

**PFAS Treatment Technologies Subgroup**  
Virginia Department of Health Office of Drinking Water Meeting  
Minutes (Final - approved March 25, 2021)  
February 25, 2021  
(10:00 a.m. – 11:30 a.m.)

1. Meeting Opening

ODW Southeast Virginia Field Office (SEVFO) Director, Dan Horne called the meeting to order at 10:03 am. He reminded everyone attending the meeting that it would be conducted as a public meeting under FOIA guidance, and would be recorded. Minutes and meeting materials will be posted on Town Hall.

Dan Horne welcomed all Subgroup members and members of the public the Treatment Technologies meeting and called roll. Members attending the meeting who answered the roll call were:

Henry Bryndza (Dupont)  
Jamie Bain Hedges (Fairfax Water)  
Mike Hotaling (Newport News Water)  
Mike McEvoy (Western Virginia Water Authority)  
Russ Navratil (Virginia Section AWWA)  
Kelly Ryan (Virginia American Water)  
Dan Horne (VDH-ODW)

Others noted as being present:

VDH:

Nelson Daniel (ODW)  
Christine Latino (ODW)  
Dwight Flammia (OEHS – Toxicology)

Members of the Public:

Paul Nyffeler  
Anna Killius  
Ellen Egen  
Amanda Waters

2. Review Meeting Agenda

Dan reviewed the agenda proposed for the meeting. He noted that he had distributed an updated agenda prior to the morning:

1. Review the draft summary from last month's meeting
2. Review Subgroup operations and expectations
3. Report on assignments from last meeting
4. Update on resources
5. Upcoming meetings and webinars
6. Preparing for next meeting
7. Public Comments
8. Next Meeting

There were no suggestions for adjustments to the agenda.

### 3. Review of draft minutes from last meeting

Dan emailed the Subgroup members the draft January meeting minutes on February 22. Mike Hotaling noted that the comment he made regarding MCLs should only apply to PFAS and PFOA, not to all PFAS. The members agreed to adopt the minutes from the January meeting as final, with that correction. Dan will make the correction and get the final summary posted to Town Hall.

### 4. Review of Subgroup logistics, functioning, and expectations

Dan went over the structure and operations of the Subgroup. The Agenda, meeting minutes and PowerPoint are located on the PFAS Workgroup SharePoint site. Meeting information is also posted on Town Hall. Any documents shared during meetings will also be posted. ODW provides support to the group. The monthly meetings are held through electronic communication means (via WebEx) because of the ongoing public health emergency. The Subgroup will continue to meet virtually for the foreseeable future. The meeting is considered a meeting of a public body. Dan will send information and other communications through blind carbon copy, so that a "reply all" isn't possible. This avoids issues related to public meeting requirements. Reminder, the PFAS Workgroup has been appointed and accepted by the State Health Commissioner, with stakeholder volunteers. The Workgroup established four subgroups who will report back to the Workgroup.

#### Subgroup 1: Health & Toxicology

- Review other States information & make recommendations on the whats & why?
- These recommendations should come with rationale (Scientific/Toxicology/Tech): why choose these PFAS chemicals or why add or remove any chemicals for VA?
- What approaches (Past & Future)?
- What Value (Rationale)?
- A report on the Subgroup Findings

#### Subgroup 2: Occurrence & Monitoring

- What, Why and How
- Rationale & Approach on selecting sampling sites
- Sampling methodology

- Coordinate Sampling effort & Report Results
- A Report on the Subgroup Findings

#### Subgroup 3: Policy & Regulation

- What methodology did other States follow to regulate such PFAS chemical in their drinking water (How)?
- Based on what info/resources we have in VA, What framework would be best suited.
- What will be the path moving forward
- A report on the Subgroup Findings.

#### Subgroup 4: Treatment Technologies

- Review & recommend Best Available Treatment Technologies (BATT) for PFAS removal
- Technical & Economical Feasibility analysis on the BATT for PFAS removal (considering conventional and advanced treatment technologies)
- Relevance & Limitations of Treatment Technologies in Virginia (including removal performance limitations, effectiveness at removing specific PFAS, waste discharge limitations, capital and operating costs, potential design guidelines, and information needs and gaps)
- Proximity to potential PFAS contamination
- A Report on the Subgroup Findings.

Members of the Treatment Technologies subgroup are expected to participate and contribute to this subgroup and commit 5-10 hours per month to study, review, interpret and develop new documents, guidelines and recommendations.

### 5. Report on assignments from last meeting

A general assignment for all members was to review the ITRC (Interstate Technology & Regulatory Council) information on treatment technologies.

Specific assignments were for Russ Navratil and Mark Estes to identify and report on some vendors and manufacturers.

Russ Navratil noted the following:

- Calgon and Norit are two common suppliers for granular activated carbon (GAC).
- Evoqua Water Technologies sells carbon (GAC) and ion exchange (IX) equipment. He is not sure how large their units go.
- Dow sells reverse osmosis (RO) equipment. RO will take PFAS out of water but the big question is what to do with the concentrate stream (since it is high in PFAS).
- BioLargo has some advanced treatment technologies for PFAS in water under development (under pilot testing). Russ has not seen the research yet.
- There are also manufacturers that handle treatment of PFAS in soil.

Mark Estes could not attend the meeting, but did send Dan some information. He didn't really address vendors, but discussed treatment processes. Dan shared from Mark's summary:

- There were a couple of different research documents that mentioned the same three processes: carbon, ion exchange and reverse osmosis. The articles did not talk about equipment. His summary did mention Battelle's "Annihilator" system currently being bench-scale tested. The unit has demonstrated that it eliminates PFAS from water (99.999999% destruction, with a starting concentration of 1,700 parts per million). Problem – what do you do with the removed fluorine?

(Note: Mark's information is posted in the Sharepoint file, under the Treatment Technology subgroup.)

Henry Bryndza commented on things mentioned by Russ and Mark.

- EPA has published a preliminary set of recommendations on how to manage concentrated PFAS waste. The document is now open for comment.
- Suez can be added to the list of major vendors/equipment providers.
- Most of the major equipment vendors provide turnkey operations that simply add multiple units/trains in parallel for bigger applications.

The conversation below was typed into the "chat box" during the meeting

from Henry to everyone: 10:23 AM

EPA has published a preliminary set of recommendations on how to manage concentrated PFAS wastes. It's now open for comment

from Paul Nyffeler to everyone: 10:28 AM

If you assume that GAC is generally understood to be a feasible treatment technology for Drinking Water, and that a given PFAS can be treated using GAC with frequent GAC turnover/replacement, is there a point where the use of GAC to treat PFAS in Drinking Water is no longer feasible?

from Henry to everyone: 10:28 AM

For treatment technologies (and per ITRC), GAC is the most widely used technology as the most simple and cost effective application. However, efficiency does drop at very low PFAS concentrations and also drops when moving from long-chain to short-chain PFAS. Ion exchange does not have either of those limitations but is more expensive and industry capacity is limited

from Henry to everyone: 10:30 AM

There's also debate about regeneration vs single pass use for ion exchange and resin lifetime

Mike Hotaling – uploaded a presentation made by Hazen and Sawyer for PFAS.

(Note: The presentation is posted in the SharePoint file under the Treatment Technology subgroup.)

## 6. Update on resources

Dan noted that ODW now has a web page for PFAS. It has some general information and placeholders for the monitoring program. Dan will provide link.  
(<https://www.vdh.virginia.gov/drinking.water/pfas/>)

AWWA released (late 2020) three updated PFAS Guidance documents:

Source Water Evaluation  
Treatment Selection Guide  
Toxicology Research

<https://www.awwa.org/Resources-Tools/Resource-Topics/PFAS>

(Documents are free to download for AWWA members) Dan encouraged everyone to download the AWWA documents. The research guide is about 42 pages.

ITRC is a multi-faceted group with a large group of teams. The link Dan provided is the link to their PFAS Pages. The site has a major assessment document, plus links to fact sheets, videos, training, and round table discussion meetings. (<https://pfas-1.itrcweb.org/>) Dan encouraged everyone to access the ITRC site and download the Treatment Technologies information.

## 7. Upcoming meetings and webinars

Dan reminded everyone that on March 4, 2021, the full PFAS Workgroup will meet for about an hour to discuss the proposed Sampling Study design.

AWWA will hold a webinar on the PFAS Treatment Selection Guide, on March 31, 2021 from 1:00 to 2:30. (<https://www.awwa.org/Events-Education/Events-Calendar/mid/11357/Occuranceid/485?ctl-ViewEvent>) Dan encouraged everyone to participate if possible. Please note there is a cost to attend, with a differential for non-AWWA members.

## 8. Preparing for next meeting

Dan noted that we will have a discussion of the commonly used PFAS treatment processes:

- Granular Activated Carbon filtration
- Ion Exchange filtration
- Reverse Osmosis filtration (high-pressure membranes)

He went through some generic slides of these processes. Before the next meeting, please have knowledge of all three of these processes.

Dan asked for volunteers to prepare summaries of these technologies to present at the next meeting.

**Mike Hotaling** noted that Newport News Water Works operates an RO plant, and he would be happy discuss this system. He also said that he knows the Director of the Cape Fear, NC, facility, and would reach out to him to get information/documents about their plant (designed to remove PFAS).

**Henry** noted that he was the technology leader for DuPont, and will be glad to discuss RO membranes and IX resins, and their applications.

**Mike McEvoy** said that he has a consultant who he will contact, in hopes that he might be able to provide some information (case histories) at other locations.

Dan noted that the Subgroup will need to pull together papers, discussions, limitations, general design criteria, operating conditions and limitations, etc. We will need to prepare a summary for each of the three processes to present to the full workgroup. We will need to look at case histories while developing the summaries. (Several people noted that AWWA should have case study documents.)

Goal: We will need to begin preparing summaries by the March meeting so we can share them with the full Workgroup in April.

## 9. Public Comments

Nelson Daniel, who leads the Policy subgroup, stated his group is curious about what kind of information would be helpful in developing recommendations. Summaries of the technologies is important. He also asked that when the Treatment Technology subgroup is working on recommendations, can they provide details of scale. Please let his subgroup know how big or small the application is, in order to be able to figure out cost. This will help when potentially applying the technology to a Virginia facility (waterworks).

Paul Nyffeler let the group know that Brunswick County, NC is putting in a low-pressure reverse osmoses system. They are specifically targeting PFAS.

Paul also asked if it would be possible to put the Subgroup meetings on the Sharepoint calendar, along with the log-in information.

## 10. Conclusion

The next meeting will be held March 25, 2021, from 10:00 to 11:30. The group will meet every fourth Thursday of the month at 10:00 a.m.

Dan adjourned the meeting at 11:03 a.m.

**PFAS Treatment Technologies Subgroup**  
Virginia Department of Health Office of Drinking Water  
DRAFT Meeting Agenda  
February 25, 2021  
1.5 hours (10:00 a.m. – 11:30 a.m.)

1. Meeting Opening
  - a. Call to order
  - b. Member roll-call
  - c. Review draft agenda
  - d. Review of draft summary from last meeting
2. Review of Subgroup logistics, functioning, and expectations
3. Report on assignments from last meeting (Navratil and Estes)
  - a. discussion
4. Update on resources
5. Assignments for next meeting
6. Upcoming meetings and webinars
7. Public Comments

Next Meeting Thursday, March 25, 10:00 a.m.

# Establishing Regulatory Limits for PFAS in Virginia Drinking Water

Treatment Technology Subgroup

Dan Horne

Virginia Department of Health

February 25, 2021



# Subgroup Members

Henry Bryndza (DuPont)

Jessica Edwards (Loudoun Water)

Wendy Eikenberry (Augusta County Service Authority)

Mark Estes (Halifax County Service Authority)

Chris Harbin (City of Norfolk)

Jamie Bain Hedges (Fairfax Water)

Jack Hinshelwood (VDH - ODW)

Mike Hotaling (Newport News Water Works)

Mike McEvoy (Western Virginia Water Authority)

Russ Navratil (Virginia Section AWWA)

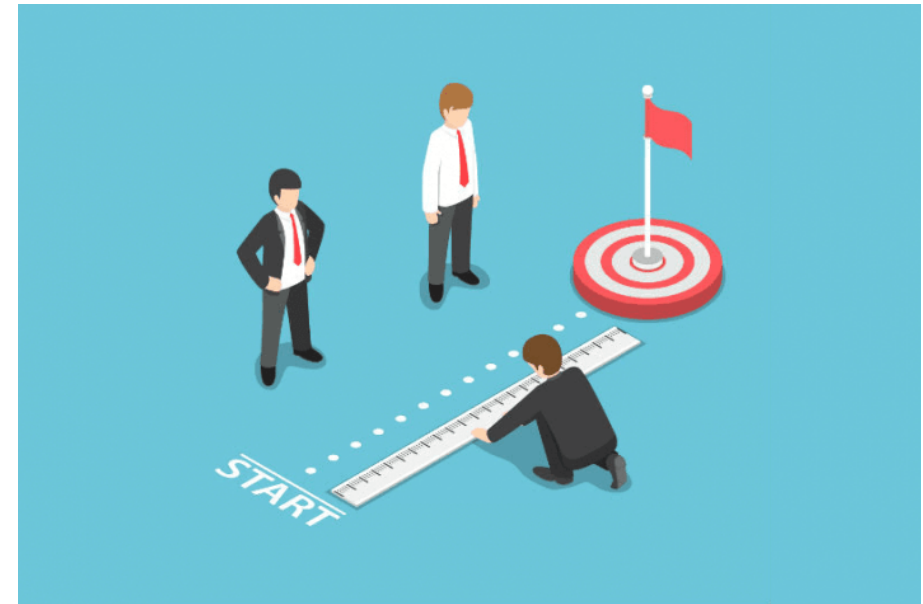
Kelly Ryan (Virginia American Water)

Dan Horne (VDH - ODW) Team lead

# PFAS Subgroup Meeting Agenda

## 25 Feb 2021

1. Call to order - Member roll-call – Review agenda – Review draft summary from last meeting
2. Review of Subgroup operation and expectations
3. Report on assignments from last meeting
4. Update on resources
5. Upcoming meetings and webinars
6. Preparing for next meeting
7. Public Comments
8. Next Meeting



# Review of Draft Summary from Last Subgroup Meeting

- Distributed to Subgroup members on March 22
- Any comments, suggestions for changes/edits?
- Consensus for accepting summary as final

# Subgroup Logistics

**Data sharing** - An electronic file sharing platform (Sharepoint site)

**Meeting information on Town Hall** ([www.townhall.virginia.gov](http://www.townhall.virginia.gov)).

**Admin support** - Office of Drinking Water (ODW) staff

**Meeting Schedule** - Monthly (as needed)

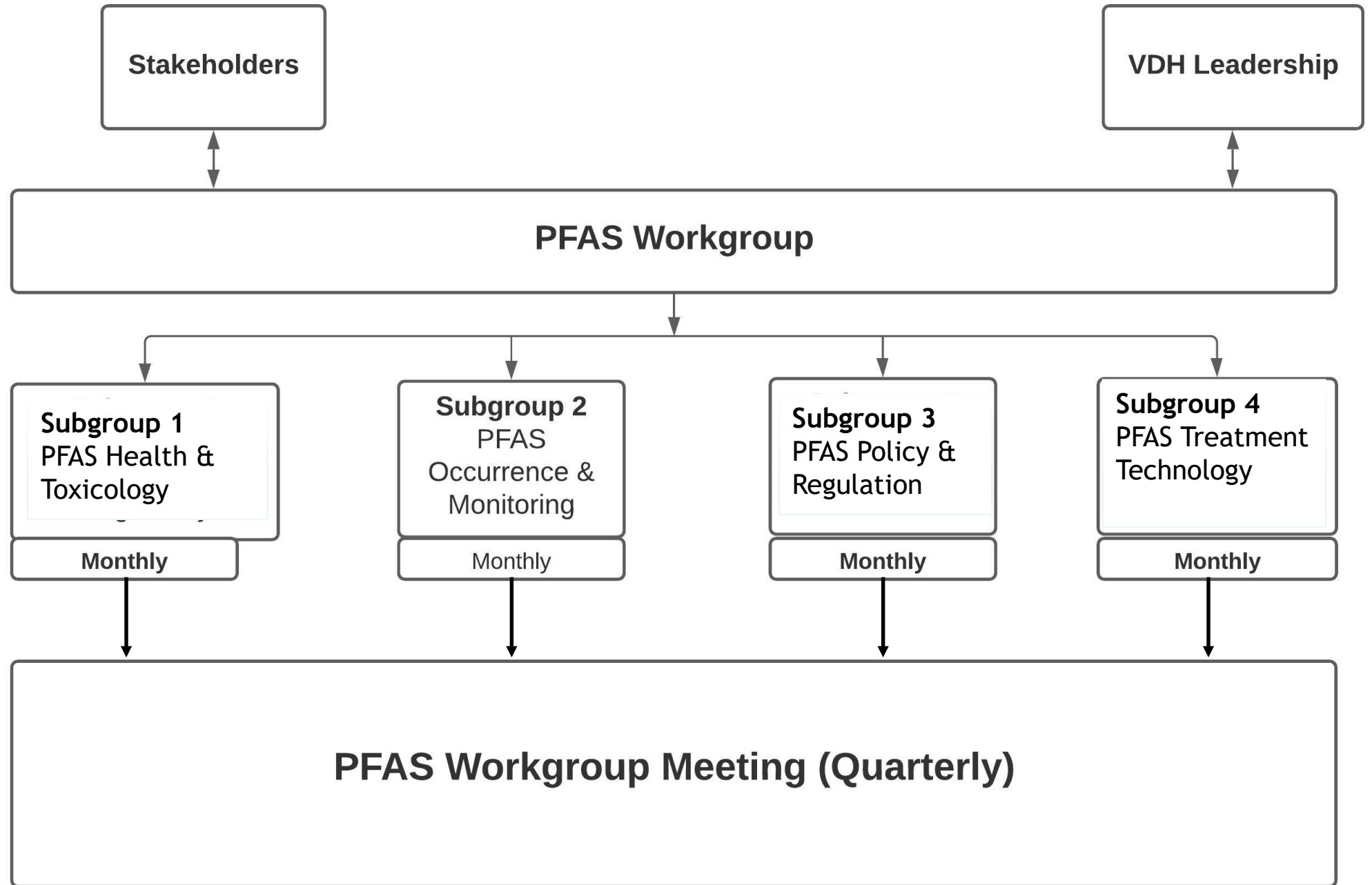
**Meetings** - Virtual via Webex

**Meetings** - Will be recorded

**Meetings** - Are considered meetings of a public body under Virginia FOIA

**Email** - Communications to Members - sent via blindcopy (so can't "reply-all")

# PFAS Subgroup Functioning



### Subgroup 1: Health & Toxicology

- Review other States information & make recommendations on the What's & Why's?
- These recommendations should accompany with:
  - Rational (Scientific/Toxicological/Tech)? : Why chose these PFAS chemicals or Why add or remove any chemicals for VA?
  - What approach (Past & Future)?
  - What Value (Rational)?
- A Report on the Subgroup Findings

### Subgroup 3: Policy & Regulation

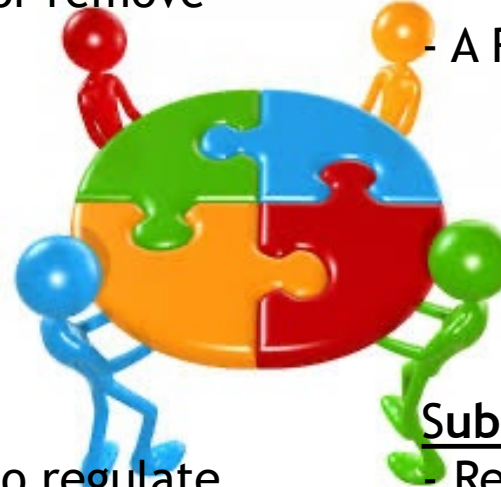
- What methodology did other States follow to regulate such PFAS chemicals in their drinking water (How)?
- Based on what info/resources we have in VA, What framework would be best suited?
- What will be the path moving forward
- A Report on the Subgroup Findings

### Subgroup 2: Occurrence & Monitoring

- What, Why and How
- Rational & Approach on selecting sampling sites
- Sampling methodology
- Coordinate Sampling effort & Report Results
- A Report on the Subgroup Findings

### Subgroup 4: Treatment Technology

- Review & Recommend Best Available Treatment Technologies (BATT) for PFAS removal
- Technical & Economical Feasibility Analysis on the BATT for PFAS removal
- Relevance & Limitations of Treatment Technologies in Virginia Proximity to potential PFAS contamination
- A Report on the Subgroup Findings



# PFAS Subgroup Member Expectations

- Participate and contribute to this subgroup
- Commitment of 5-10 hours per month to study, review, interpret and develop new documents / guidelines / recommendations

# Virginia PFAS Subgroup - Objectives

## **Review and recommend Best Available Treatment Technologies (BAT) for PFAS Removal**

- Technical and economic feasibility analysis
  - Conventional treatment
  - Advanced treatment
- Limitations on BATT
  - Removal performance limitations
    - Effectiveness against specific PFAS species
  - Waste discharge limitations
- Potential design guidelines, treatment goals, operational monitoring
  - Is pilot testing needed (ever? always?)
- Capital and operating costs
- Information needs and gaps



# Report on Assignments from last meeting

- **Mark Estes and Russ Navratil:** Identify and report on vendors/manufacturers of equipment/processes that target PFAS removal
- **All members:** Review ITRC materials on treatment technologies (Dan Horne to provide links for use)

# Update on Resources

- VDH - ODW website on PFAS  
<https://www.vdh.virginia.gov/drinking-water/pfas/>
- AWWA released (late 2020) three updated Guidance documents:
  - Source Water Evaluation
  - Treatment Selection Guide
  - Toxicological Research<https://www.awwa.org/Resources-Tools/Resource-Topics/PFAS>  
(documents are free to download for AWWA members)
- Interstate Technology Regulatory Council (ITRC) - updated PFAS document  
<https://pfas-1.itrcweb.org/>

# Upcoming meetings and webinars

- Next Thursday, 4 Mar: 2:00 - 3:00 p.m.  
PFAS Full Workgroup meeting to discuss the draft Sampling Study design  
Draft sent out via email on 23 Feb
- Wednesday, 31 Mar: 1:00 - 2:30 p.m.  
AWWA webinar on the Treatment Selection Guide  
<https://www.awwa.org/Events-Education/Events-Calendar/mid/11357/Occuranceld/485?ctl=ViewEvent>  
(note: there is a cost to attend, with a differential for non-members)

# Preparing for next meeting (1)

Discussion of commonly used PFAS treatment processes

- Granular Activated Carbon filtration
- Ion Exchange filtration
- Reverse Osmosis filtration (high pressure membranes)

# Granular Activated Carbon Filtration

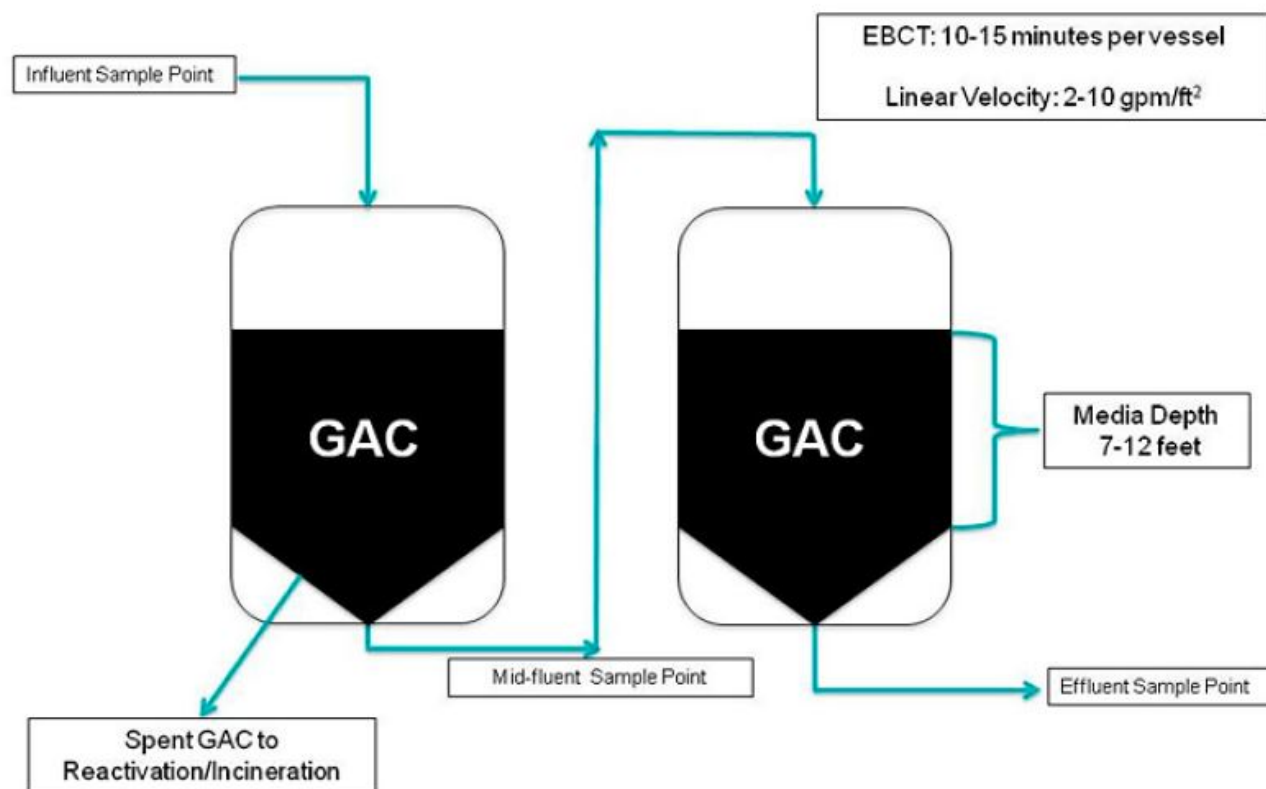


Figure 12-2. Typical GAC treatment system process flow diagram.

Source: Used with permission from Calgon Carbon Corporation.

Source: ITRC PFAS Technical and Regulatory Guidance, Document, Chapter 12

# Ion Exchange Filtration

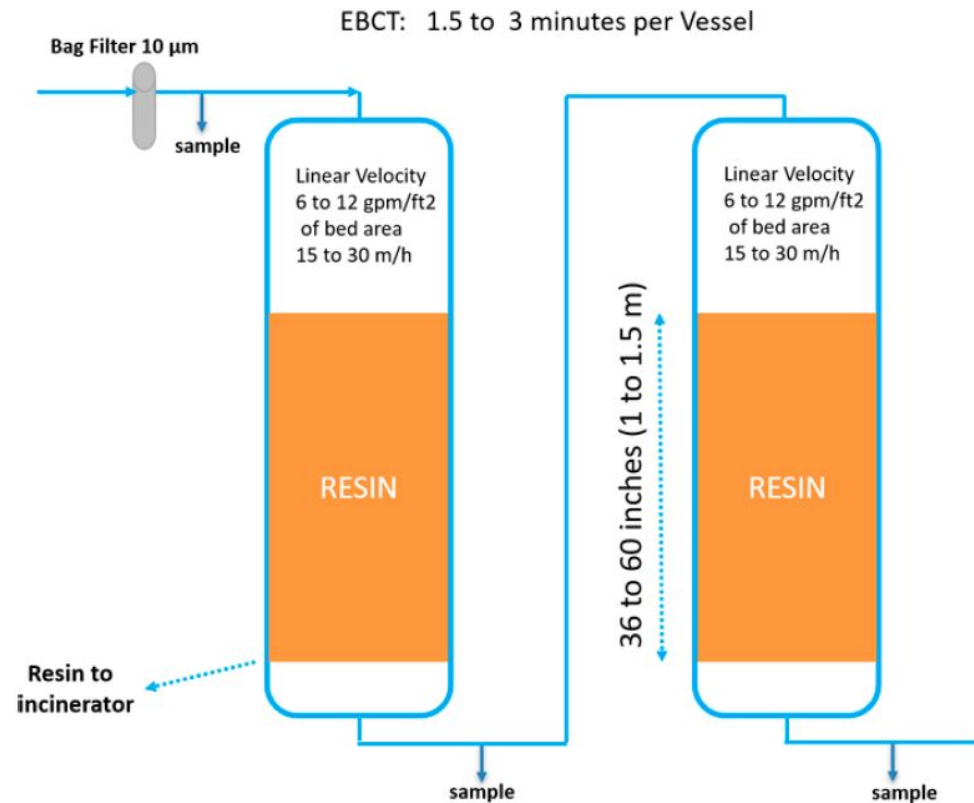
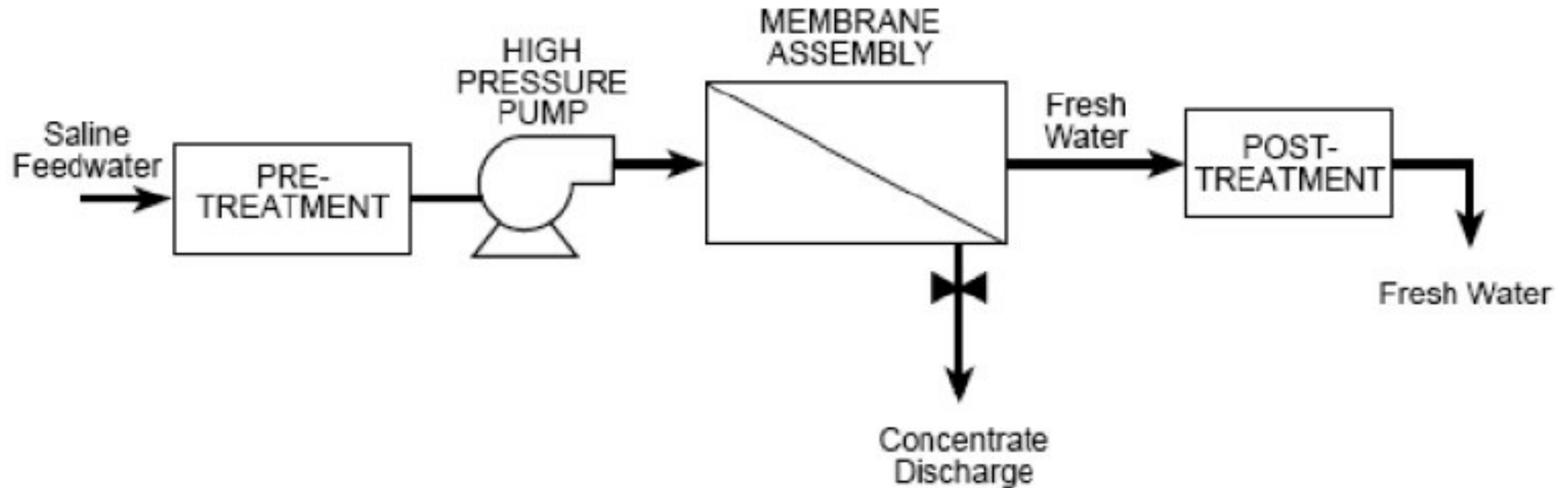


Figure 12-5. Single-use IX process flow diagram.  
Source: Used with permission from Purolite Corporation.

Source: ITRC PFAS Technical and Regulatory Guidance, Document, Chapter 12

# Reverse Osmosis Filtration



Source: “Renewable Energy Powered Desalination Systems”, Eltawil & Zhao, via ResearchGate.net

# Preparing for next meeting (2)

- Need to begin preparing summary documents for those treatment processes
  - General discussion, capabilities, limitations, operating considerations)
  - One to two pages
- Need to look at case histories of operating facilities (costs, performance, monitoring operations, etc.) and develop summaries
- **Assignments:**



# Public Comments

# Next Meeting of Subgroup

## Decision at last meeting:

- Subgroup will meet on fourth Thursday of the month, at 10:00 a.m.
- Target is for meetings to last no more than 90 minutes (end early if possible)

**Next meeting: March 25, 2021**

# Have any Questions, Comments, or Suggestions? Contact

Daniel B. Horne

[Daniel.Horne@vdh.Virginia.gov](mailto:Daniel.Horne@vdh.Virginia.gov)

757-683-2000 x 102