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Valatie PFAS Treatment Preliminary Engineering Report

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September 2025

Village of Valatie
New York

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EXECUTIVE SUMMARY

Weston & Sampson, on behalf of the Village of Valatie, New York has prepared this feasibility report for PFAS removal at their drinking water sources. New York recognizes the issue of PFAS contamination in drinking water, and Valatie has reported MCL exceedance at one of its wells. Upon exceedance, the Village of Valatie began corresponding with Weston & Sampson regarding potential solutions. In May 2022, the Village of Valatie and Weston & Sampson entered a contract to evaluate options to address PFAS contamination in the drinking water. This feasibility study considered cost, ease of operation and maintenance, space restrictions, and existing water quality characteristics to provide the most efficient and effective treatment system recommendation. After considering all practical options, Weston & Sampson recommends that the Village of Valatie implement a centralized filtration and PFAS treatment system to treat water from all four of its groundwater wells. This report details the discussion of PFAS contamination in Valatie, the treatment options considered, recommendations, and next steps.

1.0 PFAS OVERVIEW

PFAS in drinking water has been an important emerging issue nationwide. PFAS, or per- and polyfluoroalkyl substances, are a group of man-made chemicals that have been manufactured and used in a variety of industries since the 1940s. Sources of PFAS range from everyday consumer products such as Gore-Tex, non-stick cookware (i.e. Teflon), and fast-food packaging to industrial goods such as aqueous firefighting foams. Because PFAS products have been so widely used, most people have been exposed to them.

PFAS are persistent in the environment and in the human body and can bioaccumulate over time. They have been nicknamed “forever chemicals” because once they are in the environment, they are nearly impossible to remove without human intervention. PFAS can enter the human body via a variety of pathways, however the most common is ingestion of contaminated food or water. Studies link very low levels (measured in parts per trillion) of PFAS to a variety of health effects including developmental effects in fetuses and infants, effects on the thyroid, liver, kidneys, certain hormones, and the immune system.

1.1 PFAS Regulations - EPA

Under the Safe Drinking Water Act, the US EPA is responsible for managing and evaluating the quality of potable drinking water sources in the United States. Part of this process is to sponsor and conduct research on the impacts of certain potentially harmful chemicals and assess their health effects. This plan sets timelines for the EPA to act in safeguarding the public from PFAS contamination. In general, the US EPA has set goals and objectives to research, restrict, and remediate PFAS contamination. The US EPA’s efforts result in polices, guidelines, and regulations with the intent to limit harmful exposure of chemicals based on scientific information and economic feasibility.

On April 10, 2024, EPA announced the final National Drinking Water Regulations (NPDWR) for six PFAS. EPA established legally enforceable levels, called Maximum Contaminant Levels (MCLs), for PFOA, PFOS, PFHxS, PFNA, and HFPO-DA as contaminants with individual MCLs, and PFAS mixtures containing at least two or more of PFHxS, PFNA, HFPO-DA, and PFBS using a Hazard Index MCL to account for the combined and co-occurring levels of these PFAS in drinking water. These MCLs are shown in Table 1-1.

Table 1-1. EPA Proposed Maximum Contaminant Levels for PFAS

Compound	Final MCL Goal	Final MCL (enforceable levels)
PFOA	Zero	4.0 ppt
PFOS	Zero	4.0 ppt
PFHxS	10 ppt	10 ppt
PFNA	10 ppt	10 ppt
HFPO-DA (commonly known as GenX Chemicals)	10 ppt	10 ppt
Mixtures containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS	1 (unitless) Hazard Index	1 (unitless) Hazard Index

On May 14, 2025, EPA announced the agency will keep the current National Primary Drinking Water Regulations (NPDWR) for PFOA and PFOS. The EPA also announced its intent to rescind the regulations and reconsider the regulatory determinations for PFHxS, PFNA, HFPO-DA (commonly known as GenX), and the Hazard Index mixture of these three PFAS plus PFBS. To allow drinking water systems more time to develop plans for addressing PFOA and PFOS where they are found and implement solutions, EPA plans to provide additional time for compliance, including a proposal to extend the compliance date to 2031. EPA plans to issue a proposed rule Fall 2025 and finalize this rule in the Spring of 2026.

1.2 PFAS Regulations – New York State

Of the current 7,000 chemical compounds designated as PFAS, Perfluorooctane sulfonate (PFOS) and Perfluorooctanoic acid (PFOA) have received the most attention for having higher related health risks that do not have set regulations and minimal standards. As a result, New York State has made advancements to regulate PFAS for 2021 through 2024. The New York State Department of Conservation (DEC) has since issued guidance, and the New York State Department of Health (DOH) has put in place regulations on Maximum Containment Levels (MCLs) for potable drinking water.

DOH has adopted a drinking water regulation that requires all public water systems to test for different contaminants including PFOA and PFOS. Rules require that the drinking water supplier test for PFOA and PFOS and report their findings. If there is a detection of these chemicals above the MCL of 10 ppt, the water supplier must take steps to lower the level and meet the required standard.

2.0 PROJECT BACKGROUND & SUMMARY VALATIE VILLAGE WATER SYSTEM

The Village of Valatie presently has four developed groundwater wells with the ability to supply water to its consumers. Approximately 2,000 people consume Valatie's water via 700 service connections, necessitating an average daily demand of 235,000 gpd, and a maximum daily demand of 397,000 gpd. The well pump stations supply water to the distribution system and are located on either side of the Kinderhook Creek. A fifth groundwater well, the Charlie "Barrow" Well, was originally drilled for production but was not developed to provide groundwater to the community. Figure 2-1 shows the well locations in relation to Kinderhook Creek.

Figure 0-1. Supply Well Locations

Well 1 was originally approved in 1960, drilled in 196, and redeveloped by Smith Pump in 2021. It is has a depth of 34.5 ft and is located approximately 290 ft away from Kinderhook Creek. It has a permitted capacity of 125 gpm. Well 1 was tested to determine if it was Ground Water Under Direct Influence (GWUDI), which refers to a ground water source that is located close enough to a surface water source to receive direct surface water recharge. Wells are required to undergo testing if they are within 200 feet of a ground water source or is less than 50 ft in depth. Well 1 was deemed not GWUDI in 2012. At this time, it has been removed from daily service due to loss of production capacity. Wells 2, 3, and 4 are all 200 ft or less away from Kinderhook Creek and are all less than 50 ft in depth, meaning they were required to undergo GWUDI testing. Well 2 was installed in 1971 and was permitted in 2000. It has a permitted capacity of 225 gpm. It was originally deemed GWUDI, but this was rescinded in 2014 due to inconclusive results from testing conducted from 2010 to 2013. Well 3 was installed in 1998 and has a permitting capacity of 160 gpm. It was deemed GWUDI in 2010 and taken offline but was put back into use in 2016 following a request from the Village and provision of treatment modifications, including installation of a cartridge filtration system in Pump House 2. It is currently treated as GWUDI. Well 4 was permitted in 2000 for 50 gpm. The wells that have been deemed GWUDI require 4 log disinfection.

Wells 1 and 2 are treated at Pump House 1, and Wells 3 and 4 are located at Pump House 2, as noted in Fig 2.1. Pump house 1 is located 375 ft from the nearest residential building. Wells 1 and 2 share a land parcel with the pump house and therefore are also 375 ft from the nearest residential building. Wells 3 and 4 are 430 ft from the nearest residential building. Both Pump Houses treat raw water with sodium hypochlorite for disinfection and orthophosphate for corrosion control. The free chlorine residuals range in the distribution typically ranges between 0.5 – 1.0 mg/L. Table 2-1 shows characteristics of each developed well.

Table 2-1. Well Characteristics

Parameter	Well 1	Well 2	Well 3	Well 4
Operating Flowrate (gpm)	100	225	160	50
Type	20 HP Vertical Line Shaft Turbine Pump	30 HP Submersible Pump	15 HP Submersible Pump	5 HP Submersible Pump
Status	Active	Active	Active	Active
Depth (ft)	34.5	39.5	34	39
Distance from Kinderhook Creek (ft)	290	145	200	120

Using the state of NY's GIS services, no potential major sources of pollution were identified within 1,000 feet of any of the four wells. The two nearest sources of potential pollution are two petroleum bulk storage facilities located on River Street and the intersection of Chatham Street and Genesee Drive. The current treatment facilities are located within the flood plain of Kinderhook Creek. Based on the Firmette provided within Appendix D of this report, the flood elevation is between 210' and 211'

2.1 Barrow Well

There is little information on the Barrow well and most information is anecdotal. No information from the original well construction was available, and water quality data was limited to a single grab sample collected in December 2022 following a low flow, 4-hour pump test conducted by Smith Pump.

In their December 2022 report, Smith Well describes the Barrow well as a 12" well, 37' in depth, and screened from approximately 6' to 18' below grade. In their report, Smith Pump noted extensive iron fouling on well screen, casing and drop pipe. Smith Pump pumped the well for 4 hours at approximately 150 gallons per minute (gpm), inspected the well internals including a video log, and took raw water samples at the end of the 4-hour pump test. Results from these water samples indicated iron was 0.02 mg/L, manganese was <0.01 mg/L, TOC was 1.6 mg/L, TDS was 35 mg/L, chloride was 26, nitrate was 0.29 mg/L. No PFAS were detected using Method EPA 533. No organics were detected using EPA method 524.2.

It is important to note, however, that despite the low iron found in this single grab sample, the Smith Pump December 2022 report notes "the video survey indicates the well has high levels of iron, as the well screen, casing and drop pipe were heavily coated in iron oxide and this caused a diminished clarity during the video inspection." Smith Pump further recommended that "due to the elevated levels of iron, consideration should be given to attempting to clean the well prior to incorporating it into service." Weston & Sampson concurs with this recommendation. Proper cleaning of the well interior is necessary before the well condition, yield and representative water quality can be accurately assessed.

Given the lack of information on the Barrow Well, Weston & Sampson is limited to drawing inferences based on findings from studies and data from adjacent wells. Well Nos. 1 and 2 are production wells in close proximity to the Barrow well. Results from a July 2017 sampling event indicate iron in Well Nos. 1 and 2 was below detection. In their subsequent report, Smith Pump noted that acid cleaning was required to remove mineral deposits from the screen and casing, and that the specific yield was significantly improved by this acid cleaning/redevelopment. Smith Pump also anecdotally noted the well had been cleaned at least two other times since 1961. Given these findings, it is unlikely that iron in this well is always below detection. Continued sampling of both wells is recommended to determine if metal concentrations vary seasonally, and under various pumping conditions and aquifer water levels.

While the use of the Barrow Well will be postponed, Weston and Sampson recommend further exploring its use as a permanent water source for Valatie. The Village has filed a SEQR application for continued development of the Barrow Well as a future water source.

3.0 PFAS IN VALATIE

The continuous need for managing and evaluating potable drinking water sources has resulted in testing for PFAS in various ground water wells. As a result, testing was conducted on Wells 1 – 4 for various PFAS compounds. The results of the 2023 testing is shown in Table 3-1 below.

Table 3-1: Average PFAS Concentrations (2023)				
	Well 1	Well 2	Well 3	Well 4
PFOA	3.63	1.58	6.13	3.33
PFOS	8.44	2.85	2.65	1.38
PFNA	0.60	0.60	0.60	0.61
PFHxS	2.32	0.74	0.90	0.81
PFBS	4.75	1.57	7.42	4.69
HFPO-DA	1.03	<0.59	<0.6	<0.6

Currently, Well 1 has exceeded the EPA and New York PFOS MCL and Well 3 has exceeded the EPA and New York PFOA MCL. The Village will continue to sample each well for PFAS compounds on a quarterly basis as required by New York State. In addition, the PFAS compounds included in the proposed EPA regulation will continue to be monitored.

The Village of Valatie has been proactive with drinking water regulations and is planning to introduce a PFAS treatment facility into their water treatment system. Being proactive will allow Valatie to be prepared for any future PFAS regulations. The following drinking water treatment study discusses various treatment alternatives that would allow the water to be in compliance with New York state regulations as well as proposed EPA regulations. and a final recommendation of the optimal alternative. The study includes a preliminary concept layout of the recommended alternative treatment method.

4.0 AVAILABLE PFAS TREATMENT TECHNIQUES

Understanding long-term water treatment alternatives requires definition of current conditions and public health threats along with capital costs, operational costs, and minimization strategies for environmental impacts. Optimum solutions generally include minimizing energy consumption, ensuring the performance of the final remedy, and working within current infrastructure constraints to minimize any ecological disturbances. This alternatives analysis provides the background or setting related to newly identified and regulated constraints of concern, and the existing infrastructure already in place.

4.1 PFAS Treatment Overview

PFAS removal is typically accomplished by adsorption primarily through the implementation of pressure filter vessels containing a type of adsorption media. PFAS removal is influenced by contact time, with times ranging between 2.5 and 10 minutes depending on the type of media used. Because of the high contact time needed and high flowrates at WTPs, it is more efficient to have high filtration rates. Therefore, pressure vessels are typically the preferred method of filtration. PFAS cannot be removed physically, rather the PFAS chemically binds to the surface of the media particles. To ensure all PFAS is removed from the water, a lead/lag configuration is used. The lead vessel removes the majority of the PFAS, while the lag vessel is considered the "polishing" vessel. This configuration also assists in ensuring PFAS does not exit the treatment system. If PFAS concentrations are present in the lead vessel effluent, it will be removed in the lag vessel. Without the lag vessel present, media would need to be changed more often. There are two common pressure media vessels used for adsorption, granulated activated carbon, and ion exchange. These two technologies are detailed in further sections.

4.1.1 Granular Activated Carbon

Granular Activated Carbon (GAC) is a common technology used in PFAS removal. Pressure vessels are used to house the GAC and provide treatment to meet design contact times with a smaller footprint in comparison to gravity filters. GAC requires ten minutes of empty bed contact time (EBCT) for the most effective removal of PFAS. It is a robust media, meaning it can remove other water quality constituents in addition to PFAS. The location of the filter influent is an important design consideration as they are typically retrofitted into the process prior to final chemical injection to avoid the potential of GAC removing desired residual chlorine.

4.1.2 Ion Exchange Resin

Ion exchange resin (IX) is another technology used for PFAS removal. There are two main types of IX resins that can be used for PFAS removal: gel-based and ceramic-based. Ceramic-based resins can withstand low concentrations (<0.5mg/L) of chlorine without being physically affected. Gel-based resins, however, break down significantly when exposed to lower levels of chlorine residual. For this reason, PFAS treatment systems involving IX resins are often placed pre-chlorine injection. If chlorine residuals are present post-filtration, a dechlorination agent is often used to prevent chlorine from entering the IX resin filters. IX resin can affect the chloride to sulfate mass ratio (CSMR) in a distribution system, as the resins shed chloride ions upon initial startup and flushing. IX resin also has the ability to adsorb sulfate ions, which increases the overall CSMR. For this reason, various IX resin vendors have created "buffered" resins – resins that are pre-rinsed to prevent high levels of chlorides from shedding. In comparison to GAC, IX resins require a much shorter EBCT to reach full PFAS removal potential. The suggested EBCT for IX resins is 2.5 minutes. Because of the shorter EBCT, a higher flowrate can pass through the filter vessels, which in turn reduces the number or size of the vessels needed.

5.0 PFAS TREATMENT DESIGN CONSIDERATIONS

Various elements are necessary to consider in choosing a treatment technique for PFAS removal. General water chemistry, site restrictions, cost, ease of maintenance, and redundancy in supply all play roles in determining the most suitable treatment technique.

5.1 General Water Chemistry

The raw water quality at each well was also evaluated as part of this analysis to determine the appropriate treatment process and potential facility size. Parameters such as iron, manganese, and total organic carbon (TOC) can cause fouling or reduce the effectiveness of pressure filtration media of the approved PFAS treatment technologies, such as GAC or ion exchange resin. Raw water quality for each well taken in June 2025 is presented in Table 5.1 below. Wells 2, 3, and 4 all exhibited non detectable levels of iron and manganese, and relatively low TOC concentrations. Well 1 exhibited low manganese concentrations, and relatively low TOC, but had iron near the secondary MCL. It should be noted, however, Well 1 was idle for an extended period prior to sampling due to screen failure concerns, and the Fe concentration observed may not be representative of aquifer WQ conditions under typical pumping conditions.

Table 5-1. Raw Water Quality Parameters (June 2025)

Parameter	Well 1	Well 2	Well 3	Well 4
Iron (mg/L)	0.31	<0.01	<0.01	<0.01
Manganese (mg/L)	0.01	<0.01	<0.01	<0.01
TOC (mg/L)	0.578	0.551	0.664	0.664
Nitrate (as N) (mg/L)	0.37	0.45	0.8	0.54
Chloride (mg/L)	111	138	79	78
Sulfate (mg/L)	16	18	18	13
Alkalinity (as CaCO3) (mg/L)	74	340	57	52
pH	6.7	7.4	6.6	6.6
Calcium (mg/L)	37.8	2	23.8	28.4
Zinc (mg/L)	<0.01	<0.01	<0.01	<0.01
Magnesium (mg/L)	7.64	9.15	5.15	8.02

5.2 Site Restrictions (Overview) and Permitting Requirements

Each well is located in close proximity to Kinderhook Creek as shown in Figure 5.1. Regardless of location, A New York State Freshwater Wetlands permit would be required for any location within the 100-foot buffer from the Kinderhook Creek. An approximate buffer is shown in Figure 5.1 and indicates that Well 3 may be within the buffer zone. Wells 2, 3, and 4 are within 200 ft of the creek, and are therefore under risk of being deemed as GWUDI. Details regarding the GWUDI status of each well is discussed in Section 2. An *ECL Article 23 Permit to Drill* would also need to be obtained for any directional drilling required to connect Wells 3 and 4 across Kinderhook Creek and to the new treatment facility.

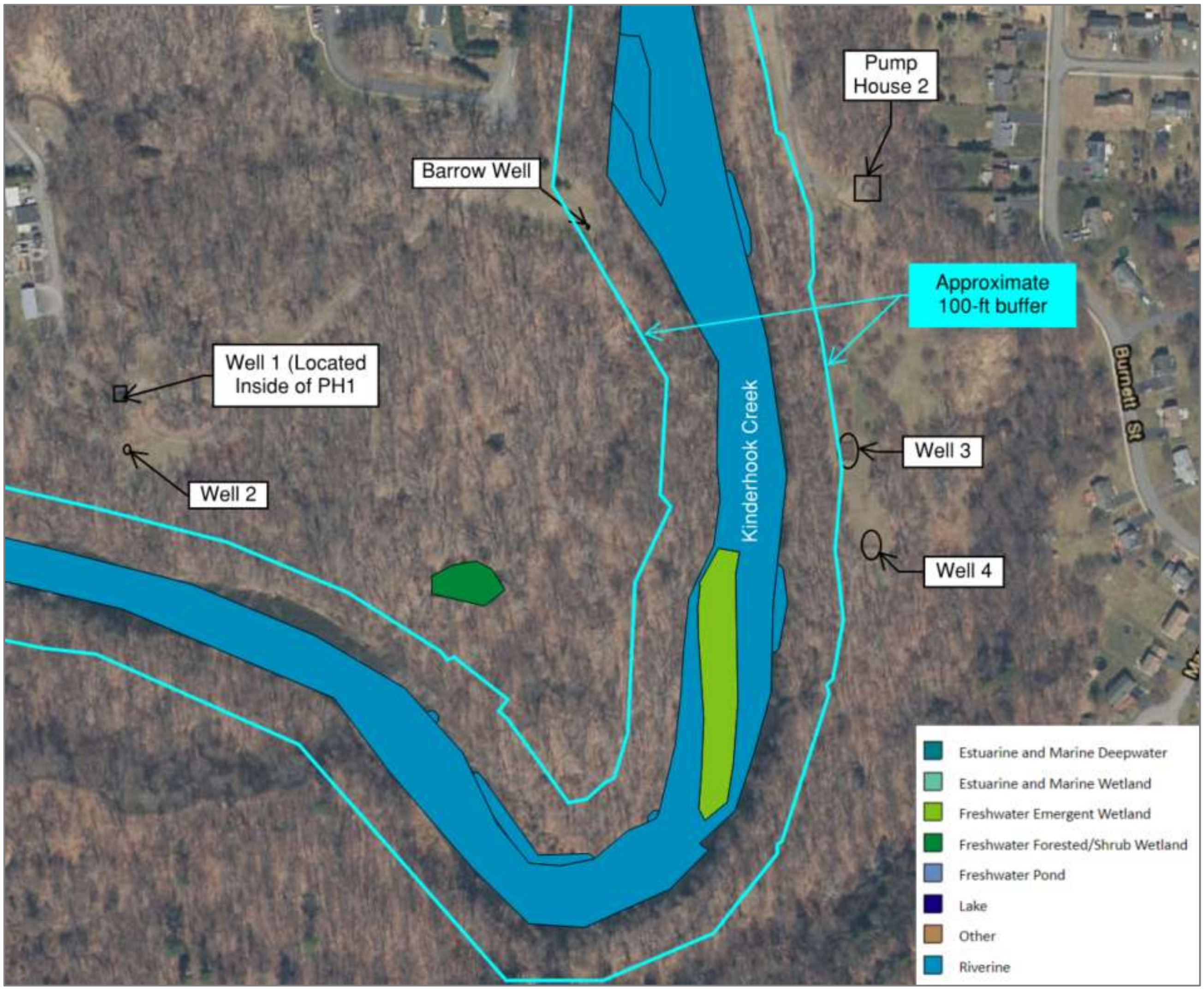


Figure 5-1. Environmental Resources

The project will also require *Approval of Plans for Public Water Supply Improvement* through the New York State Department of Health.

5.3 Redundancy

The Village currently has an average daily demand of 164 gpm or 235,000 gpd and a max daily demand of 276 gpm or 397,000 gpd. The largest well is Well 2, with an operating flowrate of 225 gpm or 324,000 gpd. Without Well 2, the system can provide up to 310 gpm or 446,400 gpd.

5.4 Operation and Maintenance

PFAS treatment systems are typically manually operated but can be automatic if desired. The most significant impact to operations is the required compliance sampling. PFAS samples must be taken at the influent, midpoint, and effluent of the system. In addition, vessels are typically equipped with sample taps at the 25%, 50%, and 75% bed depths of the media. The purpose of the sample taps is to track PFAS breakthrough across the media bed. Tracking the PFAS mass transfer zone in the media bed can help operators predict when PFAS concentrations will begin to be present in the effluent water, i.e. when the media needs to be changed out.

Differential pressures across the filter vessels also require monitoring to indicate if a backwash is needed. A backwash will take place if the differential pressures reach the indicated amount (depending on the type of media utilized). The purpose of a backwash event is to remove any particulates that may be "clog" the media over time. In the absence of Fe, Mn, bacteria and suspended solids(TSS) in the raw water, however, it is unlikely PFAS vessels will experience the significant differential pressure increase that requires routine backwash. If high concentrations of Fe, Mn, TSS and TOC are present, pre-filtration can be implemented upstream of PFAS treatment. Based on the water quality observed to date in Valatie Well Nos. 1, 2, 3 and 4 (Table 5-1), PFAS pre-treatment to remove these potential foulants is not anticipated. Quarterly samples of the wells will continue through 2025 to confirm concentrations are low throughout the year.

6.0 PFAS TREATMENT ALTERNATIVES ANALYSIS

This section details the alternatives for PFAS treatment location and technique. Treatment location refers to centralized versus decentralized treatment and the physical location of the proposed treatment facility. Treatment technique refers to GAC, IX resin, or a multimedia system.

6.1 Treatment Location

Six alternatives are presented in Table 6-1 below, but only 1 option, which is highlighted in green, was considered.

Table 6-1. Treatment Location Alternatives

Alternative	1		2	3	4		5	6
Wells Involved	1 & 2	3 & 4	1, 2, 3, & 4	1, 2, 3, 4 & Barrow	1, 2 & Barrow	3 & 4	1, 2 / Barrow	1, 2 / Barrow
Location	Pump House 1	Pump House 2	New Centralized WTP	Barrow Well	Barrow Well	Pump House 2	Barrow Well	Replace Pump House 1
Reserve/Spare Wells	-		-	-	-		3 & 4	3 & 4
Flow Treated (gpm)	325	210	325	1235	1025	210	325	325
Total Flow Treated (gpm)	535		325	1235	1235		325	325

Alternative 1 would include implementing treatment in Pump Houses 1 and 2 instead of a single treatment facility. The Village intends to build a new facility adjacent to the existing wastewater treatment plant, which would allow the village to centralize the treatment system rather than spread it over both pump houses. Alternatives 3, 4, 5, and 6 include the use of the Barrow Well, which has not yet been permitted for use as a potable water source, and would require well capacity and water quality characterization, and the completion of all permit-related prior to use. Alternatives 3 and 4 would supply over 600% more water than the Village demands, deeming these options unnecessary. The Barrow Well is near Kinderhook Creek, which is an environmental resource. Construction near an environmental resource would increase permitting efforts, and in turn, overall project cost. In addition, the Village prefers to keep the park near the Barrow Well untouched. Figure 6.1 shows the location of the Barrow Well with respect to Kinderhook Creek.

Figure 6-1. Barrow Well Location

This leaves Alternative 2 as the most suitable option. As mentioned above, the Village expressed interest in a centralized treatment facility, meaning only a single treatment facility is preferred. This alternative involves allowing Wells 1, 2, 3, and 4 to be treated at the New Centralized Water Treatment Plant.

6.2 Treatment Technique

GAC and IX Resin were considered in this feasibility study for PFAS removal. Section 6.1 presented Weston & Sampson's recommendation of a centralized treatment system, Table 6-2 presents treatment technique options for the centralized treatment system. The approximate footprint is the space necessary for PFAS treatment only and sufficient space to navigate the facility. This does not consider pretreatment.

Table 6-2. Treatment Technology Alternatives

	Wells 1, 2, 3, and 4 (325 gpm)
GAC	No. Pairs: 1 Diameter: 10' Sidewall Height: 8' Approx. footprint: 35' x 20' Overall Height: 20'
IX Resin	No. Pairs: 1 Diameter: 8' Sidewall Height: 3' Approx. footprint: 30 x 20' Overall Height: 16'
GAC followed by IX Resin	No. Pairs: 1 Train: 10-ft GAC followed by 8-ft IX Resin Approx. footprint: 35' x 20' Overall Height: 20'

6.2.1 Valatie drinking water with GAC

PFAS removal with GAC media has proven to be successful at drinking water sites, including various sites in New England. With a higher recommended EBCT, treatment with GAC would involve larger pressure vessels than a design considering only IX Resin. Site restrictions were considered in this feasibility study, and the proposed location has sufficient space for a treatment system utilizing GAC. A treatment system utilizing GAC should follow the *Bureau of Water Supply Protection Interim Recommendations for Granular Activated Carbon (GAC) – Installations – Design Review, Startup and Operations* which is included in Appendix B.

Bring a robust media in comparison to IX resin, it is expected that the lead GAC vessel would remove PFAS and trace co-contaminants such as iron, manganese, and TOC. The lag vessel would be considered the "polishing vessel," as it is in place to ensure PFAS compounds do not exit the system. With low iron and manganese concentrations, technologies other than GAC may be applicable.

6.2.2 Valatie drinking water with IX Resin

IX resin has been successful in PFAS removal but can be affected by co-contaminants. Low levels of iron and manganese would make the use of IX more feasible. As shown in Figure 6-2, the IX resin vessels necessary to treat the full flow would be 6-ft diameter pressure vessels. While IX resin systems have proven to be successful in removing PFAS, this system would create a minimum of an additional 20 pounds of head loss.

6.2.3 Valatie drinking water with GAC followed by IX Resin

Should co-contaminant concentrations increase, or the pre-filters need to be removed, the option of a multi-media system would allow for prefiltration prior to IX resin, preventing the resin from fouling. Both iron and manganese have caused issues at other groundwater treatment sites utilizing primarily IX resin. Solid iron and manganese particulates coat IX resin media and cause differential pressures across the bed to increase. Providing GAC upstream of IX resin to filter out those particulates can significantly decrease the need to backwash or change out the resin media. In addition, GAC creates less of a differential pressure buildup than IX resin, so the total pressure drop across the system would be approximately 15psi.

7.0 RESILIENCY

There will be four (4) groundwater wells used as water sources for the treatment plant. The maximum daily demand of 276 gpm can be achieved without all four (4) wells in service. Should a well be taken offline, the system will still be able to achieve the max daily demand of 276 gpm. The clearwell will contain two (2) high lift service pumps capable of providing the maximum daily demand flow rate of 276 gpm. All pump motors and the treatment plant will be connected to emergency generators in the case of power outages. The proposed treatment facility will be located within the flood plain of Kinderhook Creek. Based on the Firmette provided within Appendix C of this report, the flood elevation in the general location of the proposed treatment facility is between 210' and 211'. The facility will be located adjacent to the existing wastewater treatment plant which is also located within the flood plain. Building the water treatment plant with a finished floor elevation of 213 feet for 2 feet of freeboard above flood levels should mitigate the risk of damages from 100-year floods. Outside of flooding, natural disasters are not a concern in this location.

8.0 RECOMMENDATIONS

8.1 PFAS Treatment Location

Weston & Sampson recommends that Valatie consider a centralized PFAS treatment system that includes Wells 1, 2, 3, and 4. A centralized PFAS treatment system would minimize capital and operation and maintenance costs while providing water with non-detect PFOS and PFOA concentrations. The centralized system would be constructed adjacent to the existing wastewater treatment plant. Adequate space is available at this location, so height and footprint would not be restricted. However, the Valatie Building Department should be contacted to determine any applicable zoning height restrictions. Figure 8-1 shows a conceptual design of how the proposed system would connect into the existing distribution system.

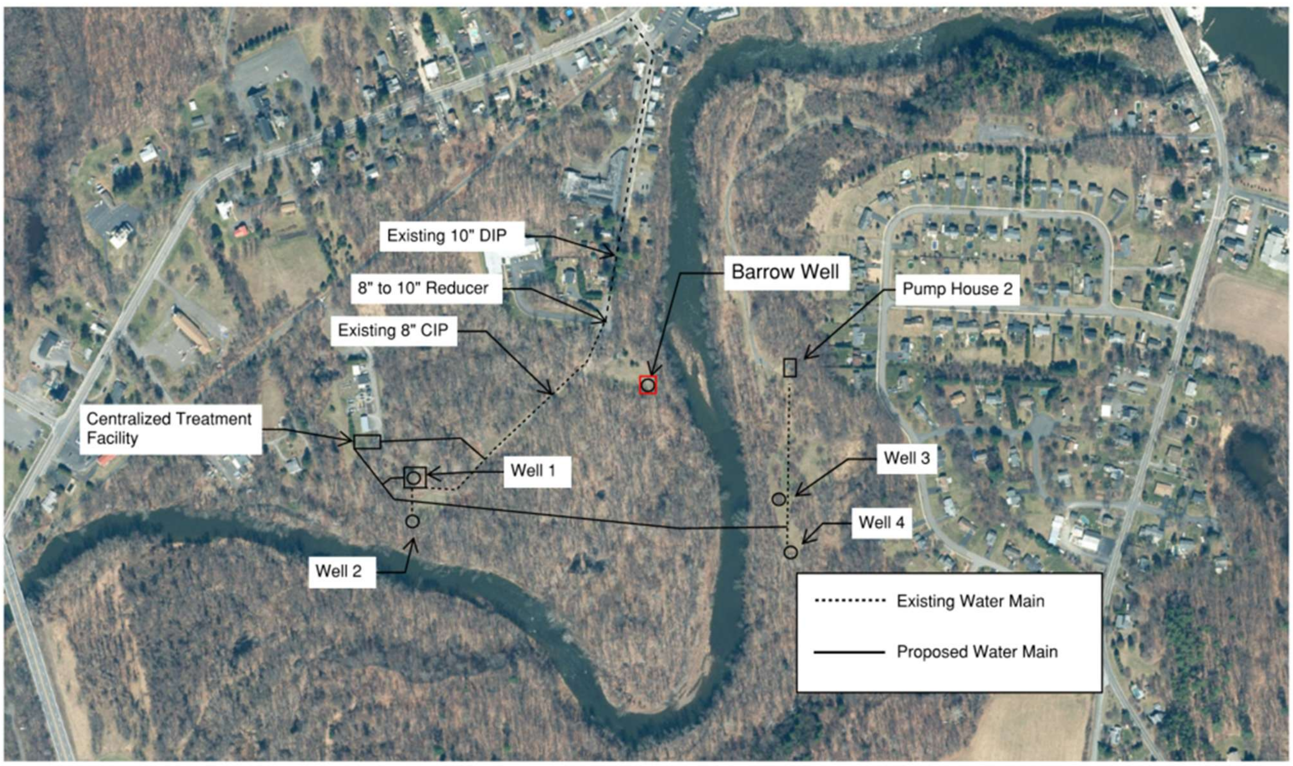


Figure 8-1. Proposed Centralized Treatment

8.2 PFAS Treatment Technique

The proposed PFAS treatment technique for Valatie includes the use of two 10-foot diameter GAC pressure vessels in a lead-lag configuration. The GAC vessels would have an empty bed contact time (EBCT) of 14.5 minutes, which is higher than the recommended 10 mins for GAC, but should provide longer filter runs as a result. In addition, the 10-foot diameter vessels would allow higher flow rates of up to 450 gpm during peak demand periods and still provide the recommended 10 min EBCT. All chemical addition to the raw water would occur at the centralized treatment facility. A clearwell will be located downstream of PFAS treatment and sized to provide adequate CT for 3-log disinfection of Giardia, as per EPA Surface Water Treatment Rule (SWTR) requirements.

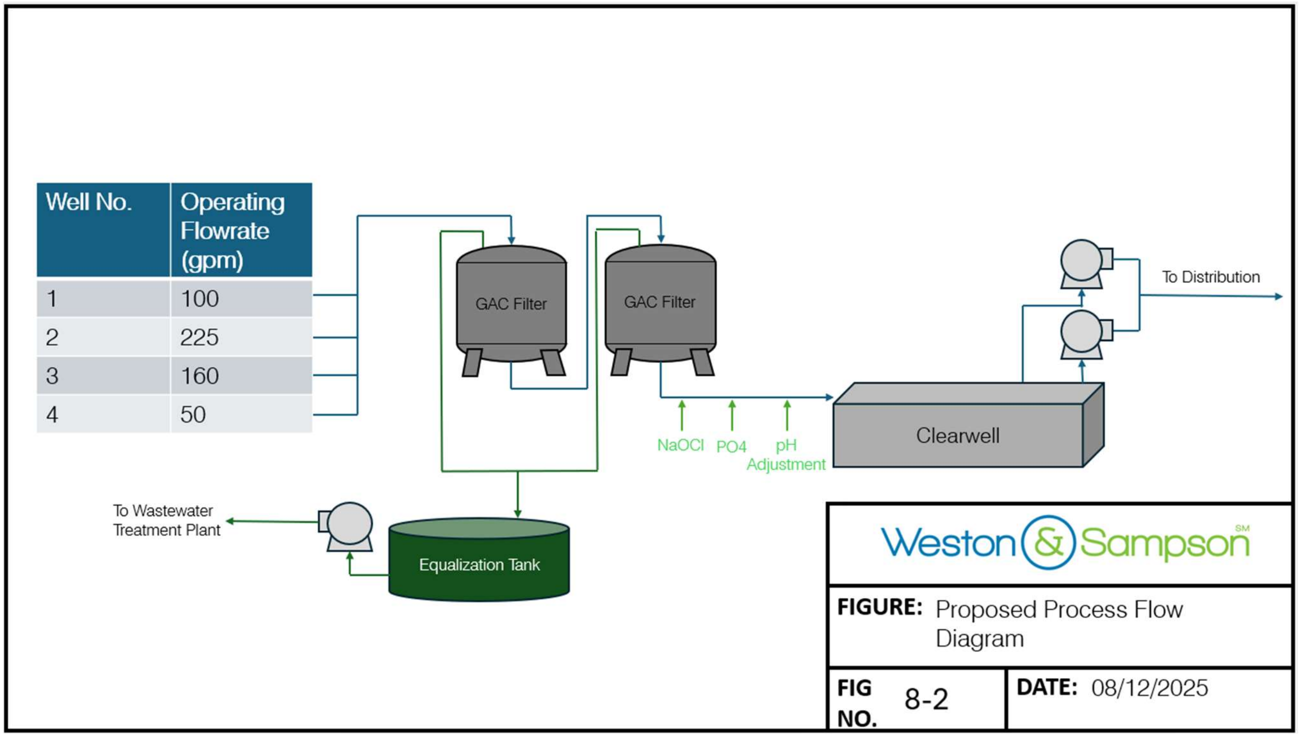


Figure 8-2. Proposed PFAS Treatment Equipment

8.3 PFAS Pilot Study

At this time, Weston & Sampson intends to bypass the need for a pilot study. We will be comparing the raw water quality data from the Village with existing GAC-PFAS treatment facilities to provide evidence that the proposed plan can be executed successfully. We intend to use this comparison to request a waiver for on-site piloting and design the treatment process based on RSSCT studies, to provide a relative measure of estimated bed life. The water quality data to date confirm low levels of iron, manganese, and TOC are present in Well Nos. 2, 3, and 4. Well No. 1 was shown to have 0.31 mg/L of iron and low levels of manganese and TOC. The water from the wells will be blended prior to treatment. Given this data, it can be concluded GAC will provide effective PFAS treatment and should experience minimal issues from foulants and co-contaminants. As noted above, quarterly sampling of Well Nos. 1, 2, 3 and 4 will continue through 2025 to confirm the concentrations are low throughout the year.

If the comparison of Valatie raw water quality to other full scale drinking water sites using GAC for PFAS removal does not provide sufficient evidence of the effectiveness of the proposed treatment, we will proceed with conducting a pilot that:

- Demonstrates that the proposed treatment process will continuously produce water that meets State and Federal drinking water standards.
- Assesses the reduction capabilities of the target contaminant.
- Assesses the impact of other contaminants that may interfere with PFAS removal.
- Assesses the need for pretreatment.

- Establishes operational and performance setpoints of the proposed processes through a range of raw water quality, flow rates, chemical feed rates, and operating conditions.

9.0 COST ESTIMATE

Various costs are necessary to implement the proposed treatment system. Costs associated with this project include:

- Permitting
- Mobilization / demobilization
- Demolishing the existing pump station
- Directional drilling under Creek
- Site work
    - Clearing
    - Grading
    - Excavation
- Yard piping
- Piping through woodland to tie in wells 3 and 4
- Connecting the wells to the new facility
- Constructing a new facility
    - Foundation
    - Building
- Process piping and controls
- Chemical feed modifications
- Pre-filtration equipment
- PFAS equipment
- Electrical
- HVAC

Table 9-1. PFAS Treatment Itemized Cost

Description	Unit	Quantity	Unit Cost	Total Cost	Option
PFAS Treatment - GAC vessels Pair of 10 ft vessels	LS	1	$500,000	$500,000	
Treatment Plant Piping and Pumps	LS	1	$400,000	$400,000	
Directional Drilling	LS	1	$240,000	$240,000	
Yard piping - transmission main from Wells 3 & 4 to WTP; WTP to DS	FT	2000	$400	$800,000	
Rock Excavation	YD^3	500	$120	$60,000	
Well Pump Modifications	EA	4	$75,000	$300,000	
Treatment Building - Metal pre-fab (40' x 60')	SF	2,400	$800	$1,920,000	
Treatment Bldg. - CMU pre-fab (40' x 60')	SF	2,400	$1,000		$2,400,000
Concrete foundation / floor	LS	1	$300,000	$300,000	
Clearwell – 75,000 Gal	LS	1		$525,000	
Pipe Loop - 24" main	FT	900	$450		$450,000
Eq Tank - 75,000 Gal.	EA	1	$250,000	$250,000	
Chemical Storage & Feed Equipment	LS	1	$400,000	$400,000	

Electrical	LS	1	$450,000	$450,000	
I&C	LS	1	$500,000	$500,000	
HVAC	LS	1	$400,000	$400,000	
Plumbing	LS	1	$200,000	$200,000	
Mechanical Installation				$472,500	
Sub-total				$8,417,500	
Engineering Design	LS	1	$492,000	$492,000	
Permitting				$252,525	
Construction Contingency @ 30%				$2,525,250	
Total				$11,687,275	

**Costs based on a 2025 cost estimate for a PFAS treatment facility in Ellington, CT*

APPENDIX A

Fact Sheet: EPA's Proposal to Limit PFAS in Drinking Water

EPA FACT SHEET

EPA's Proposal to Limit PFAS in Drinking Water

March 2023

We rely on water from the moment we wake up and make a cup of coffee to when we brush our teeth at night. Every person should have access to clean and safe drinking water. That's why the U.S. Environmental Protection Agency (EPA) is taking a key step to protect public health by proposing to establish legally enforceable levels for six PFAS known to occur in drinking water, fulfilling a foundational commitment in the Agency's PFAS Strategic Roadmap. Through this proposed rule, EPA is leveraging the most recent science and building on existing state efforts to limit PFAS and provide a nationwide, health-protective standard for these specific PFAS in drinking water.

What are PFAS chemicals and why are they in our drinking water?

PFAS are a category of manufactured chemicals that have been used in industry and consumer products since the 1940s. PFAS have characteristics that make them useful in a variety of products, including nonstick cookware, waterproof clothing, and firefighting foam, as well as in certain manufacturing processes.

People can be exposed to PFAS in several ways. When their drinking water is contaminated with PFAS, it can be a significant portion of a person's total PFAS exposure. Exposure to PFAS over a long time, and during certain critical life stages, like during pregnancy and in developing babies, may lead to negative health effects.

PFAS can enter the environment from multiple sources, and because they tend to break down very slowly in the environment, PFAS can end up in the water sources that many communities rely on for drinking water. Reducing PFAS in drinking water helps reduce PFAS health risks.

What is EPA doing to make our drinking water safe?

EPA is taking a key step to protect public health by proposing a National Primary Drinking Water Regulation (NPDWR) to establish legally enforceable levels, called Maximum Contaminant Levels (MCLs), for six PFAS known to occur in drinking water. The six PFAS are **PFOA, PFOS, PFNA, PFHxS, PFBS, and GenX Chemicals.**

An MCL protects public health by setting a maximum level of a contaminant allowed in drinking water which can be delivered to users of a public water system. Additionally, EPA is proposing health-based, non-enforceable Maximum Contaminant Level Goals (MCLGs) for these six PFAS. An MCLG is the maximum level of a contaminant in drinking water where there is no known or anticipated negative effect on an individual's health, allowing for a margin of safety.

What levels EPA is proposing and what do water systems have to do?

Specifically, EPA is proposing:

- **An enforceable MCL for PFOA and PFOS.** EPA is proposing to regulate PFOA and PFOS at a level they can be reliably measured, which is 4 parts per trillion (4.0 nanograms/Liter).
- **An enforceable limit on a combination of PFNA, PFHXs, PFBS, and GenX Chemicals.** The proposed rule also would place limits on any mixture containing one or more of PFNA, PFHxS, PFBS, and/or GenX Chemicals. For these PFAS, water systems would use an approach called a hazard index, defined in the proposed rule and described later in this document, to determine if the combined levels of these PFAS

pose a potential risk. This approach protects communities from the additive effects of multiple PFAS when they occur together.

- **Monitoring.** EPA is proposing requirements for monitoring for the six PFAS that build upon EPA's long established monitoring frameworks where monitoring frequency depends on previous results. The proposal also includes flexibilities allowing systems to use some previously collected data to satisfy initial monitoring requirements.
- **Public notification.** Public water systems would be required to notify the public if monitoring detects these PFAS at levels that exceed the proposed regulatory standards.
- **Treatment.** Public water systems would be required take actions to reduce the levels of these PFAS in drinking water if they exceed the proposed regulatory standards. This could include removing these chemicals through various types of treatment or switching to an alternative water supply that meets the standard.

Are testing and treatment technologies available to remove these six PFAS?

Available technologies exist to monitor for and treat these six PFAS. Technologies capable of reducing PFAS in drinking water include granular activated carbon (GAC), anion exchange resins (AIX), reverse osmosis (RO), and nanofiltration (NF).

What does this proposal mean?

If finalized, the proposed regulation will require public water systems to monitor for these chemicals. It will also require systems to notify the public and reduce the levels of these PFAS if levels exceed the proposed regulatory standards. EPA anticipates that over time, if fully implemented, the rule will reduce tens of thousands of PFAS-attributable illnesses or deaths.

This proposal does not require any actions for drinking water systems until the rule is finalized, and water systems will be required to meet the MCLs after a specified implementation time period. EPA anticipates finalizing the rule by the end of 2023.

Public input on the proposal

EPA welcomes public input as part of the regulatory development process. The public is invited to review the proposal and supporting information. Comments can be provided in the public docket associated with this rulemaking at regulations.gov, identified by Docket ID Number: EPA-HQ-OW-2022-0114. Comments must be submitted to the public docket during the 60-day public comment period.

EPA will consider all public comments in informing the development of the final regulation. For more information and instructions on how to submit input to the public docket, visit: www.epa.gov/dockets/commenting-epa-dockets. EPA will also hold a virtual public hearing on May 4, 2023 where the public is invited to provide EPA with verbal comments. For more information on the public hearing and how to provide EPA with verbal and written comments, please visit: www.epa.gov/sdwa/and-polyfluoroalkyl-substances-pfas.

Is funding available?

Reducing PFAS in drinking water will likely require investments in water infrastructure. Thanks to President Biden's leadership and bipartisan action in Congress, the Bipartisan Infrastructure Law provides an unprecedented $9 billion to invest in drinking water systems impacted by PFAS and other emerging contaminants. EPA will ensure that states, Tribes, and communities get their fair share of this federal water infrastructure investment—especially in disadvantaged communities. These funds include:

- **$4 billion** in investment through the **Drinking Water State Revolving Funds**, including a requirement that states dedicate 25% of these resources to disadvantaged communities or public water systems serving fewer than 25,000 people.
- **$5 billion** to communities as grants through EPA's new **Emerging Contaminants in Small or Disadvantaged Communities (EC-SDC) Grant Program**. This program will promote access to safe and clean water in small, rural, and disadvantaged communities while supporting local economies. In February 2023, EPA announced the availability of the first $2 billion of this funding.

For more information on Bipartisan Infrastructure Law funding, visit: www.epa.gov/infrastructure.

What if I am concerned about PFAS in my drinking water?

If you get your water from a drinking water system, reach out to your local water utility to learn about how they may be addressing PFAS as well as ask them to test the water for PFAS or to share information with you if they have already tested the water. Some public drinking water systems may not have this information. If you choose to test your water yourself, it is important to use a state-certified laboratory using EPA-developed testing methods. Check with your state's drinking water program to see if they have issued guidance or standards for PFAS in your state and what actions they recommend or require when there is PFAS contamination. If your state does not have standards or guidance for PFAS see EPA's Health Advisory levels for certain PFAS for EPA's advice regarding these PFAS in drinking water. You may also consider installing in-home water treatment (e.g., filters) that are certified to lower the levels of PFAS in your water. Learn about certified in-home water treatment filters.

To learn more about PFAS and steps that can be taken to reduce risks: www.epa.gov/pfas/meaningful-and-achievable-steps-you-can-take-reduce-your-risk

What does this proposed regulation mean for households on private wells?

While the Safe Drinking Water Act does not regulate private wells and this proposed rule does not set any requirements or standards for private well owners, EPA understands that people who consume water from private wells may be concerned about contamination of their drinking water by PFAS or other contaminants. EPA has resources to help people who rely on private wells for their drinking water.

First, EPA has information on protecting private wells to prevent contamination, testing private wells and protecting your health at https://www.epa.gov/privatewells. (The Centers for Disease Control and Prevention also provides similar information about private water systems at https://www.cdc.gov/healthywater/drinking/private/index.html)

Second, if test results from an approved laboratory show levels of PFOA, PFOS, Gen X or PFBS, see EPA's PFAS health advisories Questions and Answers to learn about actions that you might consider based on your test results.

Third, State Drinking Water State Revolving Loan Fund programs may provide funding to households served by private wells to connect to a drinking water system, or to form a new drinking water system that would be subject to Safe Drinking Water Act requirements. SRF funds can be used by states to provide household water quality testing for these PFAS where there is an intent to connect with a public water system, or to form a new one, and to provide temporary household or point-of-use filters while a connection to a public water system is established. For more information on these funding programs, please visit www.epa.gov/infrastructure.

My state drinking water standard for PFAS is higher than this proposal, is my water safe?

This proposal is based on the latest science and if finalized, states will need to establish standards that are as strict as the federal rule. In the interim, EPA currently has Health Advisories in place to act as a guide for states and water systems. EPA's 2022 lifetime health advisory levels represent the concentration of individual PFAS (PFOA, PFOS, GenX Chemicals, and PFBS) in drinking water at below which adverse health effects are not anticipated to occur over a lifetime. It's important to note that many states and utilities are already taking action to reduce PFAS in water, and less PFAS is better over a lifetime of exposure.

If you get your water from a drinking water system, reach out to your local water utility to learn about how they may be addressing PFAS as well as ask them to test the water for PFAS or to share information with you if they have already tested the water. NOTE: Some public drinking water systems may not have this information. If you choose to test your water yourself, it is important to use a state-certified laboratory using EPA-developed testing methods. Check with your state's drinking water program to see if they have issued guidance or standards for PFAS in your state and what actions they recommend or require when there is PFAS contamination. If your state does not have standards or guidance for PFAS see EPA's Health Advisory levels for certain PFAS for EPA's advice regarding these PFAS in drinking water. You may also consider installing in-home water treatment (e.g., filters) that are certified to lower the levels of PFAS in your water. Learn about certified in-home water treatment filters.

To learn more about PFAS and steps that can be taken to reduce risks: www.epa.gov/pfas/meaningful-and-achievable-steps-you-can-take-reduce-your-risk

This is a proposed rule for public comment. It does not require any actions for drinking water systems until EPA has a chance to consider public input and the rule is finalized. Once the rule is finalized, water systems will not be required to meet the MCLs until after a specified implementation time period. EPA anticipates finalizing the rule by the end of 2023.

Additional Background

What are MCLGs and MCLs?

MCLGs are non-enforceable public health goals. MCLGs consider only public health, not the limits of detection and treatment technology effectiveness. Therefore, they are sometimes set at levels which water systems cannot meet because of technological limitations. For example, if a contaminant is a known or likely carcinogen, EPA sets the MCLG at 0. MCLGs also consider adverse health risks to sensitive groups, including infants, children, the elderly, and immuno-compromised individuals. Once the MCLG is established, EPA determines the MCL. MCLs are enforceable standards. An MCL is the maximum level of a contaminant allowed in drinking water which can be delivered to users of a public water system. For this rule proposal, EPA evaluated available methods and treatment technologies, that are shown to measure and remove these six PFAS and set the proposed MCLs as close as possible to the MCLGs. EPA also evaluated costs and benefits in determining the proposed MCLs.

What is a Hazard Index?

The Hazard Index is a tool used to evaluate health risks of simultaneous exposure to mixtures of related chemicals. To prevent health risks from mixtures of certain PFAS in drinking water, EPA is proposing that water systems use this Hazard Index approach to regulate PFHxS, GenX Chemicals, PFNA, and PFBS. To determine the Hazard Index for these four PFAS, water systems would monitor and compare the amount of each PFAS in drinking water to its associated Health- Based Water Concentration (HBWC), which is the level at which no health effects are expected for that PFAS.

Water systems would add the comparison values for each PFAS contained within the mixture. If the value is greater than 1.0, it would be an exceedance of the proposed Hazard Index MCL for these four PFAS. For ease of use, EPA intends to provide water systems with a web-based form that will automatically calculate the Hazard Index. More information on the Hazard Index, including an example of how to calculate it, can be found in the rule proposal at: www.epa.gov/sdwa/and-polyfluoroalkyl-substances-pfas.

What are PFAS and What are their Health Effects?

There are thousands of different PFAS, and they can be found in many different consumer, commercial, and industrial products. PFAS can enter the environment from multiple sources and because they break down very slowly, concentrations of PFAS can accumulate in people, animals, and the environment over time and can end up in the water sources that many communities rely on for drinking water.

We now know that some PFAS can cause serious health problems if you are exposed to them – even at low levels – over a long period of time. Drinking water is one of several ways people may be exposed to PFAS and reducing PFAS in drinking water helps reduce PFAS health risks. Exposure to the PFAS EPA is proposing to regulate can increase the risks of a range of health effects, including:

- Reproductive effects such as increased high blood pressure in pregnant people
- Developmental effects or delays in children, including low birth weight, bone variations, or behavioral changes
- Increased risk of some cancers, including kidney and testicular cancers
- Reduced ability of the body's immune system to fight infections, including reduced vaccine effectiveness
- Interference with the body's natural hormones, including thyroid hormones
- Increased cholesterol levels
- Liver damage

What Else is EPA Doing to Stop PFAS Pollution and Protect Communities?

EPA released its PFAS Strategic Roadmap in October 2021 and has taken actions to reduce PFAS from entering the water we drink, fish, and swim; hold polluters accountable; and accelerate research that will help EPA and other agencies take future actions. EPA is committed to taking broader actions to help reduce Americans' exposure to PFAS, including:

- Monitoring thousands of drinking water systems across the country for dozens of PFAS;
- Taking final action on a proposal to designate two PFAS as "hazardous substances" to help hold polluters accountable;
- Restricting PFAS discharges to our waterways by strengthening Clean Water Act standards; and
- Finalizing chemical data and safety rules that will increase our knowledge about PFAS, allow us to act faster and more strategically, and restrict legacy PFAS from reentering production.

To learn more about the proposed rule visit:
www.epa.gov/sdwa/and-polyfluoroalkyl-substances-pfas

APPENDIX B

Bureau of Water Supply Protection
Interim Recommendations for Granular Activated Carbon (GAC)
Installations – Design Review, Startup and Operations

Interim Recommendations for Granular Activated Carbon (GAC) Installations - Design Review, Startup and Operations

This document is intended for use by local health departments (LHD) and New York State Department of Health (NYSDOH) engineering staff that review and approve granular activated carbon (GAC) treatment at public water systems (PWS). These recommendations are intended to be applicable to most GAC installations, but the LHD or NYSDOH should exercise best professional judgement during the review and approval process.

Contents

I. Definitions

Contactor: (a.k.a vessel, carbon contactor) A pressurized container in which granular activated carbon is held and through which water flows for the purpose of contacting the water with the granular activated carbon for contaminant removal.

Empty Bed Contact Time (EBCT): The amount of time water spends in contact with the GAC is quantified as the EBCT, which is calculated as the volume of the empty bed divided by the design flow rate.

Granular activated carbon (GAC): Activated carbon is commonly used to adsorb natural organic compounds, taste and odor compounds, and synthetic organic chemicals in drinking water treatment. Several raw materials can be used to make GAC, resulting in different final properties, including affinity for any specific contaminant. Final products can be manufactured to a variety of sizes. See American National Standards Institute (ANSI)/American Water Works Association (AWWA) Standard B604 for more information on GAC.

GAC10: Granular activated carbon filter beds with an empty-bed contact time of 10 minutes based on average daily flow and a carbon reactivation or replacement frequency of every 180 days, except that the reactivation frequency for GAC10 used as a best available technology for compliance with total trihalomethanes (TTHM) and haloacetic acids (five) (HAA5) maximum contaminant levels (MCLs) shall be 120 days (10 New York Codes, Rules and regulations (NYCRR) 5-1.1(aq)).

GAC20: Granular activated carbon filter beds with an empty-bed contact time of 20 minutes based on average daily flow and a carbon reactivation frequency of every 240 days (10 NYCRR 5-1.1(ar)).

GAC gravity filters: GAC may be used as a filtration media layer in conventional surface water treatment plant gravity filters. In this configuration, the GAC provides both particulate removal via filtration and chemical contaminant removal by adsorption. For simplicity, only contactors are referenced in this document, but most sections are equally applicable to gravity filters.

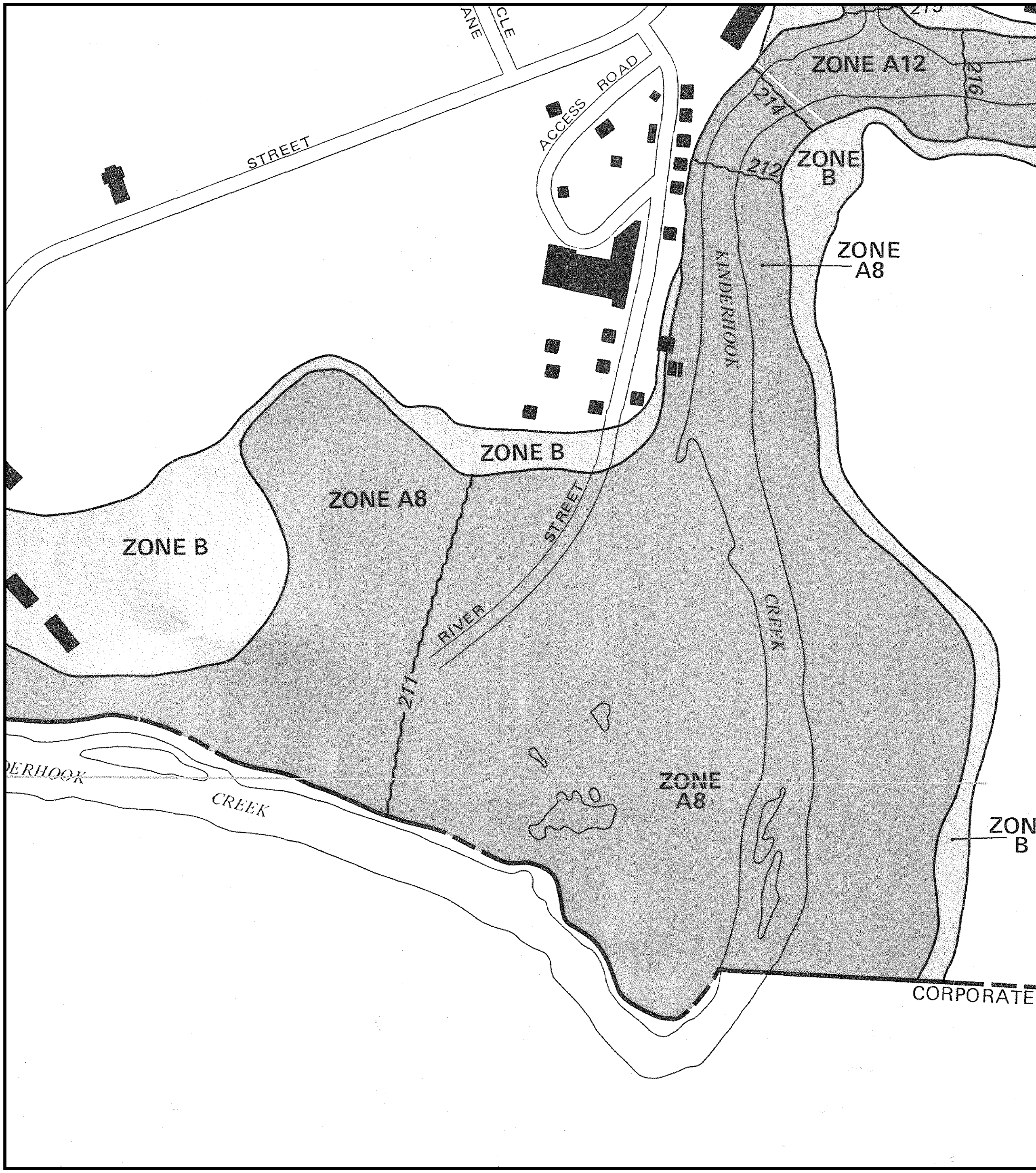
Lag contactor: When contactors are used in series as a lead-lag pair, the second contactor through which water flows is designated as the lag contactor. Lead and lag configuration in the treatment train can often be switched using valves.

Lead contactor: When contactors are used in series as a lead-lag pair, the first contactor through which water flows is designated as the lead contactor. Lead and lag configuration in the treatment train can often be switched using valves.

Treatment train: A GAC system may be comprised of one or more treatment trains, with each treatment train consisting of either a single contactor or multiple contactors in series. Each treatment train is designed to function as an individual unit within the GAC system capable of providing complete GAC treatment of the water which passes through that treatment train.

APPENDIX C

FEMA Firmette



APPROXIMATE SCALE

400 0

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

VILLAGE OF
VALATIE,
NEW YORK
COLUMBIA COUNTY

ONLY PANEL PRINTED

COMMUNITY-PANEL NUMBER
361508 0001 B

EFFECTIVE DATE:
DECEMBER 1, 1982

Federal Emergency Management Agency

This is an official FIRMette showing a portion of the above-referenced flood map created from the MSC FIRMette Web tool. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For additional information about how to make sure the map is current, please see the Flood Hazard Mapping Updates Overview Fact Sheet available on the FEMA Flood Map Service Center home page at https://msc.fema.gov.