35,000
3	**Consumables**					
		Cartridge Filters	5	EA	$ 10	$ 49
4	**Analytical**					
		Treatment Performance and Compliance Monitoring	1	LS	$ 22,500	$ 22,500
5	**Labor**					
		Treatment Plant Operator	0.1	FTE	$ 85	$ 17,680
6	**Replacement Parts (1% of Capital Cost)**					
		Replacement Part	1	LS	$ 14,478	$ 14,500
		GRAND TOTAL ANNUAL O&M				**$ 90,000**

Annual O&M (2 year changeout Frequency)

No.	O&M Category	Item Description	Quantity	Units	Unit Cost	Total Cost
1	**Energy**					
		Electricity	8029	kWh	$ 0.11	$ 883
2	**Media**					
		GAC Media	10000	lb	$ 1.75	$ 17,500
3	**Consumables**					
		Cartridge Filters	5	EA	$ 10	$ 49
4	**Analytical**					
		Treatment Performance and Compliance Monitoring	1	LS	$ 22,500	$ 22,500
5	**Labor**					
		Treatment Plant Operator	0.1	FTE	$ 85	$ 17,680
6	**Replacement Parts (1% of Capital Cost)**					
		Replacement Part	1	LS	$ 14,478	$ 14,500
		GRAND TOTAL ANNUAL O&M				**$ 73,000**

Tighe&Bond

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST
Project: **Scenario 2 - GAC**

Estimate Type: ☑ Conceptual ☐ Preliminary Design ☐ Design Development ☐ Construction ☐ Change Order _____% Complete

Prepared By: JRC
Date Updated: 11/3/2017
T&B Project No.: A1000-83A

Spec. Section	Description	Qty	Units	Material/Installed Cost $/Unit	Material/Installed Cost Total	Installation $/Unit	Installation Total	Total
DIVISION 2 - SITE WORK								
	16" Pipe	317	LF	$150	$47,550		$0	$47,550
	6 - 8" Pipe	430	LF	$100	$43,000		$0	$43,000
	WTP Site Clearing	20,400	SF	$7	$142,800		$0	$142,800
	Process Piping (15% of Div 15)	1	LS	$234,765	$234,765		$0	$234,765
	Site Security	1	LS	$60,000	$60,000		$0	$60,000
	Backwash Tank Pad	21	CY	$1,100	$23,005		$0	$23,005
	Bituminous Concrete	1,667	SY	$35	$58,333		$0	$58,333
	Stormwater Management	1	LS	$25,000	$25,000		$0	$25,000
SUBTOTAL - DIVISION 2								**$634,453**
DIVISION 4 - MASONRY/BUILDINGS								
	GAC Building	3,750	SF	$125	$468,750		$0	$468,750
SUBTOTAL - DIVISION 4					**$468,750**			**$468,750**
DIVISION 15 - MECHANICAL								
	34,000 gallon Bolted Steel Tank	1	LS	$44,000	$44,000			$44,000
	100 gpm Centrifugal Backwash Recycle Pumps	2	EA	$5,500	$11,000	$4,400	$8,800	$19,800
	100 gpm Cartridge Filters	2	EA	$1,750	$3,500	$1,400	$2,800	$6,300
	GAC Contactors (Lead/Lag Pair with Valves)	1	LS	$1,080,000	$1,080,000	$324,000	$324,000	$1,404,000
	Replacement Well Pumps	5	LS	$13,000	$65,000	$5,200	$26,000	$91,000
SUBTOTAL - DIVISION 15					**$1,203,500**			**$1,565,100**
DIVISION 16 - ELECTRICAL								
	Electric Service & Conduits (12% of Div 15)	1	LS	$187,812	$187,812		$0	$187,812
	Instrumentation and Controls (12% of Div 15)	1	LS	$187,812	$187,812		$0	$187,812
SUBTOTAL - DIVISION 16					**$375,624**		**$0**	**$375,624**
SUBTOTAL								**$3,043,927**
General Conditions - Division 1 (15%)								$456,600
Contingency (30%)								$913,200
Total Construction Cost								**$4,413,700**
Design Engineering Services (12%)								$529,644
Construction Phase Engineering Services (12%)								$529,644
Construction and Design Subtotal								**$5,472,988**
Aquarion Internal Costs (5%)								$273,649
Total Project Cost								**$5,750,000**

Annual O&M (1 year changeout Frequency)

No.	O&M Category	Item Description	Quantity	Units	Unit Cost	Total Cost
1	**Energy**	Electricity	52657	kWh	$ 0.11	$ 5,792
2	**Media**	GAC Media	80000	lb	$ 1.75	$ 140,000
3	**Consumables**	Cartridge Filters	6	EA	$ 10	$ 59
4	**Analytical**	Treatment Performance and Compliance Monitoring	1	LS	$ 90,000	$ 90,000
5	**Labor**	Treatment Plant Operator	0.25	FTE	$ 85	$ 44,200
6	**Replacement Parts (1% of Capital Cost)**	Replacement Part	1	LS	$ 44,137	$ 44,100
		GRAND TOTAL ANNUAL O&M				**$ 324,000**

Annual O&M (2 year changeout Frequency)

No.	O&M Category	Item Description	Quantity	Units	Unit Cost	Total Cost
1	**Energy**	Electricity	52657	kWh	$ 0.11	$ 5,792
2	**Media**	GAC Media	40000	lb	$ 1.75	$ 70,000
3	**Consumables**	Cartridge Filters	6	EA	$ 10	$ 59
4	**Analytical**	Treatment Performance and Compliance Monitoring	1	LS	$ 90,000	$ 90,000
5	**Labor**	Treatment Plant Operator	0.25	FTE	$ 85	$ 44,200
6	**Replacement Parts (1% of Capital Cost)**	Replacement Part	1	LS	$ 44,137	$ 44,100
		GRAND TOTAL ANNUAL O&M				**$ 254,000**

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST
Project: **Scenario 3 - GAC**

Tighe&Bond

Estimate Type: ☑ Conceptual ☐ Preliminary Design ☐ Design Development ☐ Construction ☐ Change Order _____% Complete

Prepared By: JRC
Date Updated: 11/3/2017
T&B Project No.: A1000-83A

Spec. Section	Description	Qty	Units	Material/Installed Cost $/Unit	Material/Installed Cost Total	Installation $/Unit	Installation Total	Total
DIVISION 2 - SITE WORK								
	16" Pipe	370	LF	$150	$55,500		$0	$55,500
	6 - 8" Pipe	0	LF	$100	$0		$0	$0
	WTP Site Clearing	20,400	SF	$7	$142,800		$0	$142,800
	Process Piping (15% of Div 15)	1	LS	$237,495	$237,495		$0	$237,495
	Site Security	1	LS	$60,000	$60,000		$0	$60,000
	Backwash Tank Pad	21	CY	$1,100	$23,005		$0	$23,005
	Bituminous Concrete	1,667	SY	$35	$58,333		$0	$58,333
	Stormwater Management	1	LS	$25,000	$25,000		$0	$25,000
SUBTOTAL - DIVISION 2								**$602,133**
DIVISION 4 - MASONRY/BUILDINGS								
	GAC Building	3,750	SF	$125	$468,750		$0	$468,750
SUBTOTAL - DIVISION 4					**$468,750**			**$468,750**
DIVISION 15 - MECHANICAL								
	34,000 gallon Bolted Steel Tank	1	LS	$44,000	$44,000			$44,000
	100 gpm Centrifugal Backwash Recycle Pumps	2	EA	$5,500	$11,000	$4,400	$8,800	$19,800
	100 gpm Cartridge Filters	2	EA	$1,750	$3,500	$1,400	$2,800	$6,300
	GAC Contactors (Lead/Lag Pair with Valves)	1	LS	$1,080,000	$1,080,000	$324,000	$324,000	$1,404,000
	Replacement Well Pumps	6	LS	$13,000	$78,000	$5,200	$31,200	$109,200
SUBTOTAL - DIVISION 15					**$1,216,500**			**$1,583,300**
DIVISION 16 - ELECTRICAL								
	Electric Service & Conduits (12% of Div 15)	1	LS	$189,996	$189,996		$0	$189,996
	Instrumentation and Controls (12% of Div 15)	1	LS	$189,996	$189,996		$0	$189,996
SUBTOTAL - DIVISION 16					**$379,992**		**$0**	**$379,992**
SUBTOTAL								**$3,034,175**
General Conditions - Division 1 (15%)								$455,100
Contingency (30%)								$910,300
Total Construction Cost								**$4,399,600**
Design Engineering Services (12%)								$527,952
Construction Phase Engineering Services (12%)								$527,952
Construction and Design Subtotal								**$5,455,504**
Aquarion Internal Costs (5%)								$272,775
Total Project Cost								**$5,730,000**

Annual O&M (1 year changeout Frequency)

No.	O&M Category	Item Description	Quantity	Units	Unit Cost	Total Cost
1	**Energy**	Electricity	63622	kWh	$ 0.11	$ 6,998
2	**Media**	GAC Media	80000	lb	$ 1.75	$ 140,000
3	**Consumables**	Cartridge Filters	6	EA	$ 10	$ 59
4	**Analytical**	Treatment Performance and Compliance Monitoring	1	LS	$ 90,000	$ 90,000
5	**Labor**	Treatment Plant Operator	0.25	FTE	$ 85	$ 44,200
6	**Replacement Parts (1% of Capital Cost)**	Replacement Part	1	LS	$ 43,996	$ 44,000
		GRAND TOTAL ANNUAL O&M				**$ 325,000**

Annual O&M (2 year changeout Frequency)

No.	O&M Category	Item Description	Quantity	Units	Unit Cost	Total Cost
1	**Energy**	Electricity	63622	kWh	$ 0.11	$ 6,998
2	**Media**	GAC Media	40000	lb	$ 1.75	$ 70,000
3	**Consumables**	Cartridge Filters	6	EA	$ 10	$ 59
4	**Analytical**	Treatment Performance and Compliance Monitoring	1	LS	$ 90,000	$ 90,000
5	**Labor**	Treatment Plant Operator	0.25	FTE	$ 85	$ 44,200
6	**Replacement Parts (1% of Capital Cost)**	Replacement Part	1	LS	$ 43,996	$ 44,000
		GRAND TOTAL ANNUAL O&M				**$ 255,000**

MEMORANDUM

Conceptual Evaluation of GAC PFAS Treatment for Well 6

TO: Carl McMorran, Aquarion Water Company

FROM: James Collins, Tighe and Bond

COPY: Mark Fois, Aquarion Water Company; Peter Galant, Tighe and Bond

DATE: September 10, 2020

Well 6 is one of six wells located in the Mill Road wellfield that supplies the system through the Mill Rd Water Treatment Plant (WTP). Per and Polyfluoroalkyl Substances (PFAS) have been detected in five of the 6 wells. Well 6 has the highest PFAS concentrations followed by Well 11 and 9, which are located downgradient of Well 6. All of the Mill Rd wells are blended prior to chemical treatment for corrosion control and disinfection at the Mill Rd WTP. New Hampshire has maximum contaminant levels for four PFAS. Regulatory compliance is based on samples collected at the point-of-entry (POE) to the distribution system after all wells are blended and treated at the WTP. Well 6 currently has concentrations of PFOA that exceed the NH MCL and individual blended water samples at the POE has approached or exceeded the NH PFOA MCL.

Tighe & Bond prepared the *Mill Rd Temporary PFAS Treatment* memorandum, August 2020, to summarize the alternatives available for temporary treatment of Well 6. The August 2020 evaluation focused on rental equipment with temporary piping connections assuming short term operation.

The following memorandum summarizes a more detailed cost evaluation for four alternatives for the selected treatment alternative (granular activated carbon (GAC)), which includes purchasing GAC treatment equipment that will be housed in a metal building or the existing garage for year round operation. This evaluation assumes additional winterization, including underground piping, tank insulation, natural gas heating, and ventilation.

1.1 Vessel Sizing

Four GAC vessels sizes were evaluated for treating Well 6 (Table 1-1), 8', 10', and 12', vessels located in a new metal building and 6' vessels for construction within the existing Garage located along Shop Road.

Three vessels sizes were evaluated for footprint and backwash requirements within a new building, but capital costs were only developed for two options to bracket the potential capital costs. For the 8' diameter vessels, a lead and lag vessel would be required to achieve the target Empty Bed Contact Time (EBCT) of 10 minutes. The target EBCT can be achieved with a single 10' or 12' diameter vessel. The evaluated vessels would all be able to keep building heights below 35 feet to avoid additional the need for a zoning variance.

Only the 6' diameter vessel was evaluated for construction within the existing garage building along Shop Road. The garage has an interior clearance height of 15' at the highest point and 8, 10, and 12-foot vessels do not meet this height restriction. Utilization of the existing garage will eliminate the need for a new structure and the associated permitting requirements.

TABLE 1-1
GAC Contactors

	6′ Vessels		8′ Vessels	10′ Vessels	12′ Vessels
Design flow rate (gpm)	360				
Vessel operation	Lead/Lag	Lead	Lead/Lag	Lead	Lead
Number of vessels	4	2	2	1	1
Vessel diameter (ft)	6	6	8	12	12
Media/vessel (lbs)	6,000	6,000	10,000	20,000	20,000
Total installed media (lbs)	24,000	12,000	20,000	20,000	20,000
Standard pressure rating (psi)	125				
Volume of media per vessel (gallons)	1,331	1,331	2,219	4,438	4,438
Design EBCT (min) per vessel	7.4	7.4	6.2	12.3	12.3
Media size (units)	12x40				
Bed volumes treated to media changeout[1]	75,000	60,000	75,000	75,000	75,000
Changeout frequency at design flow rate (days)	385	308	321	642	642
Changeout frequency at 300 gpm flow rate (days)	462	370	385	770	770
GAC Vessel Purchase Price	$314,000 (lead/lag)	$157,000 (lead)	$225,000 (lead/lag)	$210,000 (lead) $370,000 (lead/lag)	$225,000 (lead) $400,000 (lead/lag)

[1] Assumed changeout based on breakthrough of regulated PFAS

[2] Assumed a building large enough for lead/lag operation

1.2 Backwashing

The GAC will require 20 – 30 minutes of backwashing of the media prior to operation after each changeout. The backwash flow rate is approximately 8 gpm/ft^2. Table 1-2 summarizes the backwashing volumes required for each vessel size. The backwash flow rate and volume decrease with smaller diameter vessels. This analysis assumes that waste washwater will be collected in a rental frac tank and either disposed of on-site, if acceptable, or pumped out and disposed of off-site.

Table 1-2
Estimated Backwash Volumes

Vessel Size	Backwash Flow Rate (gpm)	Backwash Volume for One Vessel (gallons)
6′	230	4,500-7,000
8′	400	8,000 – 12,000
10″	630	12,000 – 19,000
12′	900	18,000 – 27,000

To backwash the vessels, temporary hosing would connect to the existing hydrant located near Well 8A or Well 6 on the Well 11 and 9 raw water transmission main depending on the selected treatment location. The temporary hosing can typically be provided by the media vendor during media changeout if the hydrant is located near the treatment facility. Backwash water will be supplied by Well 8A or Wells 9 and 11. Therefore, backwashing will only be able to occur if the well(s) are in operation.

Backwash waste washwater could also be collected in conical settling tanks installed on a concrete pad outside of the metal building. The conical tanks would allow for better settling of the GAC fines for reducing the volume to be disposed of off-site, if required. Two 10,000 gallon conical settlings tanks would be required to allow sufficient storage for the backwash of both eight foot diameter vessels or one 12 foot diameter vessel. This would add an additional cost of approximately $77,000 to the OPCC of the project, including contingency.

All GAC media can release small amounts of arsenic during initial operation (typically less than 200 bed volumes) depending on site specific water quality. Calgon GAC F400AR media was assumed for this evaluation and is expected to have an initial arsenic leaching of less than 5 μg/L after initial backwash. Well 6 is approximately 10% of the total water flow for the Mill Road Water Treatment Plant. After blending, arsenic concentrations will be well below the MCL at the Mill Rd WTP Point of Entry. To further reduce potential arsenic concentrations at startup, Calgon can also provide media with additional acid washing to reduce the expected concentration to less than 2 μg/L. This media has an additional cost of $3,000 for each media changeout.

1.3 Building and Site Design

1.3.1 New Building

The construction costs assume an insulated metal building with a concrete foundation. The building assumes one roll up door, two man doors, lights, gas unit heaters, and ventilation. The building for each vessel alternative was sized to accommodate the vessel skid (two vessels and valve rack) and 8 feet of clearance on each size. The assumed building sizes are summarized in Table 1-3. It was assumed that only one 10′ or 12′ vessel would be initially installed but the building would be sized for adding a second vessel, if required in the future. For the 8′ vessel it was assumed that two vessels would be installed initially and that room for future vessels would not be included.

Table 1-3
Building Size

Vessel Size	Building Size (LxWxH)
8′	38′ x 26′ x 20′
10″	42 x 27 x 27
12′	47′ x 30′ x 20′

Attachment A shows the proposed location of the new temporary building. The building will be located in North Hampton at the corner of the Well 6 access drive and the existing clearing for the raw water mains to Mill Road WTP.

Gas Main

The building was assumed to include gas unit heaters for year round operation. A gas service is provided to the Mill Road Water Treatment Plant. It was assumed that there is sufficient capacity at the gas meter to service the new building. A gas main will be constructed from the gas meter at the Mill Road WTP to the proposed building along the existing water main and electrical clearing.

Site Access

A truck turning analysis was completed to determine clearances for building and site access. The analysis indicated that additional clearing and gravel will be required at the entrance of the Well 6 access drive to allow trucks to enter the Well 6 access road. Trucks entering the facility will be required to turn around at the garage area of Shop Road and then enter the Well 6 access drive from the east. The additional clearing and gravel drive are shown on Sheet 1.

Piping Layout

To isolate Well 6 and allow the operation of Wells 9 and 11 while backwashing, a wye and isolation valve would be cut in before the intersection of Wells 6, 9, and 11. New 8″ HDPE piping would be installed from the wye to the proposed building. Water would be discharged into the existing 16″ water main to the north of the proposed building. A fire hydrant would be installed along the discharge line to allow for filter to waste capability for start-up.

1.3.2 Existing Garage

The 6′ vessels would be located within the existing garage along Shop Road. Two alternatives are presented for the 6′ Vessels, the first alternative includes one vessel pair which provides up to 7.4 min of EBCT per vessel at the design flow and 8.7 min of EBCT at the operating flow. The second alternative includes two 6′ vessel pairs, which allows the facility to operate in lead/lag operation with the same EBCTs per vessel. Note GAC usage rates will increase if the EBCT is less than 10 min. The pilot data showed breakthrough of PFOA at 60,000 bed volumes treated at 7.5 min of EBCT as compared to an anticipated PFOA breakthrough at 75,000 bed volumes treated at 10 min of EBCT.

Gas Main

This analysis assumed that the HVAC system within the existing garage will require upgrading to maintain sufficient heating and ventilation. Therefore, a gas main will be constructed from the gas meter at the Mill Road WTP to the existing garage along Shop Road.

Piping Layout

To treat the Well 6 water at the garage location, a wye and isolation valve would be cut in before the intersection of Wells 6, 9, and 11. Approximately 480 feet of 8" HDPE piping would be installed from the wye along the Well 6 access drive to the existing 8" abandoned cast iron pipe in shop road. Water will be routed through the existing piping past the Mill Road WTP to the existing garage. This will require the contractor to remove the cap that was installed during the construction of the Mill Road WTP and reconnect the pipe at that location. This alternative assumes that the existing 8" cast iron water main is not active between the Mill Road WTP and the garage building.

1.4 Permitting

The following permitting is expected for the construction of PFAS treatment. The selected boiling location will impact local town permitting.

- New Building
  - North Hampton Permitting
    - Special Exception for a public utility building from the ZBA
    - Site Plan Review
  - NHDES design review

- Existing Garage
  - NHDES design review

1.5 Opinion of Probable Construction Cost

The conceptual opinion of probable construction cost (OPCC) for the PFAS treatment systems is based on Class 3 level construction cost estimates, as defined by the Association for the Advancement of Cost Engineering (AACE) International Recommended Practices and Standards. The expected accuracy range of a Class 3 estimate is between -20% to +30%. The conceptual OPCC is based on equipment costs obtained from Calgon Carbon. Cost estimates for the new building were based on 8' and 12' GAC vessels to bracket potential capital costs. The presented costs are based on the following assumptions:

- Installation of one 12' vessel and valve rack or two 8' vessels with valve rack or two 6' vessels with valve rack.
- Waste washwater will be collected in a rental frac tank and discharged locally with fines vacuumed out for disposal.
- PFAS treatment will be located in an insulated metal building with gas unit heaters, one roll up door and two man doors for 8', 10' or 12' vessels.
- PFAS treatment will be located in the existing garage for 6' vessels.
- The existing 8" cast iron main is abandoned between the end of the Well 6 access drive and the existing garage location.
- GAC vessels will have spray-on insulation to minimize sweating in the summer.
- Well pump upgrades are not included
- Cost multipliers:

  - General conditions: 15%
  - Contingency: 20%
  - Design and construction phase engineering: 15%
- Annual O&M costs
  - Replacement frequency based on pilot test data for NH regulated PFAS
  - Labor for media changeout and additional power due to added head loss was excluded from the annual O&M costs
  - Frac tank will be onsite for 30 days

Table 1-4 summarized the opinion of probable construction costs for all four alternatives. Detailed costs estimated are provided in Attachment B. Costs assume no instrumentation or control changes are required. Treatment flow rate will be monitored by the existing Well 6 flowmeter. The primary monitoring parameter for the GAC vessels will be differential pressure, which is assumed to be monitored locally at the GAC vessels.

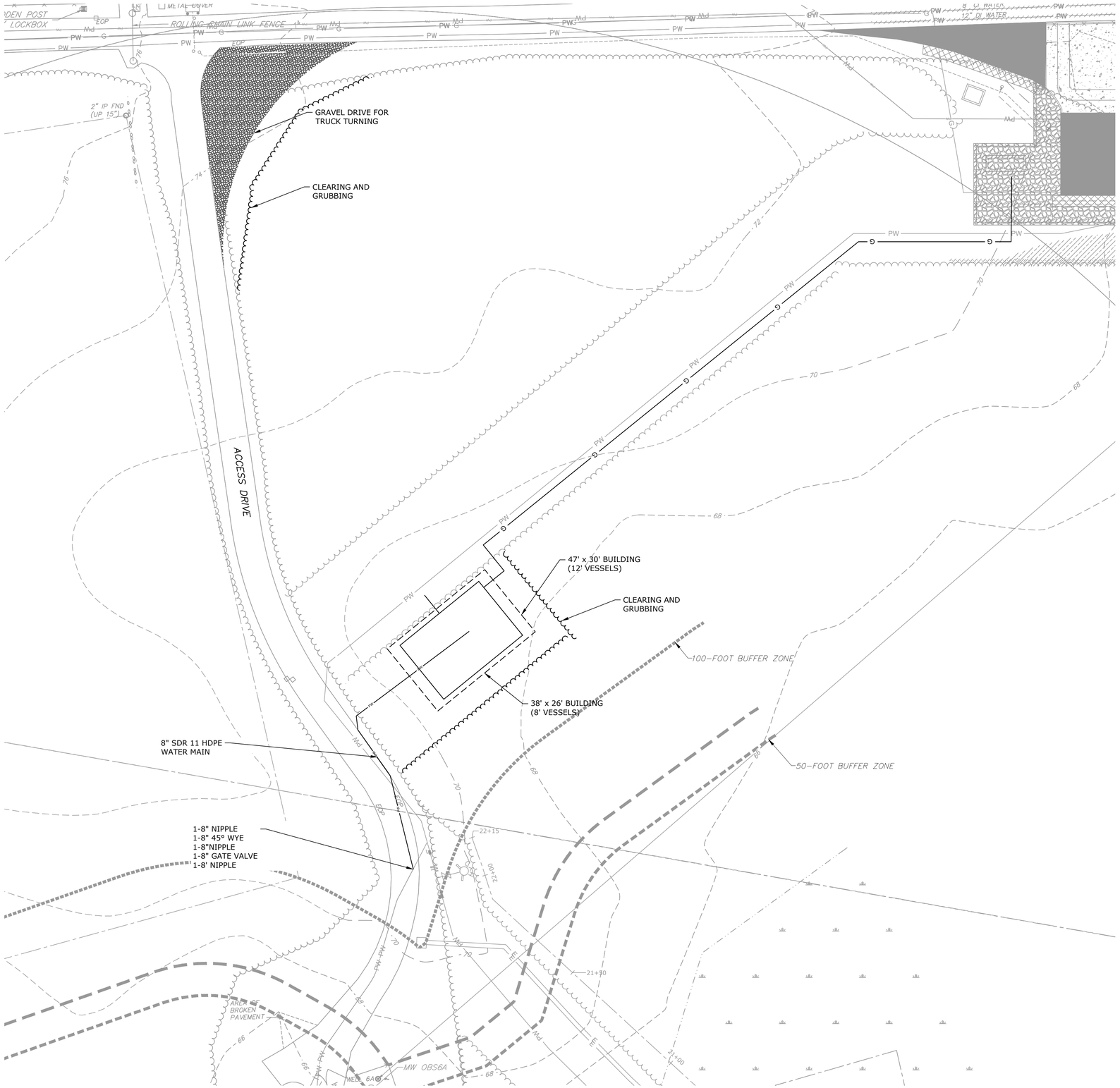
Table 1-4

Opinion of Probable Construction Cost and O&M Costs

	GAC			
	Existing Garage		**New Building**	
	6' Vessels (One Pair)	**6' Vessels (Two Pairs)**	**8' Vessels**	**12' Vessels**
Site Work	$160,140	$160,140	$124,644	$124,644
Building	$41,150	$42,950	$160,437	$215,073
Process Equipment	$201,400	$402,800	$295,000	$297,500
Construction Subtotal	**$402,690**	**$605,890**	**$580,081**	**$637,217**
General Conditions - 15%	$60,404	$90,884	$87,012	$95,583
Contingency - 20 %	$92,619	$139,355	$133,419	$146,560
Engineering - 15%	$83,357	$125,419	$120,077	$131,904
Total Project Cost	**$639,069**	**$961,547**	**$920,588**	**$1,011,264**
Annual O&M Costs for Media Changeout and Backwashing				
Media Replacement	$27,819	$22,279	$22,279	$22,279
Backwash Frac Tank Rental	$1,500	$1,200	$1,500	$750
Total O&M Cost	**$29,319**	**$23,479**	**$23,779**	**$23,029**

Appendix A

Conceptual Layout



NOT FOR CONSTRUCTION

Aquarion Water Company of New Hampshire

MILL ROAD WTP PFAS TEMPORARY TREATMENT

North Hampton, New Hampshire

MARK	DATE	DESCRIPTION

PROJECT NO:	A1000/83A
DATE:	SEPTEMBER 2020
FILE:	Hampton Temporary PFAS Building.dwg
DRAWN BY:	HRB
CHECKED:	JRC
APPROVED:	PJG

SITE PLAN

SCALE: AS SHOWN

SHEET 1

Last Saved: 9/3/2020
Plotted: Thursday, September 03, 2020 - 9:15am By: HRB
Tighe & Bond: J:\A\A1000 AWC\83A - Mill Road PFC Treatment\Drawings_Figures\AutoCAD\Sheets\2020 PFAS\Hampton Temporary PFAS Building.dwg

Tighe&Bond
Engineers | Environmental Specialists

N

EXISTING GARAGE

TWO 6' VESSEL SKID

FUTURE TWO 6' VESSEL SKID

8" SDR 11 HDPE RAW WATER MAIN

CONNECT TO EXISTING 8" WATER MAIN

REMOVE EXISTING CAP AND RECONNECT TO 8" WATER MAIN

2" GAS MAIN

TREATED WATER MAIN (CONNECT TO EXISTING 10" WATER MAIN)

8" SDR 11 HDPE RAW WATER MAIN

1-8" NIPPLE
1-8" 45° WYE
1-8"NIPPLE
1-8" GATE VALVE
1-8' NIPPLE

NOT FOR CONSTRUCTION

Aquarion Water Company of New Hampshire

MILL ROAD WTP PFAS TEMPORARY TREATMENT

North Hampton, New Hampshire

MARK	DATE	DESCRIPTION

PROJECT NO:	A1000/83A
DATE:	SEPTEMBER 2020
FILE:	Hampton Temporary PFAS Building.dwg
DRAWN BY:	HRB
CHECKED:	JRC
APPROVED:	PJG

SITE PLAN

SCALE: AS SHOWN

SHEET 2

SCALE IN FEET
0 30' 60'
GRAPHIC SCALE

Last Saved: 9/9/2020
Plotted: Sep 09, 2020 - 10:48am By: HRB
Tighe & Bond: J:\AA\1000 AWC\83A - Mill Road PFC Treatment\Drawings_Figures\AutoCAD\Sheets\2020 PFAS\Hampton Temporary PFAS Building.dwg

00316

Appendix B

Conceptual Costs

Tighe&Bond

WELL 6 PFAS TEMPORARY TREATMENT - 6' VESSEL SINGLE PAIR EXISTING GARAGE
HAMPTON, NEW HAMPSHIRE

OPINION OF PROBABLE CONSTRUCTION COST

AQUARION WATER COMPANY OF NEW HAMPSHIRE

ITEM	DESCRIPTION	UNITS	QTY	UNIT PRICE	SUB TOTAL	INSTALLATION	TOTAL
1.	**Site Work**						**$160,140**
	8" Water Main to and From Garage	LF	680	$180	$122,400	N/A	$122,400
	8" Wye	EA	2	$320	$640	N/A	$640
	8" Butterfly Valves	EA	5	$1,500	$7,500	N/A	$7,500
	8" 45 Degree Bends	EA	2	$180	$360	N/A	$360
	8" 90 Degree Bends	EA	5	$220	$1,100	N/A	$1,100
	8" Tee	EA	2	$320	$640	N/A	$640
	Hydrant	EA	1	$5,500	$5,500	N/A	$5,500
	Gas Main	LF	550	$40	$22,000	N/A	$22,000
2.	**Building**						**$41,150**
	Concrete Equipment Pads	CY	2	$900	$1,800	N/A	$1,800
	HVAC Equipment	LS	1	$18,600	$18,600	N/A	$18,600
	Chain Link Fence	LF	300	$60	$18,000	N/A	$18,000
3.	**Process Equipment**						**$201,400**
	6' PFAS Vessels and Valve Rack	LS	1	$157,000	$157,000	$31,400	$188,400
	Spray Insulation for PFAS Vessels and Valve Rack	SF	520	$25	$13,000	N/A	$13,000
					$0	N/A	$0
					SUBTOTAL		**$402,690**
4.	**General Conditions - 15%**						**$60,404**
					CONSTRUCTION - SUBTOTAL		**$463,094**
5.	**Contingency - 20%**						**$92,619**
6.	**Design and Construction Phase Engineering - 15%**						**$83,357**
					TOTAL		**$639,069**
					SAY		**$639,000**

O&M Costs

1.	Backwash						$1,500
	Frac Tank Pickup & Delivery	LS	1	720	$720	N/A	$720
	Frac Tank	Days	30	$26	$780	N/A	$780
2.	Media Replacement	lb.	11838	$2.35	$27,819	N/A	$27,819
						Total	$29,319

This is an engineer's Opinion of probable Construction Cost (OPCC). Tighe & Bond has no control over the cost or availability of labor, equipment or materials, or over market conditions or the Contractor's method of pricing, and that the Opinion of Probable Construction Costs are made on the basis of the Tighe & Bond's professional judgment and experience. Tighe & Bond makes no guarantee nor warranty, expressed or implied, that the bids or the negotiated cost of the Work will not vary from this Opinion of the Probable Construction Cost.

Tighe&Bond

WELL 6 PFAS TEMPORARY TREATMENT - 6' VESSEL DUAL PAIR EXISTING GARAGE
HAMPTON, NEW HAMPSHIRE

OPINION OF PROBABLE CONSTRUCTION COST

AQUARION WATER COMPANY OF NEW HAMPSHIRE

ITEM	DESCRIPTION	UNITS	QTY	UNIT PRICE	SUB TOTAL	INSTALLATION	TOTAL
1.	**Site Work**						**$160,140**
	8" Water Main to and From Garage	LF	680	$180	$122,400	N/A	$122,400
	8" Wye	EA	2	$320	$640	N/A	$640
	8" Butterfly Valves	EA	5	$1,500	$7,500	N/A	$7,500
	8" 45 Degree Bends	EA	2	$180	$360	N/A	$360
	8" 90 Degree Bends	EA	5	$220	$1,100	N/A	$1,100
	8" Tee	EA	2	$320	$640	N/A	$640
	Hydrant	EA	1	$5,500	$5,500	N/A	$5,500
	Gas Main	LF	550	$40	$22,000	N/A	$22,000
2.	**Building**						**$42,950**
	Concrete Equipment Pads	CY	4	$900	$3,600	N/A	$3,600
	HVAC Equipment	LS	1	$18,600	$18,600	N/A	$18,600
	Chain Link Fence	LF	300	$60	$18,000	N/A	$18,000
3.	**Process Equipment**						**$402,800**
	6' PFAS Vessels and Valve Rack (Two Pairs)	LS	1	$314,000	$314,000	$62,800	$376,800
	Spray Insulation for PFAS Vessels and Valve Rack	SF	1040	$25	$26,000	N/A	$26,000
					$0	N/A	$0
					SUBTOTAL		**$605,890**
4.	**General Conditions - 15%**						**$90,884**
					CONSTRUCTION - SUBTOTAL		**$696,774**
5.	**Contingency - 20%**						**$139,355**
6.	**Design and Construction Phase Engineering - 15%**						**$125,419**
					TOTAL		**$961,547**
					SAY		**$962,000**

O&M Costs

1.	Backwash						$1,200
	Frac Tank Pickup & Delivery	LS	0.8	720	$576	N/A	$576
	Frac Tank	Days	24	$26	$624	N/A	$624
2.	Media Replacement	lb.	9481	$2.35	$22,279	N/A	$22,279
						Total	$23,479

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Tighe&Bond

WELL 6 PFAS TREATMENT - 8' VESSELS NEW BUILDING
HAMPTON, NEW HAMPSHIRE

OPINION OF PROBABLE CONSTRUCTION COST

AQUARION WATER COMPANY OF NEW HAMPSHIRE

ITEM	DESCRIPTION	UNITS	QTY	UNIT PRICE	SUB TOTAL	INSTALLATION	TOTAL
1.	**Site Work**						**$124,644**
	8" Water Main to and From PFAS Vessels	LF	150	$180	$27,000	N/A	$27,000
	8" Wye	EA	1	$320	$320	N/A	$320
	8" Butterfly Valves	EA	5	$1,500	$7,500	N/A	$7,500
	8" 45 Degree Bends	EA	3	$180	$540	N/A	$540
	8" 90 Degree Bends	EA	2	$220	$440	N/A	$440
	8" Tee	EA	1	$320	$320	N/A	$320
	Hydrant	EA	1	$5,500	$5,500	N/A	$5,500
	Gas Main	LF	285	$40	$11,400	N/A	$11,400
	Electrical Service to Building	LS	1	$57,800	$57,800	N/A	$57,800
	Clearing and Grubbing	SF	1728	$8	$13,824	N/A	$13,824
2.	**Building**						**$160,437**
	Concrete Building Slab	CY	83	$900	$74,667	N/A	$74,667
	Insulated Metal Building	SF	988	$50	$52,150	N/A	$52,150
	HVAC Equipment	LS	1	$18,600	$18,600	N/A	$18,600
	Building Lighting	SF	988	$5	$4,940	N/A	$4,940
	Chain Link Fence	LF	168	$60	$10,080	N/A	$10,080
3.	**Process Equipment**						**$295,000**
	8' PFAS Vessels and Valve Rack	LS	1	$225,000	$225,000	$45,000	$270,000
	Spray Insulation for PFAS Vessels and Valve Rack	SF	1000	$25	$25,000	N/A	$25,000
4.	**General Conditions - 15%**						**$87,012**
				CONSTRUCTION - SUBTOTAL			**$667,093**
5.	**Contingency - 20%**						**$133,419**
6.	**Design and Construction Phase Engineering - 15%**						**$120,077**
					TOTAL		**$920,588**
					SAY		**$921,000**

O&M Costs

1.	Backwash						$1,500
	Frac Tank Delivery and Pickup	LS	1	720	$720	N/A	$720
	Frac Tank	Days	30	$26	$780	N/A	$780
2.	Media Replacement	lb.	9481	$2.35	$22,279	N/A	$22,279

This is an engineer's Opinion of probable Construction Cost (OPCC). Tighe & Bond has no control over the cost or availability of labor, equipment or materials, or over market conditions or the Contractor's method of pricing, and that the Opinion of Probable Construction Costs are made on the basis of the Tighe & Bond's professional judgment and experience. Tighe & Bond makes no guarantee nor warranty, expressed or implied, that the bids or the negotiated cost of the Work will not vary from this Opinion of the Probable Construction Cost.

Tighe&Bond

WELL 6 PFAS TREATMENT - 12' VESSELS NEW BUILDING
HAMPTON, NEW HAMPSHIRE

OPINION OF PROBABLE CONSTRUCTION COST

AQUARION WATER COMPANY OF NEW HAMPSHIRE

ITEM	DESCRIPTION	UNITS	QTY	UNIT PRICE	SUB TOTAL	INSTALLATION	TOTAL
1.	**Site Work**						**$124,644**
	8" Water Main to and From PFAS Vessels	LF	150	$180	$27,000	N/A	$27,000
	8" Wye	EA	1	$320	$320	N/A	$320
	8" Butterfly Valves	EA	5	$1,500	$7,500	N/A	$7,500
	8" 45 Degree Bends	EA	3	$180	$540	N/A	$540
	8" 90 Degree Bends	EA	2	$220	$440	N/A	$440
	8" Tee	EA	1	$320	$320	N/A	$320
	Hydrant	EA	1	$5,500	$5,500	N/A	$5,500
	Gas Main	LF	285	$40	$11,400	N/A	$11,400
	Electrical Service to Building	LS	1	$57,800	$57,800	N/A	$57,800
	Clearing and Grubbing	SF	1728	$8	$13,824	N/A	$13,824
2.	**Building**						**$215,073**
	Concrete Building Slab	CY	116	$900	$104,533	N/A	$104,533
	Insulated Metal Building	SF	1410	$50	$73,250	N/A	$73,250
	HVAC Equipment	LS	1	$18,600	$18,600	N/A	$18,600
	Building Lighting	SF	1410	$5	$7,050	N/A	$7,050
	Chain Link Fence	LF	194	$60	$11,640	N/A	$11,640
3.	**Process Equipment**						**$297,500**
	12' PFAS Vessels and Valve Rack	LS	1	$225,000	$225,000	$45,000	$270,000
	Spray Insulation for PFAS Vessels and Valve Rack	SF	1100	$25	$27,500	N/A	$27,500
					$0	N/A	$0
					SUBTOTAL		**$637,217**
4.	**General Conditions - 15%**						**$95,583**
					CONSTRUCTION - SUBTOTAL		**$732,800**
5.	**Contingency - 20%**						**$146,560**
6.	**Design and Construction Phase Engineering - 15%**						**$131,904**
					TOTAL		**$1,011,264**
					SAY		**$1,011,000**

O&M Costs

1.	Backwash						$750
	Frac Tank Pickup & Delivery	LS	0.5	720	$360	N/A	$360
	Frac Tank	Days	15	$26	$390	N/A	$390
2.	Media Replacement	lb.	9481	$2.35	$22,279	N/A	$22,279
						Total	$23,029

This is an engineer's Opinion of probable Construction Cost (OPCC). Tighe & Bond has no control over the cost or availability of labor, equipment or materials, or over market conditions or the Contractor's method of pricing, and that the Opinion of Probable Construction Costs are made on the basis of the Tighe & Bond's professional judgment and experience. Tighe & Bond makes no guarantee nor warranty, expressed or implied, that the bids or the negotiated cost of the Work will not vary from this Opinion of the Probable Construction Cost.

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 1

Data Request Received: April 14, 2021 Date of Response: April 26, 2021
Request No.: Staff 1-10 Witness: John Walsh

REQUEST: Has the Company considered the cost and impact of further reducing or ceasing the flow-rate at GPW-6 of the Mill Road well field or relocating the well? Please explain further.

RESPONSE:

Please refer to Staff 1-5 Attachment 1. As described in section 1.3 of Staff 1-5 Attachment 1, the full capacity of Well 6 is needed to ensure that the water system has an adequate supply of water to meet maximum day water demands. Thus, the Company is not considering ceasing use or further reducing production from Well 6.

The Company has not considered relocating Well 6. Refer to Figure 1-7, Staff 1-5 Attachment 1.There is a plume of PFAS that is moving into the wellfield. Even if Well 6 could successfully be relocated on the site away from the plume (and success would depend on many factors including possible impacts on the capacity of the other wells), it can be expected that the plume would simply progress towards Wells 11 and 9, and impact those two wells more than they are already being impacted by PFAS. Also, installing a new well would take an estimated one to two years to complete (including time for permitting), during which time the system would continue to have the supply risk that is described in Staff 1-5 Attachment 1 and the Comppany’s response to Staff 1-5.

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 1

Data Request Received: April 14, 2021 Date of Response: April 26, 2021
Request No.: Staff 1-11 Witness: John Walsh

REQUEST: **Petition at 29**
The Memorandum from Tighe & Bond explains additional backwashing and arsenic options totaling $77,000 to the OPCC (opinion of probable construction costs) and $3,000 for each media change out.

a) Please confirm if these costs are included in
   i) the totals of Table ES-1; and
   ii) the requested loan amount of $1,284,750; and
b) Please explain further if the Company has decided if it will implement these additional options; and
c) If the Company has chosen to implement these additional options, please include any effect the additional costs will have on the monthly bill of an average residential customer of the Company.

RESPONSE:

a) The Company decided that it will use rental frac tanks instead of permanent conical settling tanks for handling backwash waste washwater. The $77,000 cost for these settling tanks is not included in the OPCCs for any of the options, in either Table ES-1 or the requested loan amount.

Arsenic is naturally occurring in the GAC media and arsenic concentrations in the treated water can be present for the first several days of operation. The Company has decided that it will have the GAC acid washed to limit arsenic leaching. Two levels of acid washing are available for the best performing GAC in the bench and pilot-scale testing. The first level of acid washing is expected to maintain arsenic concentrations below 5 µg/L during initial start-up. This level of acid washing adds an additional $0.60/lb or $12,000 per 20,000 lbs of GAC. A higher level of acid washing can be selected that is expected to maintain arsenic concentrations below 2 µg/L during initial start-up. The higher level of acid washing adds an additional $0.15/lb or $3,000 per 20,000 lbs of GAC. Please refer to Company's petition in this matter, Exhibit JPW-3 (Bates page 9).

Construction costs for all four options for the initial fill of GAC and annual O&M costs for GAC replacement in Tighe and Bond's memorandum include acid washed GAC that is expected to maintain arsenic concentrations below 5 µg/L during initial start-up. This level of acid washing was selected based on the understanding that the NH arsenic Maximum Contaminant Level will decrease to 5 µg/L in July 2021. Thus, the higher

Data Request Received: April 14, 2021 Date of Response: April 26, 2021
Request No.: Staff 1-11 Witness: John Walsh

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level of acid washing referred to in Tighe and Bond's memorandum was not selected; as such, its cost (i.e. $3,000 for each media change out) is not included in the annual O&M costs shown in the memorandum.

b) As noted for "a", the Company decided not to implement these two options.

c) As noted for "a", the Company decided not to implement these two options.

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 1

Data Request Received: April 14, 2021 Date of Response: April 26, 2021
Request No.: Staff 1-12 Witness: Donald Smiarowski

REQUEST: **Petition at 3 and Testimony of John Walsh and Donald Smiarowski at 13**
The Company indicates the financing from the DES is lower than both the 10-year and 30-year U.S. Treasury rates as of March 25, 2021. At any point in time prior to March 25, 2021, or prior to the submittal of the PFAS RLF application to DES on February 10, 2021, and the establishment of the PFAS RLF in 2020, did the Company contact any outside lenders as to their long-term loan rates or perform an analysis of using other sources of financing including but not limited to internal sources?

RESPONSE: The 1.55% rate by the DES for up to a 25-year loan has been locked since August 6, 2020 when the 10-year and 30-year U.S. Treasury ("UST") averaged around 0.60% and 1.20% respectively for the last week of July 2020 and the first week of August 2020. Those rates were at 1.18% and 1.95% on February 9, 2021 and 1.74% and 2.41% at the time of filing on March 31, 2021.

The Company contacted one of its current outside lenders on March 23, 2021 and was advised that a secured 20-year amortizing financing would be around 3.70% (which was 146 basis points above the 20-year UST at the time). The Company does not have access to any internal sources of long-term financing.

Finally, the Company confirmed its understanding by reaching out to a placement agent on April 22, 2021 and was advised that an indicative rate for a 25-year amortizing loan would be around 2.51% (secured) - 2.56% (unsecured). The spread would be 95 to 100 basis points above the 10-year UST.

The Company's expectation based on discussion with lenders, and past experience in recent financings is that any new financing would be subject to a spread above the UST. Given that the current UST rates are above 1.55%, the Company has determined that the DES financing would be the lowest cost long-term alternative, even more so with the opportunity for up to 50% contingent reimbursement which would not be available with the other lenders.

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 1

Data Request Received: April 14, 2021 Date of Response: April 26, 2021
Request No.: Staff 1-13 Witness: J. Walsh / D. Smiarowski

REQUEST: **Petition at 14 and Testimony of John Walsh and Donald Smiarowski at 16 & 17**
The Company indicated it applied for, and received, a grant of 25% ($428,250) of the overall estimated costs of the project ($1,713,000) thereby leaving $1,284,750 to be financed through other options. The Company also indicated the grant amount of 25% was requested as it was the Company's belief this was the typical maximum amount given. Has the Company considered contacting the DES to discuss the possibility of increasing the grant and thereby decreasing the requested loan amount?

RESPONSE: Please refer to the Prefiled Testimony of John Walsh and Donald Smiarowski, Bates page 15. Based on the Company consultants' experience with other clients, 25% is the typical maximum amount that is given in the form of a grant without extenuating circumstances.

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 1

Data Request Received: April 14, 2021 Date of Response: April 26, 2021
Request No.: Staff 1-14 Witness: J. Walsh / D. Smiarowski

REQUEST: **Exhibit DJS-3 at 39,**
The Company's Proforma Income Statement does not appear to reflect the addition of the annual O&M costs or the additional depreciation expense of the added plant. Please explain further.

RESPONSE: The Company does not expect to complete the project until the end of 2021. The Company's main purpose for providing the Proforma Income Statement was to show the impact of the grant that the Company has been approved for and the requested loan as of December 31, 2020.

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 1

Data Request Received: April 14, 2021 Date of Response: April 26, 2021
Request No.: Staff 1-15 Witness: John Walsh

REQUEST: **Petition at 1**
Please provide a copy of the DES RLF application including any and all approvals from the DES not already submitted as part of the instant filing.

RESPONSE: The PFAS Remediation Loan Fund has a two step approval process; an eligibility request and final application. To date the eligibility request has been submitted and approved. Please refer to Staff 1-15 Attachment 1 for the Company's Eligibility Request to NH DES.

ELIGIBILITY REQUEST

Water Division/Drinking Water and Groundwater Bureau
Per- and Polyfluoroalkyl Substances
Remediation Loan Fund (PFAS RLF)

RSA 485-H/Env-Dw 1400

1. **PUBLIC WATER SYSTEM INFORMATION**	
Water System Name: Aquarion Water Company of New Hampshire	PWS ID #: NH1051010
Town/City: Hampton	Municipal ☐ Private ☒
Contact Person: John Walsh	Title: : Vice President of Operations & Utility Innovation
Email: : JWalsh@aquarionwater.com	Phone: 781-413-6175

2. **PROJECT TITLE:** Mill Road Wellfield PFAS Treatment

3. **PROJECT DESCRIPTION**

Provide a concise description of the proposed project and the need for the proposed project, including how it will address public health protection, what alternatives have been considered, and a demonstration of how the eligibility requirements of RSA 485-H:3, I are met. The proposed project will provide treatment for Per- and Poly-flouroalkyl Substances (PFAS) present within groundwater at the Mill Road well field. The well field consists of 6 wells in Hampton and North Hampton, NH and is critical to meet water supply needs of the Hampton, North Hampton, and Rye communities. PFAS concentrations (in particular, PFOA) at the point of entry (POE) have exceeded the newly adopted New Hampshire Maximum Contaminant Levels (MCLs) on an individual sample basis and the running annual average is currently over 80% of the MCL. PFAS concentrations, particularly PFOA, are rising in the wells. To continue to meet the MCL at the Mill Rd WTP POE, blending will require increasingly lower production volumes from Wells 6, 9 and 11. Absent the capacity to remove PFOA, the practical effect will be a substantial loss of production capacity in just a few years. The proposed project includes granular activated carbon (GAC) treatment for Well 6, which is the well with the highest concentrations

4. **COMMUNITY INFORMATION, if available**

Current Residential Water Rate: $ 670.57/single family home/year

Based on 71,996 gallons/year. If cost of water is included in other charges (rent, condo fees), break out the estimated annual cost per unit of water. NHDES may request back-up documentation as these figures are used to determine affordability.

Median Household Income (MHI): $ Hampton - $92,688 North Hampton - $103,649 Rye - $103,482

If known, MHI of population served using results of a recent income survey or latest data from the American Community Survey.

Note: An income survey may be required for small, privately-owned water systems serving portions of a community where the survey data does not accurately reflect the income of the residents.

5. **PROJECT SCHEDULE, to the extent available**	
Anticipated Authority to Borrow Date:	March 2021
Anticipated Design Start Date:	November 2020
Anticipated Construction Contract Award Date:	March 2021
Anticipated Project Completion Date:	June 2021

6. **LOAN FUNDING REQUEST**

Requested Loan Amount:	$ 1,284,750
Loan Term* (5, 10, 15, 20 or 30** years):	20 years

Notes

** Loan term cannot exceed the life-cycle cost of the financed asset/improvement.*

*** Loans to disadvantaged water systems may be for a term of up to 30 years.*

7. ESTIMATED PROJECT COSTS, to the extent available and necessary to support the demonstration of eligibility

Project Costs

List all cost categories for this project with amounts that relate to PFAS remediation only.

Category	Amount
Construction Costs:	$ 1,242,000
Construction Contingency (10%):	$ 248,000
Planning/Engineering Costs:	$ 233,000
Other (describe):	$
	$
	$
Total Estimated Project Costs:	$ 1,713,000

Assumptions made in estimating costs: Project costs are based on an opinion of probable construction cost (OPCC) included in Conceptual Evaluation of GAC PFAS Treatment for Well 6 dated February 2021

Other Funding Sources Contributing to the Project:

Source	Secured	Amount	Status
Drinking Water Groundwater Trust Fund		$ 428,250	Approved 2/8/2021
		$	
		$	

Applicant certifies that the information in the application and in the attachments is true, not misleading and as complete as practicable to the best of the representative's knowledge and belief. Applicant understands that any department determination that the applicant and the applicant's project qualifies for funding from the PFAS RLF that is based on false, incomplete, or misleading information is subject to modification, up to and including reversal, through an adjudicative proceeding conducted in accordance with applicable provisions of Env-C 200. Applicant also understands that the signer is subject to the penalties specified in New Hampshire law for falsification in official matters, currently RSA 641.

If the applicant's authorized representative is, or is acting on behalf of, a listed engineer as defined in Env-C 502.10, the signature also constitutes certification that the signer understands that the submittal of false or misleading information is grounds for debarring the listed engineer from the roster.

Signature of Authorized Representative

Vice President of Operations and Utility Innovation
Title

February 9, 2021 | 8:10 AM EST

Date

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 1

Data Request Received: April 14, 2021 Date of Response: April 26, 2021
Request No.: Staff 1-16 Witness: John Walsh

REQUEST: **Tighe and Bond Report (Bates number 28 & 33)**

a) Regarding the change out frequency of the carbon media, please detail the potential cost of replacing the carbon media and the frequency of those change outs for all four options.
b) Please confirm whether the Company intends to treat the carbon media as an annual operations and maintenance expense item or a capital investment?
c) In the event the Company intends to expense the carbon media change outs, please reconcile that with the projected annual increase to O&M costs, which states the same media replacement cost for an 8' vessel as the 12' vessel, even though according to Bates number 28, both have different change out frequency rates (321 vs. 642 days).
d) Please also detail the Company's efforts to mitigate potential increases in carbon media replacement in the future.
e) Has the Company, furthermore, analyzed the market for carbon media? Is the Company aware of an upward trend in cost for carbon media, especially in light of its increased demand?
f) Did the Company consider the change out rate and associated costs in its selection of the proposed solution?

RESPONSE:

a) Please refer to Staff 1-5 Attachment 1. GAC replacement frequency is dependent on a number of factors (e.g. influent PFAS concentrations, flow rate). For the "existing garage" options, the evaluation conservatively assumed that two vessels (one pair) would require GAC replacement each year prior to the peak demand season. For the "new building" options, GAC replacement was based on the calculated days to breakthrough, but similarly could require pre-scheduled replacements prior to breakthough to avoid having to perform a GAC replacement, and thus reduction in system supply capacity, during the peak demand season.

   Its important to note that in practice, the cost of GAC will be less with lead/lag operation than lead-only operation because with lead/lag operation, the GAC can be used past PFAS breakthrough (i.e., PFAS present in the treated water) (because of both the PFAS removal benefit provided by the lag vessel and because GAC replacements can be done at any time of year), whereas with lead-only operation, the GAC cannot be reliably and

safely used past PFAS breakthrough. Staff 1-5 Attachment 1 discusses these options in greater detail.

b) The initial quantity of GAC is part of the total project cost. Subsequent replacements will be expensed.

c) The average annual O&M costs ($/yr) are based on the estimated GAC usage rate (lbs/yr) (which is independent of vessel size) times the cost of GAC ($/lb). This is why the 8' and 12' diameter vessels have the same average annual O&M cost. The carbon replacement frequencies (vessel/yr) are based on the GAC usage rate (lbs/yr) divided by the vessel size (lbs/vessel). The 8' diameter vessels contain half the carbon as the 12' vessels (10,000 lbs vs 20,000 lbs) resulting in a need to replace the GAC twice as frequently at the same GAC usage rate. Please refer to Staff 1-5 Attachment 1 for more details.

d) Compared to the lead-only options, the lead/lag option (the selected option) will help reduce GAC replacement because this option provides more complete use of the absorptive capacity of the GAC as it allows the GAC to be used past PFAS breakthrough as described in "a" above and in Staff 1-5 Attachment 1.

e) The company has not performed an evaluation of GAC media price trends.

f) Refer to Staff 1-5 Attachment 1. One reason that the company selected the proposed solution is the benefits of lead/lag vessel operation, including the fact that it allows the GAC to be fully utilized to breakthrough and therefore will result in the lowest annual O&M cost. Note again that this is not reflected in the Tighe and Bond memos, Company Application, Exhibit JPW-3, because for the memos it was conservatively assumed that for the existing garage options, GAC replacement would be done for one pair of GAC vessels each year.

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 2

Data Request Received: May 13, 2021 Date of Response: May 19, 2021
Request No.: Staff 2-1 Witness: John Walsh

REQUEST: Relative to the status of the construction of the Company's solution (8' Vessels (Two Pairs)):

a) Will the Company begin construction on the chosen solution before possible approval from the Commission?

b) Has the Company spent any internal funds on the project that will be reimbursed by the financing? If so, please detail the funds expended by the Company which will be reimbursed with PFAS funding or grant money.

c) Has the Company already begun construction of the project?

d) If construction has not started, please verify when and if contracts have been signed obligating construction crews to a certain date.

RESPONSE:

a.) The Company has awarded and is in process of drafting a contract with Jamco Excavators LLC to complete this work as soon as possible and anticipate the start of construction prior to Commission approval.

b.) Through April 2021, the Company has spent $161,432 on the project related to planning and design ($116,444) as well as a deposit related to the purchase of the first pair of GAC Vessels ($44,988) which will be reimbursed with PFAS funding or grant money.

c.) The Company has not broken ground on the project but has secured key materials and contracts.

d.) Contracts are being processed currently and a copy will be provided to the Commission.

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 2

Data Request Received: May 13, 2021 Date of Response: May 19, 2021
Request No.: Staff 2-2 Witness: John Walsh

REQUEST: **Referencing Staff 1-9, Attachment 2, Page 17, Tighe & Bond memo dated November 6, 2017**
This memo discusses the regeneration of spent, or previously used, GAC media for re-use rather than new using new GAC media in the vessels. Please explain further if this option is, or is not, used, and if it does or does not result in any savings to the Company and the Company's customers.

RESPONSE: The intial GAC to be installed during construction will be virgin GAC media. After the media is exhausted, two commonly used options are available; 1) virgin media can be purchased and the media vendor can then regenerate the spent media and use it for other applications, or 2) the GAC media from the Mill Road PFAS WTP can be taken off-site, regenerated by the media supplier, and reinstalled at the Mill Road PFAS WTP. Aquarion will solicit bids from the GAC vendors for both options when GAC replacement is required to determine the most cost and schedule effective solution. The most cost effective solution may change over time as GAC media prices change. Regeneration and re-installation requires additional time for shipping and regeneration of the media while virgin media can be removed and replaced in a day. With the selection of the two pair option operating in lead/lag configuration, regeneration and re-use of the GAC is more feasible as treatment can be maintained by the lag vessel pair during the regeneration process. With the single pair option this would not be possible without taking the facility offline for an extended period of time.

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 2

Data Request Received: May 13, 2021 Date of Response: May 19, 2021
Request No.: Staff 2-3 Witness: John Walsh

REQUEST: **Referencing Bates page 21, Tighe and Bond memo dated February 8, 2021 & Company Response to Staff 1-9 Attachment 3, Tighe & Bond memo dated September 10, 2020**
In the February 8, 2021 memo, the Company was presented with four solutions to the PFAS concerns to which the Company indicated it chose the 8' Vessels (Two Pairs) within the existing garage. The NH DES has expressed support for a solution (Petition at 45) dated March 3, 2021, however, did the Company submit all four options presented in either the September 10, 2020 or the February 8, 2021 Tighe & Bond memos to the NH DES for its review and subsequent letters of PFAS RLF approval and letter of support? If so, please cite the supporting statements from NH DES, which relate to the specific project selected by the Company (8' Vessels (Two Pairs)).

RESPONSE: The February Tighe and Bond memo was submitted to DES for both the Drinking Water and Groundwater Trust Fund and PFAS Remediation Loan Fund applications. The February Tighe and Bond memo presented all four alternatives and applications included the two pairs of 8' diameter vessels in the existing garage as the basis of the project costs (i.e. $1.7M) that were requested in the grant and loan applications and were approved by DES. DES did not directly comment on the alternative selection other than approving the applications as submitted with the presented alternatives in the supporting documents.

Please refer to Staff 1-8 for additional information.

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 2

Data Request Received: May 13, 2021 Date of Response: May 19, 2021
Request No.: Staff 2-4 Witness: John Walsh

REQUEST: **Referencing Company's response to Staff 1-8, DES Design Review Letter, Page 3, Item #4**
The Company has referenced the possibility of treating additional wells beyond well #6, specifically, wells #9 and #11. The DES letter attached to the Company's response to Staff 1-8 noted that it appeared a new building would have to be constructed to fit additional treatment for the other wells. Please explain further, and provide supporting documentation and references, if the treatment of additional wells, such as #9 and #11, does in fact require an additional, new building, or whether there is another method with which the Company has explored when, and if, treatment of additional wells is required.

RESPONSE: The DES letter was based on the design drawings that only showed the proposed two pairs of 8' diameter and did not include the identified space for adding an additional three pairs of future vessels. Additional demolision work within the garage would be required to fully utilize the existing space, which was not included in the design drawings that were reviewed by DES. The existing garage can hold five pairs of 8' diameter GAC vessels, as described in Section 1.4.2 of the April 21, 2021 Tighe and Bond memo. This is enough space to provide capacity to treat Wells 6 and 11 in lead/lag configuration or Wells 6, 9, and 11 in lead configuration. An addition to the garage would be required for treating Wells 6, 9, and 11 in lead/lag configuration or if treatment of the full Mill Road well field is required.

AQUARION WATER COMPANY OF NEW HAMPSHIRE, INC.
2021 PFAS RLF FINANCING REQUEST

DW 21-072

Aquarion Water Company's Responses to Staff Data Requests—Set 2

Data Request Received: May 13, 2021 Date of Response: May 19, 2021
Request No.: Staff 2-5 Witness: John Walsh

REQUEST: **Referencing Petition at 31 and Company's Response to Staff 1-9, Attachment 3, Page 6**
The Tighe & Bond memo dated September 10, 2020, lists an opinion of probable construction costs in Table 1-4 for the four options explored in that memo. A subsequent Tighe & Bond memo submitted with the Petition, dated February 8, 2021, also lists an opinion of probable construction costs in ES-1 for the four options explored in that memo. In both of these tables, the total project cost estimates under the new building options are the same, $920,588 and $1,011,264 respectively. However, it appears as if the February report replaced the 6' foot vessel options located in the existing garage with 8' foot vessel options located in the existing garage. This change also appears to have increased the total project costs accordingly and the Annual Operation and Maintenance expense as well. Please explain further:

a) Why the 6' foot vessel option was replaced by the 8' foot vessel option even though page 1 of the September memo stated that only the 6' foot vessel will fit in the existing garage due to the current height of the building of 15' feet.
b) The increase in the Total O&M expense in all of the options from the September report to the February report with supporting calculations.

RESPONSE:

a) At the time of the September 10, 2020 memo, 6' diameter vessels were the largest size identified that could fit within the height of the existing garage. Subsequent to the release of that memo, an 8' diameter vessel was identified that would fit within the existing garage.

   The advantage of an 8' diameter vessel is that it can hold up to 7,500 lbs of GAC media compared to 6,000 lbs for a 6' diameter. The additional GAC capacity maximizes the available Empty Bed Contact Time and hydraulic capacity of the treatment system. The higher EBCT can result in higher PFAS removal capacity, which can assist with reducing annual O&M costs. The higher hydraulic capacity optimizes the available space in the existing garage to maximize the expansion capacity for additional wells.

b) Annual O&M cost assumptions were updated for the February Tighe and Bond memo to account for additional operating costs including natural gas for heating and monthly water quality sampling. The September 10, 2020 memo focused on the differences between the alternatives (Table 1) and the February

Data Request Received: May 13, 2021 Date of Response: May 19, 2021
Request No.: Staff 2-5 Witness: John Walsh

8, 2021 memo was expanded for a better understanding of the total annual O&M increase compared to current operations for budgetary planning (Table 2). The addition of natural gas and water quality sampling resulted in a $23,000 increase in the evaluated annual O&M costs. GAC media replacement costs were identical for the new building options (i.e. $22,279) in both memos. The annual GAC media replacement costs for the existing garage options were higher in the Febuary memo because of the conservative assumption that the GAC media would be changed out annually to avoid shutdowns during peak demand season as discussed in Section 1.4.3 of the April 26, 2021 Tighe and Bond memo. Refer to Staff 1-16 for additional information regarding GAC change out frequency and assumptions.

Table 1. Tighe and Bond September 10, 2020 GAC Evaluation Annual O&M Costs

	Existing Garage		**New Building**	
	6' Vessels (One Pair)	**6' Vessels (Two Pairs)**	**8' Vessels (One Pair)**	**12' Vessels (One Vessel)**
Media Replacement	$27,819[1]	$22,279[2]	$22,279[2]	$22,279[2]
Backwash Frac Tank Rental	$1,500	$1,200	$1,500	$750
Total O&M Cost	**$29,319**	**$23,479**	**$23,779**	**$23,029**

[1] Assumes GAC replacement at 60,000 bed volumes treated due to lower empty bed contact time.

[2] Assumes GAC replacement at 75,000 bed volumes treated

Table 2. Tighe and Bond February 8, 2021 and April 26, 2021 GAC Evaluation Annual O&M Costs

	Existing Garage		**New Building**	
	8' Vessels (One Pair)	**8' Vessels (Two Pairs)**	**8' Vessels (One Pair)**	**12' Vessels (One Vessel)**
Backwash Tank Rental	$2,000	$2,000	$1,000	$1,000
GAC Replacement	$35,250[1]	$35,250[1]	$22,279[2]	$22,279[2]
Water Quality Sampling	$21,000	$21,000	$21,000	$21,000
Natural Gas (Heating)	$2,000	$2,000	$2,000	$2,000
Total O&M Cost	**$60,250**	**$60,250**	**$46,279**	**$46,279**

[1] Assumes annual GAC replacement prior to peak demand season

[2] Assumes GAC replacement based on monitoring of PFAS breakthrough.