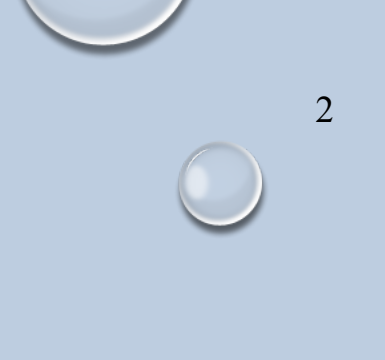



REGULATION OF PFAS IN PUBLIC DRINKING WATER SYSTEMS IN VERMONT

DRINKING WATER AND GROUNDWATER PROTECTION DIVISION



DRINKING WATER & GROUNDWATER PROTECTION DIVISION

**1 National Life Drive, Davis 4
Montpelier VT 05620-3521**

Phone: 802-828-1535

Fax: 802-828-1541

<https://dec.vermont.gov/water>



WHAT ARE PFAS?

3

PFAS (pronounced “pee-fass”) stands for a class of chemicals referred to as PER AND POLYFLUOROALKYL SUBSTANCES

PFAS are a family of more than 4000 man-made fluorinated organic chemicals that have been used in industry and consumer products as early as the 1940s because they are resistant to heat, water, and oil

- **widely used in food packaging and cookware, household cleaning products, water and stain repellants, electronics, chrome plating, personal care products and many industrial uses**
- **detected in drinking water, landfills, wastewater, in humans, animals, and even plants**

Commercial and Consumer Products Containing PFAS:

- paper and packaging
- clothing and carpets
- outdoor textiles and sporting equipment
- ski and snowboard waxes
- non-stick cookware
- cleaning agents and fabric softeners
- polishes and waxes, and latex paints
- pesticides and herbicides
- hydraulic fluids
- windshield wipers
- paints, varnishes, dyes, and inks
- adhesives
- medical products
- personal care products (for example, shampoo, hair conditioners, sunscreen, cosmetics, toothpaste, dental floss)

WHAT ARE PFAS?

4

PFAS are chemicals formed from carbon chains (i.e. alkanes) with strong carbon-fluorine bonds which are extremely difficult to break down

perfluorinated = straight carbon chains and fully fluorinated

polyfluorinated = side chained carbons and partially fluorinated

The ionic state (i.e. electrical charge) and chemical and physical properties control fate and transport in the environment, as well as human health and ecological effects

➤ Found in various different forms

- ☐ acid
- ☐ anion (negatively charged and commonly exist in this form in environment)
- ☐ cations (positively charged)
- ☐ some *both* negative and positively charged

Perfluorooctanoic acid (PFOA) and Perfluorooctane sulfonic acid (PFOS) are most produced and studied PFAS

WHAT ARE PFAS?

5

PFAS Family Tree

Family

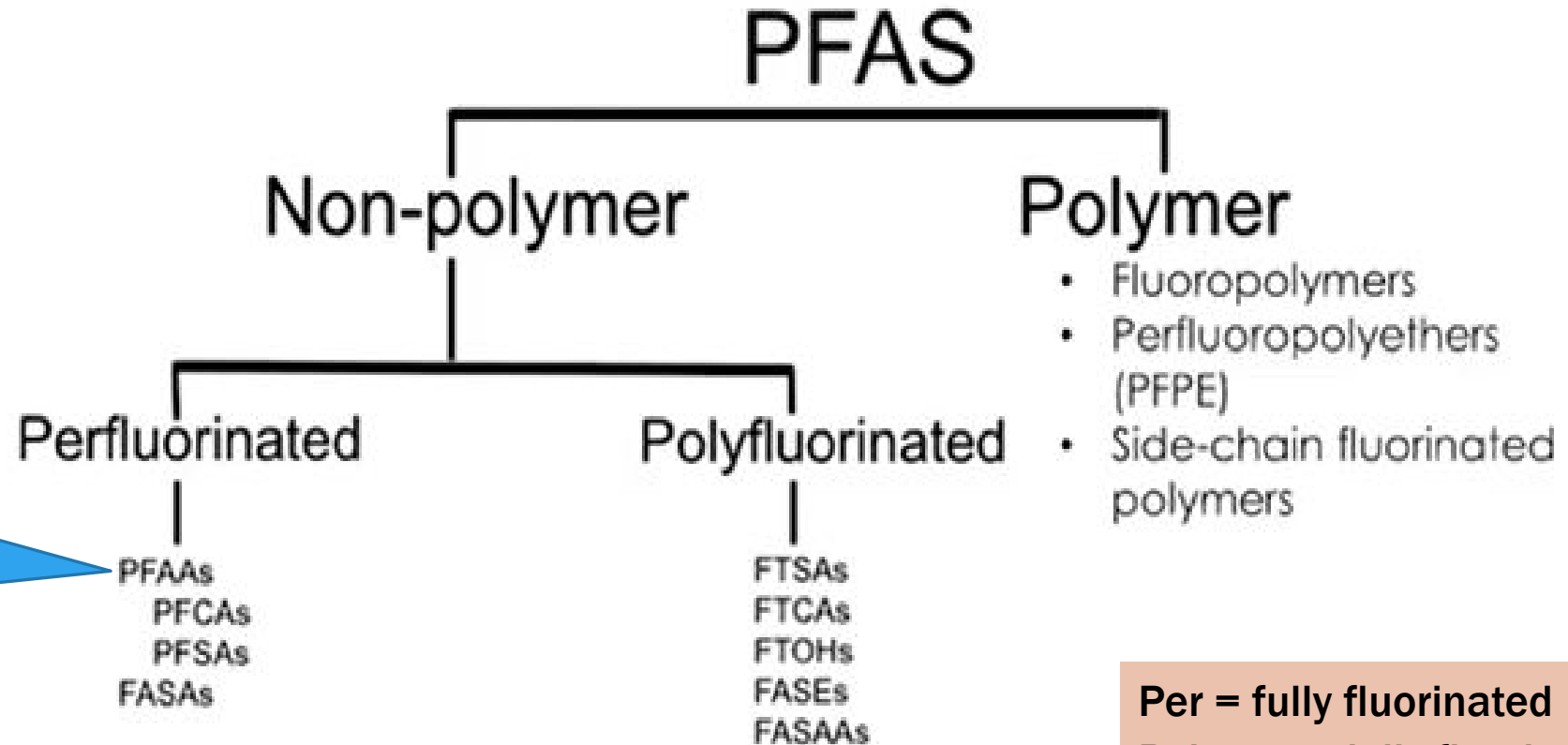
Class

Subclass

Group

Subgroup

PFOA and PFOS are in the Perfluoroalkyl acids (PFAAs) group



Per = fully fluorinated
Poly = partially fluorinated

PFAAs are considered “terminal” because they are very stable and do not naturally break down

WHAT ARE PFAS?

6

PFOA and PFOS, (as well as PFHxS, and other related precursors) have been phased out by industry but still being produced internationally and imported into the US

Similar replacement chemicals remain:

GenX - (HFPO-DA) replacement chemical for PFOA which was historically used in non-stick coating production.

ADONA - replacement chemical for PFOA

PFBS - substitute for PFOS

WHAT ARE PFAS?

7

Length of carbon chain and functional group largely regulate behavior in the environment, but in general:

Long Chain (like PFOA, PFOS)

- have greater number of carbon atoms and considered more toxic, bioaccumulate

Short Chain (like PFBS, PFBA)

- have fewer carbons, considered less toxic, not shown to bioaccumulate like longer-chained PFAS

“PFC” no longer used as that would not include the polyfluorinated compounds

“PFAS” differentiates from carbon-ring compounds and refrigerants

WHAT ARE PFAS?

8

Why do PFAS get so much attention?

- they are everywhere – colorless, odorless, wide variety of uses
- persistent in the body and mobile in the environment
- easily contaminate groundwater and surface water

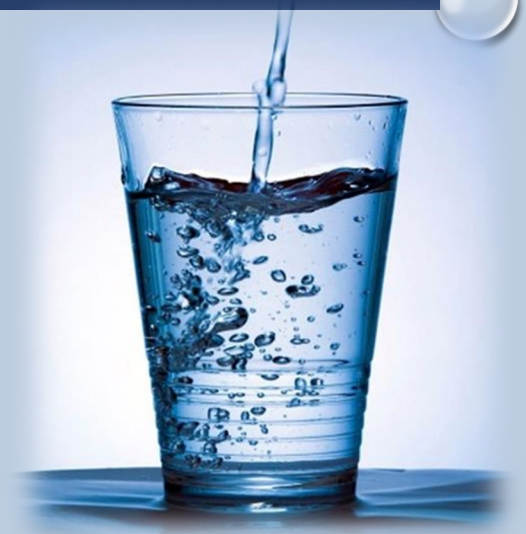
Do not break down easily (especially PFAAs), but do transform

- found in people's blood, liver and kidneys, wildlife (even polar bears), fish all over the world
- bioaccumulation - can take many years to leave the body even after exposure stops

WHAT ARE THE 5 VT REGULATED PFAS?

9

- PFOA (perfluorooctanoic acid)
- PFOS (perfluorooctane sulfonic acid)
- PFHxS (perfluorohexane sulfonic acid)
- PFHpA (perfluoroheptanoic acid)
- PFNA (perfluorononanoic acid)

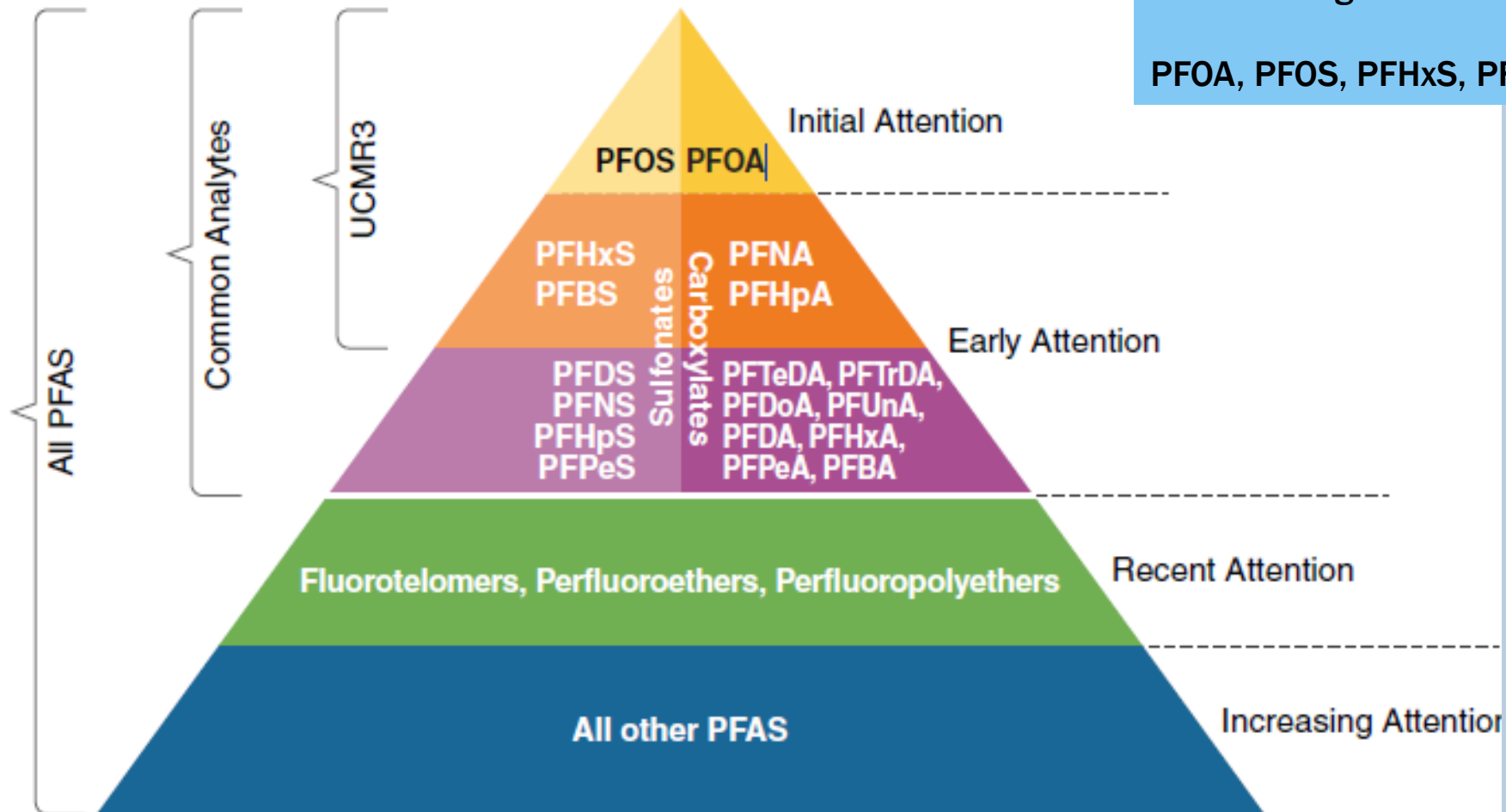


BACKGROUND

10

Vermont Regulated 5 PFAS:

PFOA, PFOS, PFHxS, PFHpA, PFNA



Thematic and not proportional. Bottom of triangle indicates additional number of compounds; not a greater quantity by mass, concentration, or frequency of detection.

Figure 3-1. Emerging awareness and emphasis on PFAS occurrence in the environment

BACKGROUND

Table 2-1. Discovery and manufacturing history of select PFAS

PFAS ¹	Development Time Period							
	1930s	1940s	1950s	1960s	1970s	1980s	1990s	2000s
PTFE	Invented	Non-Stick Coatings			Waterproof Fabrics			
PFOS		Initial Production	Stain & Water Resistant Products	Firefighting foam				U.S. Reduction of PFOS, PFOA, PFNA (and other select PFAS ²)
PFOA		Initial Production	Protective Coatings					
PFNA					Initial Production	Architectural Resins		
Fluoro-telomers					Initial Production	Firefighting Foams		Predominant form of firefighting foam
Dominant Process ³		Electrochemical Fluorination (ECF)						Fluoro-telomerization (shorter chain ECF)
Pre-Invention of Chemistry /			Initial Chemical Synthesis / Production			Commercial Products Introduced and Used		

Notes:

1. This table includes fluoropolymers, PFAAs, and fluorotelomers. PTFE (polytetrafluoroethylene) is a fluoropolymer. PFOS, PFOA, and PFNA (perfluorononanoic acid) are PFAAs.
2. Refer to Section 3.4.
3. The dominant manufacturing process is shown in the table; note, however, that ECF and fluorotelomerization have both been, and continue to be, used for the production of select PFAS.

Sources: Prevedouros et al. 2006; Concawe 2016; Chemours 2017; Gore-Tex 2017; US Naval Research Academy 2017

MAJOR SOURCES OF PFAS

12

Industrial sites that use or process PFAS, manufacturing facilities using PFAS (i.e. waterproof fabric manufacturing, semiconductor fabrication, and wire coating facilities)

Fire training/fire response sites due to the use of Aqueous Film-Forming Foam (AFFF)

Landfills

WWTPs/Biosolids



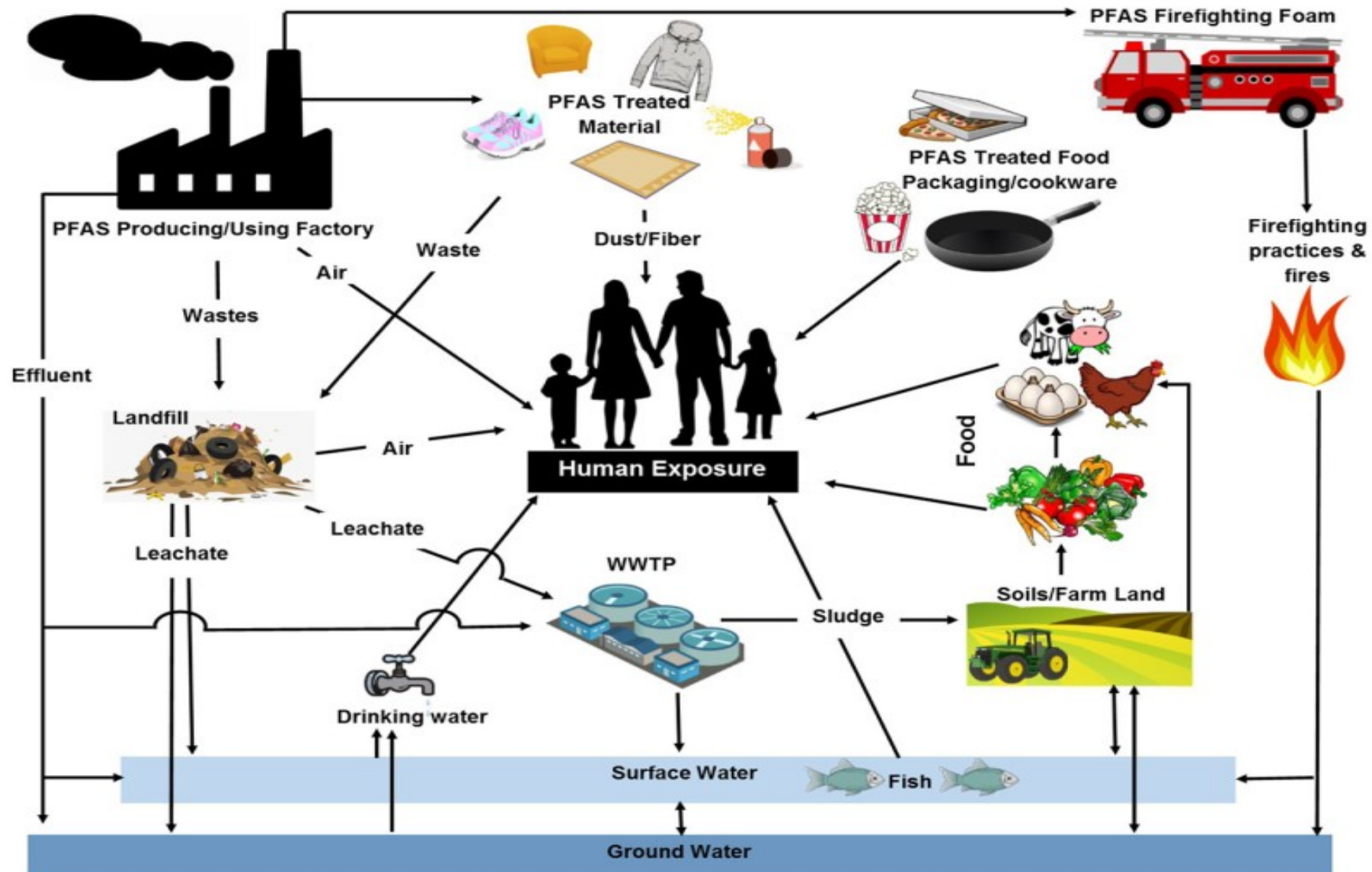
[This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)



[This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

SOURCES OF PFAS

13



Human Exposure and sources of PFAS

Image: DWP, adapted from Oliaei et al. 2013.

PRODUCTS CONTAINING PFAS

14

Water resistant clothing and shoes with Gore-Tex™

Non-stick coatings such as Teflon® (PTFE or polytetrafluoroethylene)

Stain resistant treatments such as Scotchgard ®

Water resistant building materials such as Tyvek®

Waterproof/treated paper or field books, plastic clipboards

Post-It® and other adhesive paper products

Cosmetics, shampoo, fabric softeners

Pre-packaged food, fast food wrappers

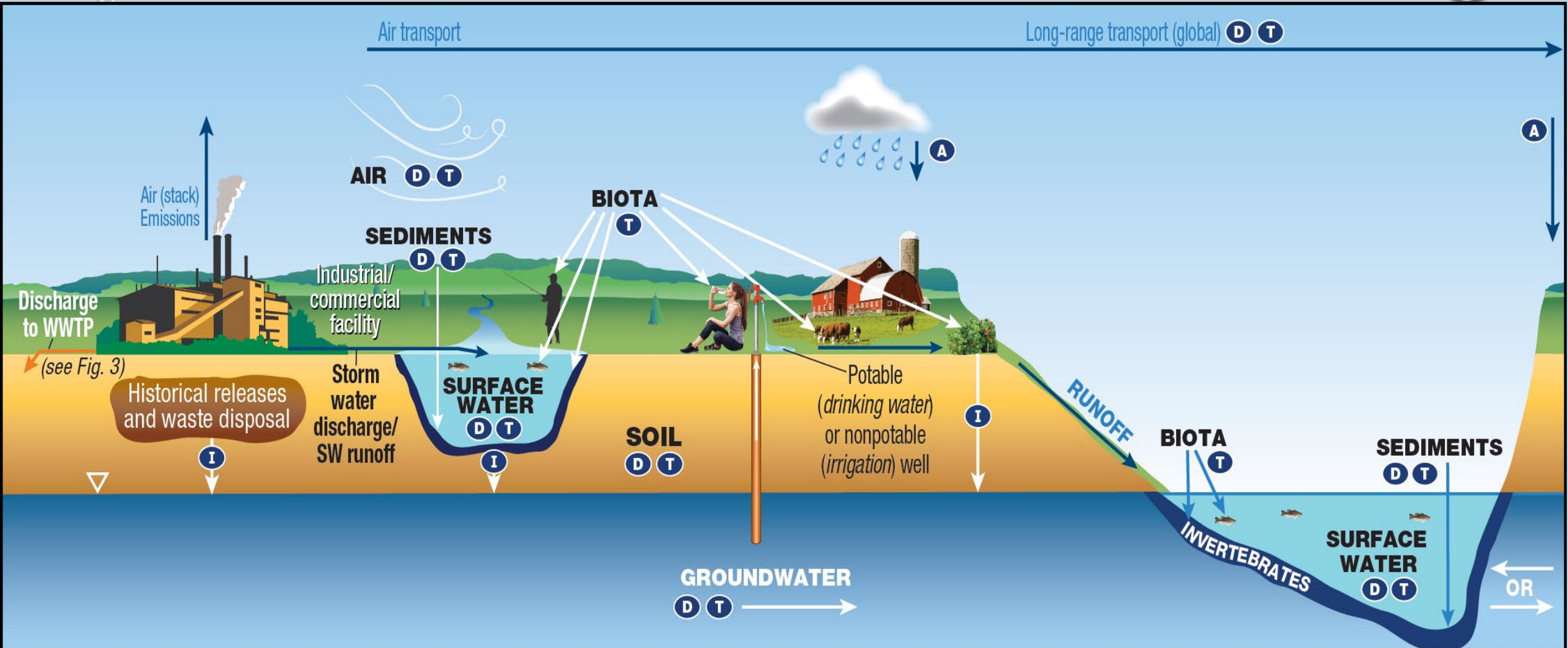
Take out food containers,
and pizza boxes



This Photo by Unknown Author is licensed under [CC BY-SA](#)

PFAS ENVIRONMENTAL FATE AND TRANSPORT

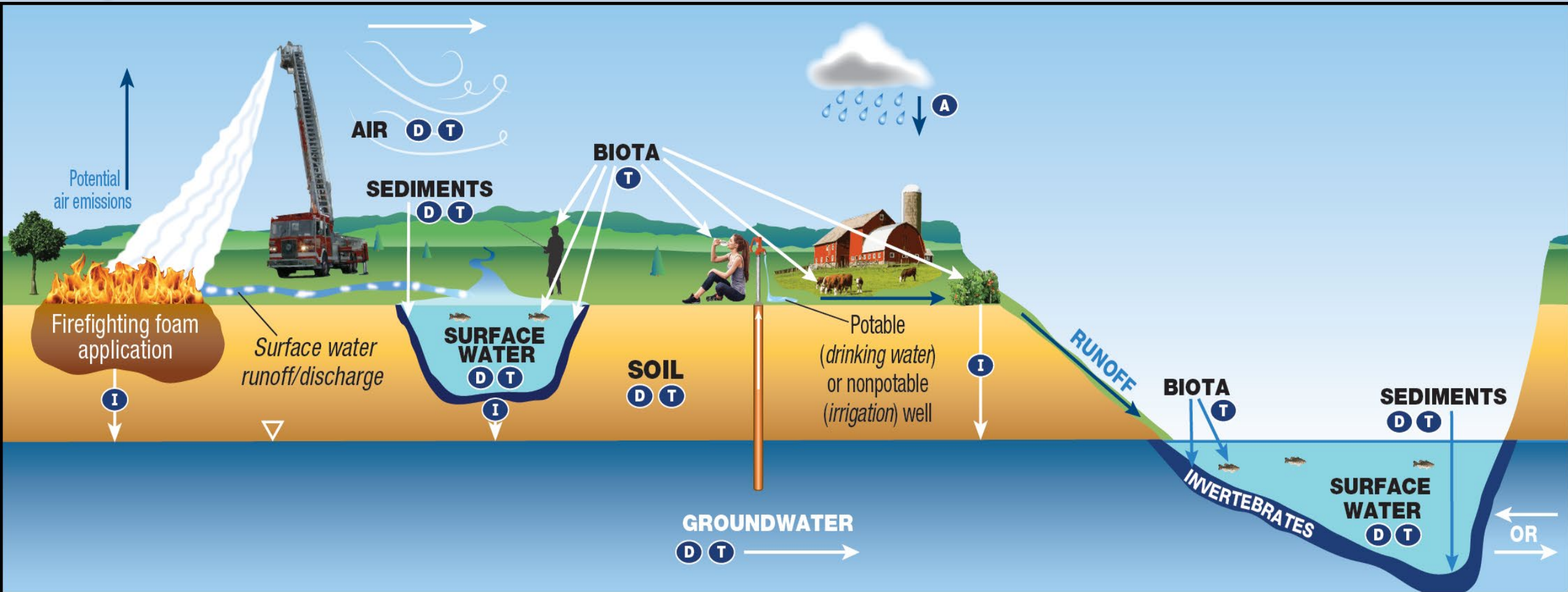
15



KEY **A** Atmospheric Deposition **D** Diffusion/Dispersion/Advection **I** Infiltration **T** Transformation of precursors (abiotic/biotic)

MORE FATE AND TRANSPORT

16



KEY **A** Atmospheric Deposition **D** Diffusion/Dispersion/Advection **I** Infiltration **T** Transformation of precursors (abiotic/biotic)

HOW DID WE GET HERE?

17

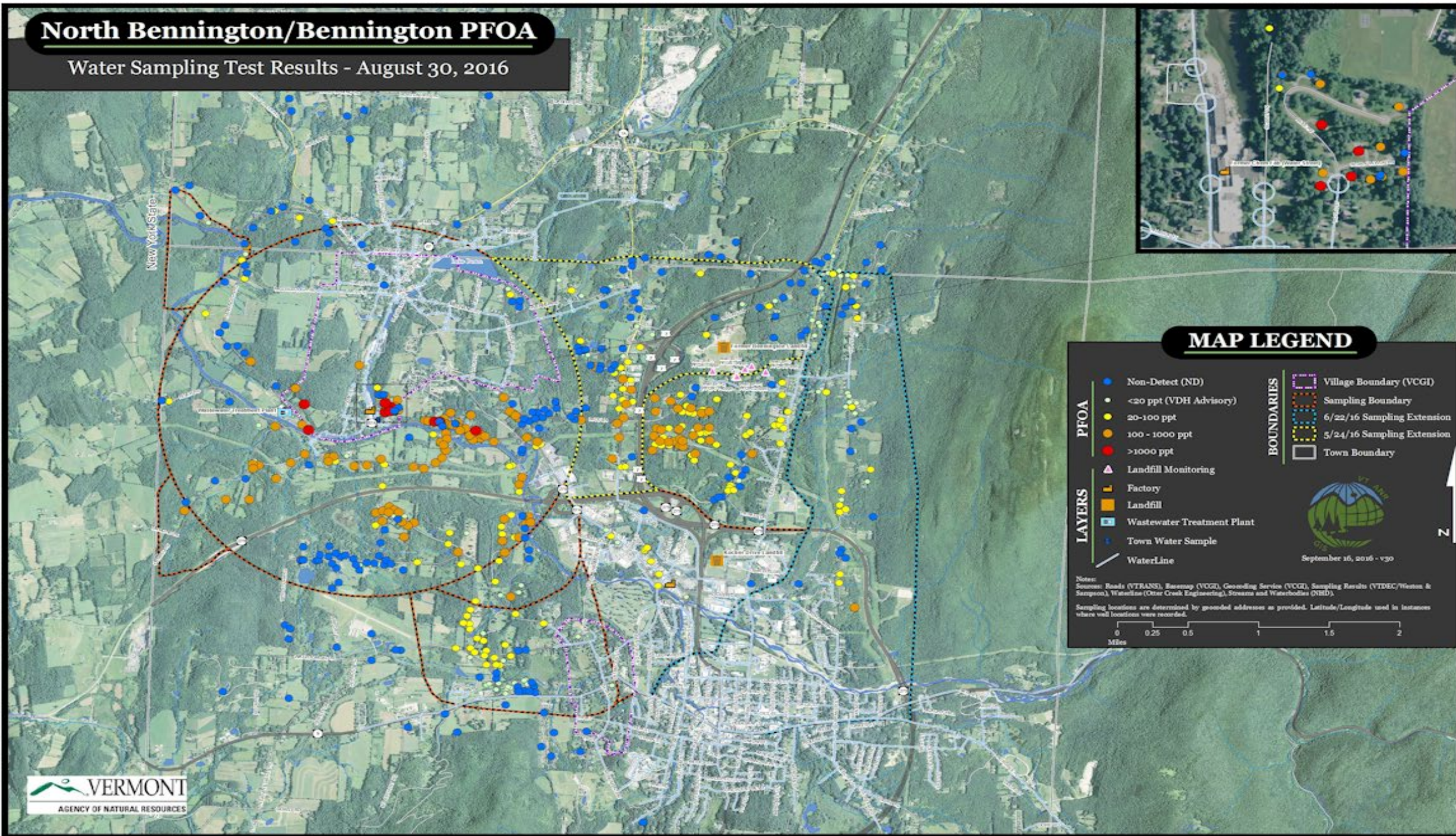


Hoosick Falls, NY – PFOA from Saint-Gobain Performance Plastics

North Bennington, Bennington – Former CHEMFAB Teflon fabric-coating facilities

North Bennington/Bennington PFOA

Water Sampling Test Results - August 30, 2016



EVOLUTION OF REGULATION IN VT

19

➔ 2009 EPA issues provisional health advisory for PFOA at 400 ppt and PFOS at 200 ppt

➔ 2016 EPA establishes 70 ppt health advisory for the sum of PFOA and PFOS

➔ 2016 Vermont establishes 20 ppt health advisory for sum of PFOA and PFOS

➔ 2018 Vermont updates 20 ppt health advisory to include additional PFAS similar to PFOA and PFOS (total of 5 PFAS)

➔ 2019 Act 21 establishes an interim maximum contaminant level (MCL) for same 5 PFAS at 20 ppt

➔ 2020 Water Supply Rule updated to incorporate PFAS MCL and sampling requirements.



EPA HEALTH ADVISORY VS. VERMONT MCL

20

No federal MCL exists for PFAS, but EPA has a lifetime health advisory of 70 parts per trillion (ppt) for PFOA and PFOS only

- Based on exposure to a lactating woman and adverse developmental health effects to the most sensitive populations (i.e. fetuses during pregnancy and breastfed infants)



In Vermont, the MCL is 20 parts per trillion (ppt) for the sum of any combination of PFOA, PFOS, PFHxS, PFHpA and PFNA

- Based on exposure to an infant. Because an infant drinks more water per body weight than an adult woman, the dose to the infant is higher than the dose to the adult woman



BACKGROUND

Data acquired under EPA's Third Unregulated Contaminant Monitoring Rule (UCMR 3) for 6 PFAS

2013 - 2015 select community water systems were sampled and results non-detect (ND)*

** Reporting Limits were considerably higher*

2016 Targeted sampling around the state based on location, industrial, and land uses indicating potential sources of contamination (PSOC)

- State Fire Academy – Pittsford
- Airports from use of AFFF – Clarendon, Rutland
- Bennington, Pownal, North Bennington, Shaftsbury
- multiple public systems and private wells were also sampled due to proximity to PSOC

Contaminant	UCMR 3 Reporting Limit (ppt)
<i>PFBS</i>	90
PFHpA	10
PFHxS	30
PFNA	20
PFOA	20
PFOS	40

2018 Pilot study at select schools throughout the state due to proximity to PSOC

BACKGROUND

22

Detections found:

of schools tested in pilot

- 2 public systems with PFAS over MCL – GAC (Granular Activated Carbon) treatment installed

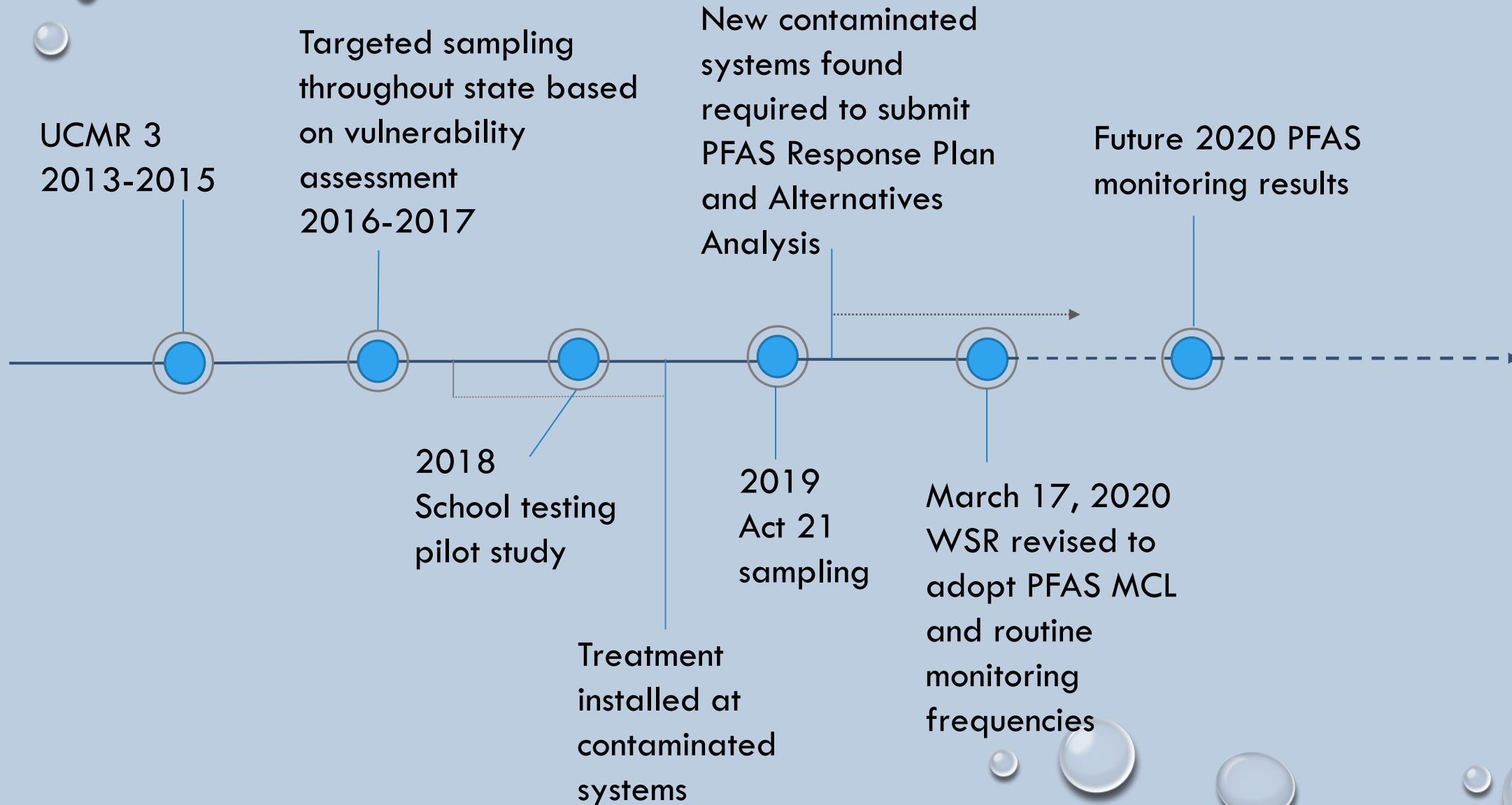
of the public water systems in areas of concern tested had PFAS over the MCL

- 4 TNCs in Bennington area
- 1 CWS - Pownal Fire District 2
- 1 NTNC - Rutland Regional Airport Business Park –

✓ Treatment has been installed at each system and finished water is non-detect for PFAS

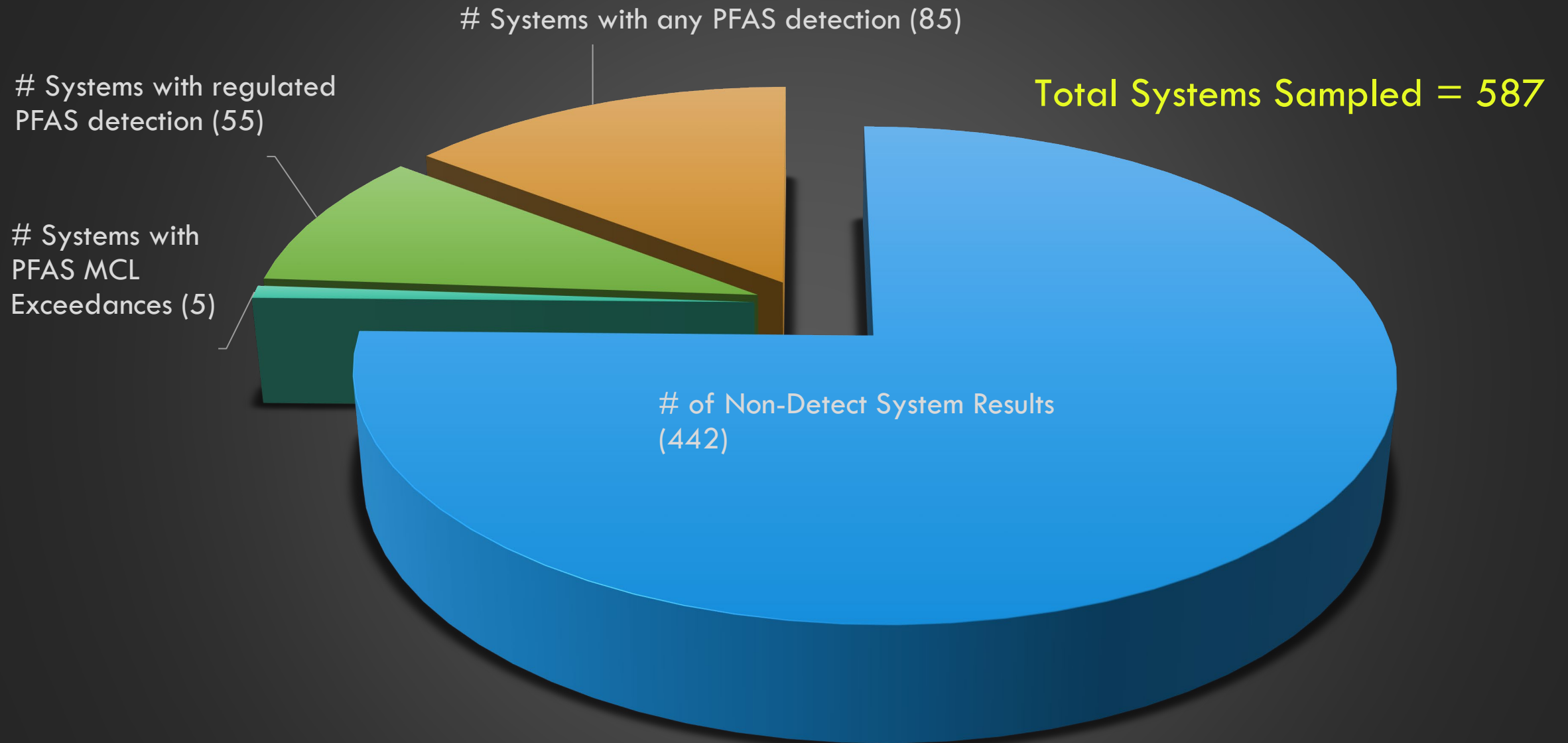
PUBLIC DRINKING WATER PFAS SAMPLING IN VT TIMELINE

23



ACT 21 PFAS SAMPLING RESULTS

24



Section 6.12, Table 6-1:

The Maximum Contaminant Level (MCL) for PFAS is 20 parts per trillion (ppt) or 20 nanograms per liter (ng/L) for the sum of 5 PFAS (PFOA, PFOS, PFHxS, PFHpA, and PFNA)

→ individually or in any combination

- 1 ppt equals 1 ng/L (labs will likely report data in ng/L)

PFAS-RELATED PROVISIONS IN WSR

26

- **§3.3 – Emergency Permits to Construct**
- **§6.1.2(c) – Analysis by VDH-certified lab, using EPA Method 537.1 or alternative method authorized by the Secretary**
- **§6.18.2 – May require TNCs to collect PFAS sampling when contamination is known or suspected of being present to ensure protection of public health and welfare.**
- **§6.18.4(2) – Domestic bottled water systems must take one sample from each source prior to treatment and one sample from each bottled water product type and package size.**

SAMPLING FREQUENCY

27

- 2019 sampling was based on the interim standard and Act 21
- 2020 sampling is “annual monitoring” under 6.18.5 of the rule
 - Every system must sample in 2020, likely in 3rd or 4th quarter unless 2019 results were above 15 ng/L.
- If 2020 sampling is non-detect → system decreases to 3-year
 - Following two sequential 3-year periods at non-detect → system reduces to 6-year monitoring.
- If 2020 sampling is above 15 ng/L → system will sample quarterly
- If 2020 sampling is above detection but at/below 15 ng/L → system samples annually.
- If above 20 ng/L, a confirmation sample is required ASAP, no more than 10 days later.

SAMPLING FREQUENCY

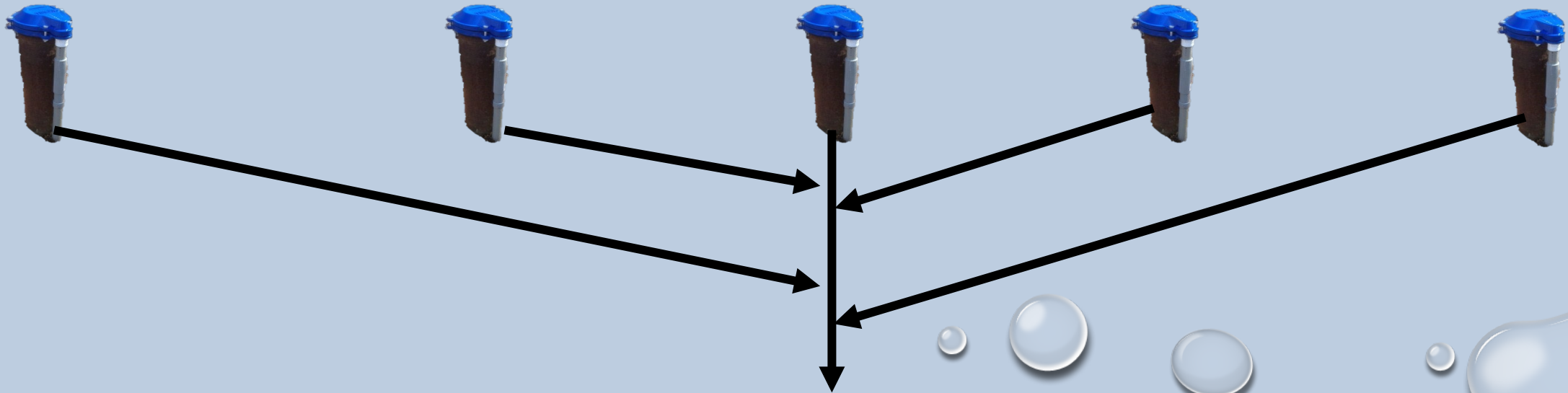
28

- If above 20 ng/L, a confirmation sample is required ASAP, no more than 10 days later.*
 - Must include a field blank AND trip blank with confirmation sample
 - Must use same lab as original sample
 - Assess compliance with MCL based on average of initial and confirmation sample results.

RAW WATER SAMPLING

29

- If an entry point is supplied by multiple wells and the sample taken that represents all those wells is above 15 ng/L, a sample from each respective source will be required within 30 days.
 - The raw water samples will not be used toward compliance with the MCL, but be diagnostic to assess the source of PFAS.



EMERGENCY PFAS RESPONSE PLAN

30

- “Draft Final PFAS Response Plan” created by consultants to assess:
 - Response types:
 - Emergency – bottled water, bulk haul water
 - Short-term – bulk haul water, temporarily connect to other source/supply
 - Long term – blend, treat, improve existing or develop new source
- Weighs pros/cons, costs, etc. for possible alternatives.

<https://dec.vermont.gov/sites/dec/files/PFAS/Draft-Final-PFAs-Response.pdf>

HEALTH EFFECTS OF PFAS

31

PFAS is a group of chemicals that may affect different systems in the body. Although more research is needed, some studies in people have shown that these chemicals may affect:

- growth, learning, and behavior in babies and children;**
- lower a woman's chance of getting pregnant;**
- interfere with the body's natural hormones;**
- increase cholesterol levels;**
- affect the immune system;**
- and increase the risk of cancer.**

IMPORTED BOTTLED WATER AND PFAS

32



- <https://dec.vermont.gov/sites/dec/files/PFAS/Data-PFAs-received.pdf>
- In order to sell bottled water in Vermont, the facilities are required to comply with the MCL.

VT REGULATED PFAS CONTAMINANTS (5)

33

- PFOA (perfluorooctanoic acid)
- PFOS (perfluorooctane sulfonic acid)
- PFHxS (perfluorohexane sulfonic acid)
- PFHpA (perfluoroheptanoic acid)
- PFNA (perfluorononanoic acid)



PFAS MCL CALCS

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Examples (note 1 ppt = 1 ng/L):

Lab results (in ng/L)

The MCL is 20, not 20.0

PFOA	PFOS	PFNA	PFHxS	PFHpA	Total regulated PFAS concentration in sample
4.5	4.5	4.5	4.5	4.5	22.5 rounds to 23
20.4	0	0	0	0	20.4 rounds to 20
10.0	10.5	0	0	0	20.5 rounds to 21

Detection of 2.0 ng/L is equal to 0.000002 mg/L - looking at low low numbers!

Fun fact: Of the 93 million mile distance from EARTH to the SUN, 1 ppt is the equivalent of moving 6 inches of that total distance

ROUTINE PFAS MONITORING REQUIREMENTS

35

All public community water systems (PCWS) and non-transient non-community (NTNC) systems must sample the active entry point(s) to distribution for PFAS

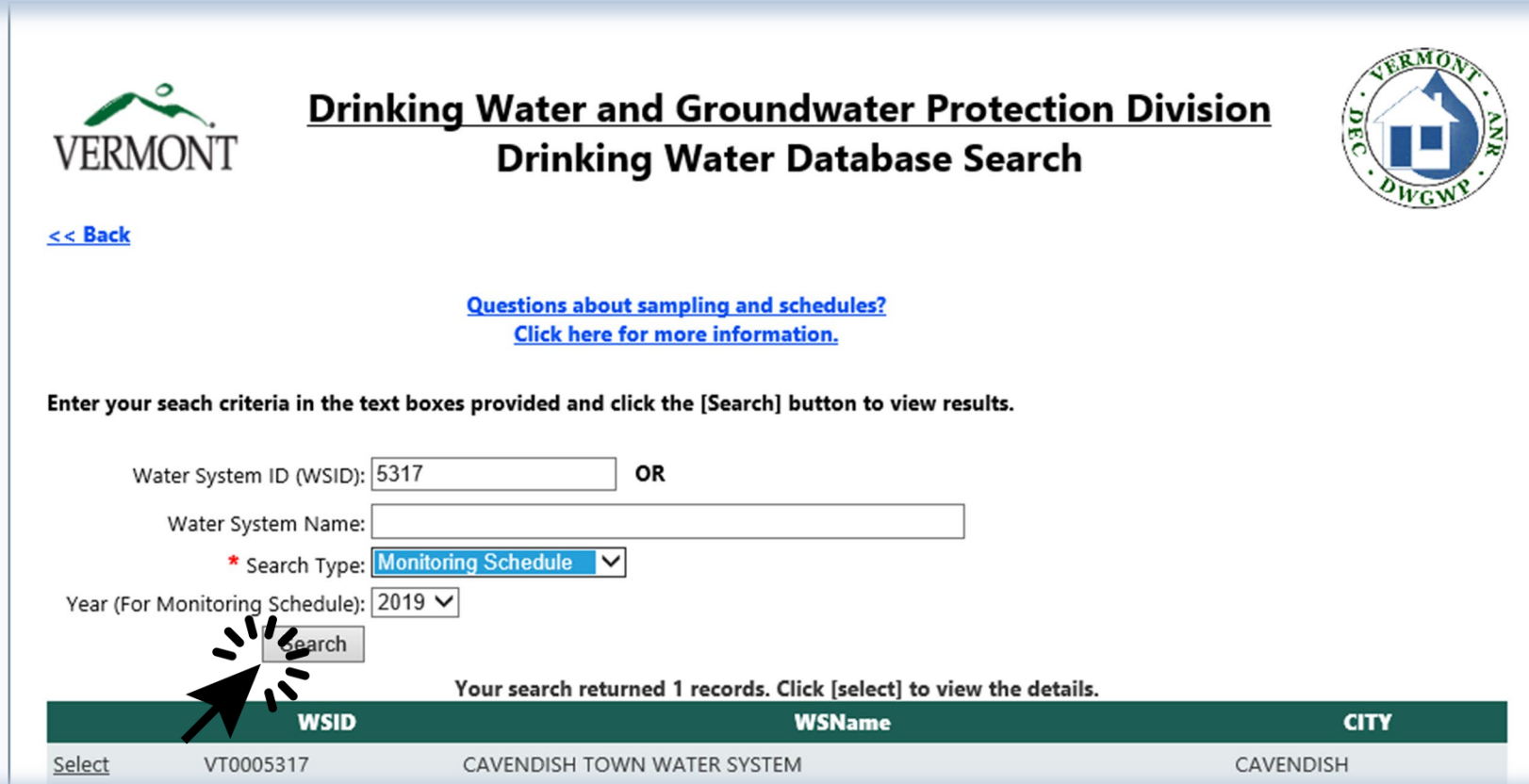
If the entry point is served by multiple wells, the sample must reflect all sources supplying that entry point.*



DOs	DON'Ts
Sample at entry point to distribution	Sample raw water (unless directed to do so)
Sample following all treatment/storage, where possible	Take composite samples among multiple entry points
Code the sample appropriately (TP00# / EP00#)	Sample outside your prescribed monitoring period
Follow Approved schedule	Use a non-certified laboratory
Analyze via EPA Method 537.1	Submit old data instead of sampling when required
Use a VDH-certified laboratory	

WHERE IS MY MONITORING SCHEDULE?

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[HTTPS://ANRWEB.VT.GOV/DEC/DWGWP/](https://anrweb.vt.gov/dec/dwgwp/)





 **Drinking Water and Groundwater Protection Division**
Drinking Water Database Search 


[<< Back](#)

[Questions about sampling and schedules?](#)
[Click here for more information.](#)

Enter your search criteria in the text boxes provided and click the [Search] button to view results.

Water System ID (WSID): OR
Water System Name:

* Search Type: 
Year (For Monitoring Schedule): 



Your search returned 1 records. Click [select] to view the details.

	WSID	WSName	CITY
Select	VT0005317	CAVENDISH TOWN WATER SYSTEM	CAVENDISH

WHERE IS MY MONITORING SCHEDULE?

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DEC.VERMONT.GOV/WATER

The screenshot shows the DEC Vermont Government website. The browser address bar displays <https://dec.vermont.gov/water>. The website header includes the Vermont Official State Website logo and the Vermont Department of Environmental Conservation logo. The navigation menu lists various topics, with 'Drinking Water and Groundwater' highlighted. A search bar is located in the top right corner. A large arrow points down from the 'Drinking Water and Groundwater' section to the 'DWGWP Updates' section.

VERMONT OFFICIAL STATE WEBSITE

AGENCY OF NATURAL RESOURCES
Department of Environmental Conservation

AIR AND CLIMATE LAND WASTE WATER LEARN MORE, DO MORE

Home
About DEC
Commissioner's Office
Administration and Innovation
Air Quality and Climate
Drinking Water and Groundwater
COVID-19 Response and Resources
PFAS (Per- and polyfluoroalkyl substances) Information Page
Public Drinking Water

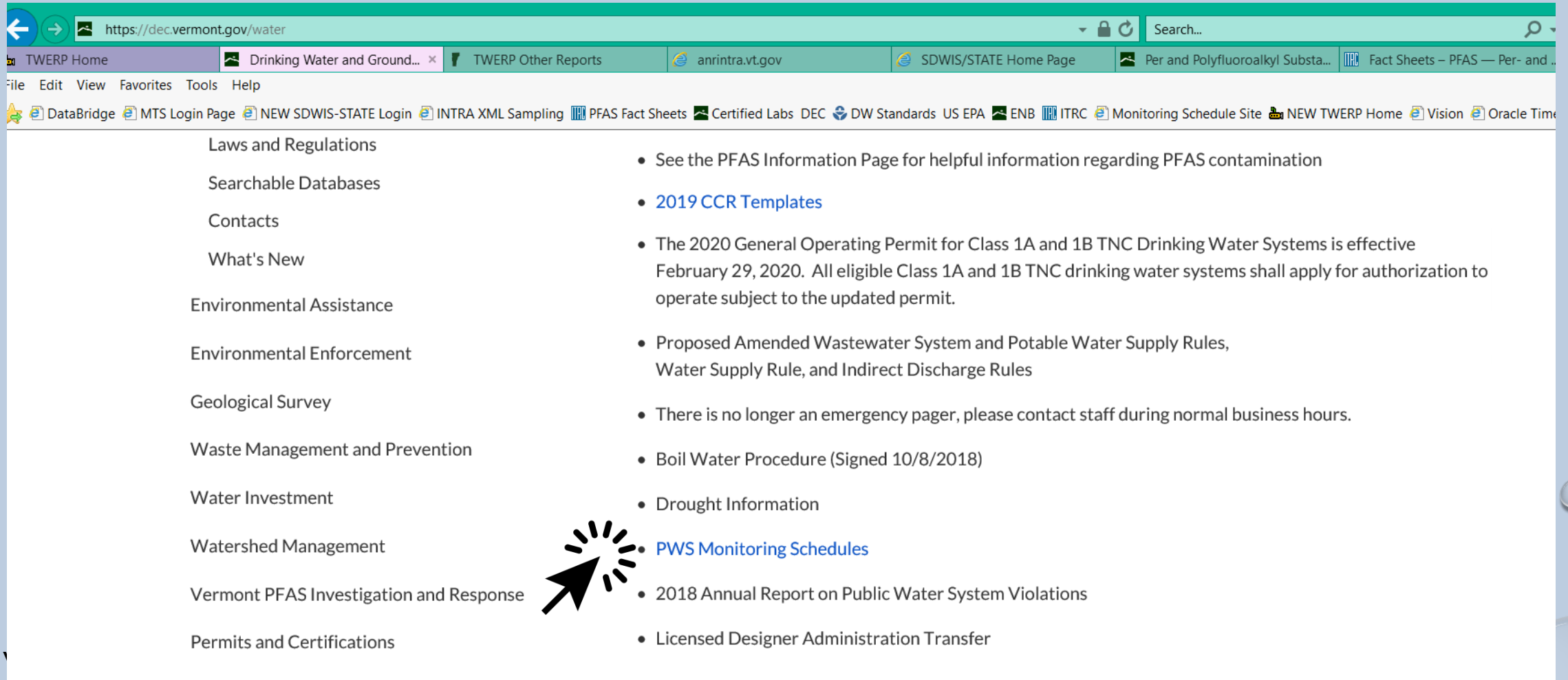
Licensed Designer Soil Training »
Learn what it takes to become a licensed designer

DWGWP Updates

WHERE IS MY MONITORING SCHEDULE?

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DEC.VERMONT.GOV/WATER



The screenshot shows the DEC.Vermont.gov/Water website. The browser address bar displays <https://dec.vermont.gov/water>. The website has a navigation menu on the left with the following items: Laws and Regulations, Searchable Databases, Contacts, What's New, Environmental Assistance, Environmental Enforcement, Geological Survey, Waste Management and Prevention, Water Investment, Watershed Management, Vermont PFAS Investigation and Response, and Permits and Certifications. On the right side, there is a list of links: See the PFAS Information Page for helpful information regarding PFAS contamination, 2019 CCR Templates, The 2020 General Operating Permit for Class 1A and 1B TNC Drinking Water Systems is effective February 29, 2020. All eligible Class 1A and 1B TNC drinking water systems shall apply for authorization to operate subject to the updated permit., Proposed Amended Wastewater System and Potable Water Supply Rules, Water Supply Rule, and Indirect Discharge Rules, There is no longer an emergency pager, please contact staff during normal business hours., Boil Water Procedure (Signed 10/8/2018), Drought Information, **PWS Monitoring Schedules** (highlighted with a black arrow), 2018 Annual Report on Public Water System Violations, and Licensed Designer Administration Transfer.

Navigation Menu:

- Laws and Regulations
- Searchable Databases
- Contacts
- What's New
- Environmental Assistance
- Environmental Enforcement
- Geological Survey
- Waste Management and Prevention
- Water Investment
- Watershed Management
- Vermont PFAS Investigation and Response
- Permits and Certifications

Links:

- See the PFAS Information Page for helpful information regarding PFAS contamination
- [2019 CCR Templates](#)
- The 2020 General Operating Permit for Class 1A and 1B TNC Drinking Water Systems is effective February 29, 2020. All eligible Class 1A and 1B TNC drinking water systems shall apply for authorization to operate subject to the updated permit.
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- Boil Water Procedure (Signed 10/8/2018)
- Drought Information
- [PWS Monitoring Schedules](#)**
- 2018 Annual Report on Public Water System Violations
- Licensed Designer Administration Transfer

WHERE DO I FIND MY FACILITY ID?

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2020 Monitoring Schedule Details

VT0005272 - MONTPELIER WATER SYSTEM

System Type: C Population: 8700 Primary Source: SW

Generated on 4/27/2020 from <https://anrweb.vt.gov/DEC/dwgwp>

Notes: For additional monitoring requirement details, view instructions [here](#). Click on chemical groups below for a list of all included analytes within the group. Water Systems that do not follow their required monitoring schedule will receive a monitoring violation.

A Facility ID = code in our database about your water system infrastructure

Entry Point to Distribution System Samples (Finished Water)

If using treatment, take these samples from finished water after treatment

Facility ID: TP001 - TREATMENT PLANT 1

Sample Point: EP001

Analyte/Group	Monitoring Period	Sample Frequency	Sample Site
NITRATE	1/1 - 3/31	1 per year	FINISHED WATER PUMP ROOM
VOLATILE ORGANIC CHEMICALS	1/1 - 3/31	1 per year	FINISHED WATER PUMP ROOM
PFAS - VT 5 SUM	10/1 - 12/31	1 per year	FINISHED WATER PUMP ROOM

Facility Name and ID will be listed here

Distribution System Samples - always follow approved sampling plans

Routine Total Coliform Bacteria

Sample location(s):

Facility ID	Facility Name	Sample Point
DS001	DISTRIBUTION SYSTEM	TC001

WHERE DO I FIND MY SAMPLE POINT?

40

2020 Monitoring Schedule Details

VT0005272 - MONTPELIER WATER SYSTEM

System Type: C Population: 8700 Primary Source: SW

Generated on 4/27/2020 from <https://anrweb.vt.gov/DEC/dwgwp>

Notes: For additional monitoring requirement details, view instructions [here](#). Click on chemical groups below for a list of all included analytes within the group. Water Systems that do not follow their required monitoring schedule will receive a monitoring violation.

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PFAS - VT 5 SUM	10/1 - 12/31	1 per year	FINISHED WATER PUMP ROOM

Distribution System Samples - always follow approved sampling plans

Routine Total Coliform Bacteria

Sample location(s):

Facility ID	Facility Name	Sample Point
DS001	DISTRIBUTION SYSTEM	TC001

A Sample Point = code tied to a Facility ID identifying where to take your sample

Sample Site = description of your sampling point in our database. This is often listed as "location" on your COC

FILLING OUT LABORATORY PAPERWORK

41

Sample Types:

RT = Routine

SP = Special Purpose

EP = Entry Point to Distribution System, NOT entry point to water system

Facility IDs:

WL = WELL/SPRING

TP = TREATMENT PLANT

DS = DISTRIBUTION SYSTEM

IN = INTAKE (SURFACE WATER)

ST = STORAGE TANK

PF = PUMP FACILITY

TM = TRANSMISSION MAIN

Sample Points:

RW = RAW WATER

EP = ENTRY POINT

AS = ASBESTOS

LC = LEAD AND COPPER

TC = TOTAL COLIFORM

HA = HALOACETIC ACIDS

TH = TRIHALOMETHANES

Most common code combination for water systems is TP001/EP001

Bigger systems (especially with multiple wells) get more complicated

FILLING OUT LABORATORY PAPERWORK

42

Endyne pre-filled COC – check your codes!

Page 1 of 1

WSID 21368 Burr & Burton PFAS

Endyne Inc. COC
Prepared: 8/16/19

1911-30630

1911-30630

Bill to: Ben Freeman
Burr & Burton Academy
57 Seminary Avenue
Manchester Village VT 05254
Ph: 802-824-4846

Report to: Andy Dahlstrom
Burr & Burton Academy
57 Seminary Avenue
Manchester Village VT 05254
adahlstrom@burrburton.org, mharve

Cust # 101036
Burr & Burton Academy
WSID 21368 Burr & Burton PFAS
VT0021368
PFA0021368

Facility ID: TP001 Smp Pt: EP001 Categ: GE Smp Type: RT Repl Ind: N Compl Ind: Y/N
LOCATION Lebanon, NH Sampled Date/Time: 11/25/19 @ 1230
PFAS WSID Package 2 - 250 mL Plastic Pre - Preserved with Trizma

Facility ID: UNKNO Smp Pt: UNKNO Categ: UN Smp Type: UN Repl Ind: U Compl Ind: Y/N
FIELD BLANK Sampled Date/Time: 11/25/19 @ 1230
PFAS WSID Package 2 - 250 mL Plastic Pre - Preserved with Trizma

Facility ID: UNKNO Smp Pt: UNKNO Categ: UN Smp Type: UN Repl Ind: U Compl Ind: Y/N
TRIP BLANK Sampled Date/Time: Prepared at Lab
DO NOT OPEN!
PFAS WSID Package 2 - 250 mL Plastic Pre - Preserved with Trizma

CHAIN OF CUSTODY PAGE ____ OF ____ Date Rec'd in Lab: 11/25/19

ALPHA ANALYTICAL
WESTBORO, MA TEL: 508-895-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9000 FAX: 508-822-3288

Project Information
Project Name: 1911-30630
Project Location: VT
Project #:
Project Manager:
ALPHA Quote #:
☒ Standard ☐ RUSH (only confirmed if pre-approved)
Date Due: Time:
Email: arawko+z@endynelabs.com

Client Information
Client: Endyne, Inc
Address: 56 Etna Rd
Lebanon, NH 03766
Phone: 603-678-4891
Fax: 603-678-4893

Regulatory Requirements
State/Fed Program (V)

Turn-Around Time

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS
PFAS (537.1)

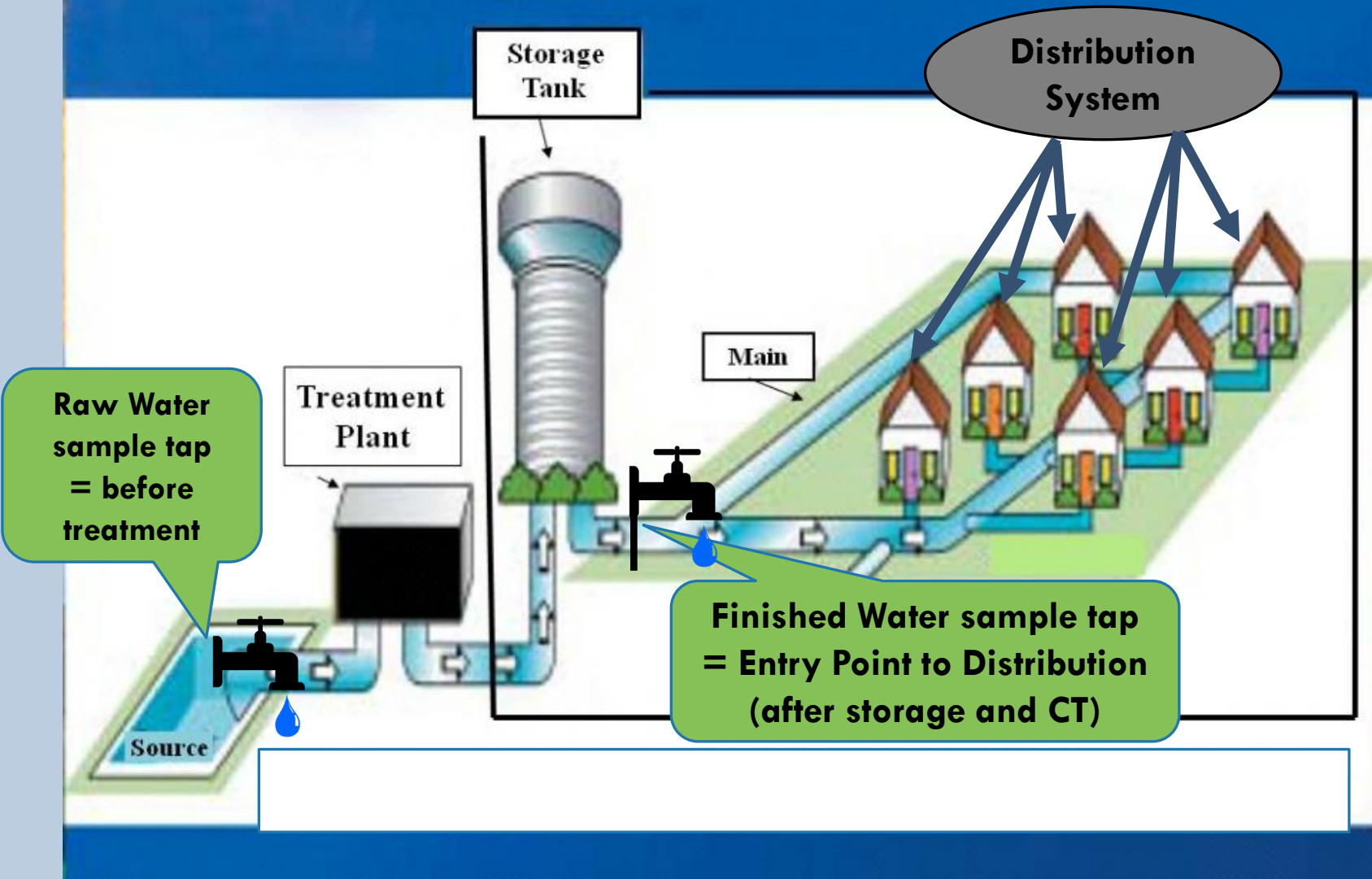
ALPHA Lab ID (Lab Use Only)	Sample ID	Collection		Sample Matrix	Sampler's Initials	
		Date	Time			
-01	1911-30630-001	11/25/19	12:30	DW	-	X
-02	1911-30630-002 (FB)	11/25/19	12:30	-	-	X
-03	1911-30630-003 (TB)	Prepared By Alpha				X
	WSID 21368					

Subcontracted work will have multiple COCs

ENTRY POINT TO DISTRIBUTION

43

Water Supply Distribution System



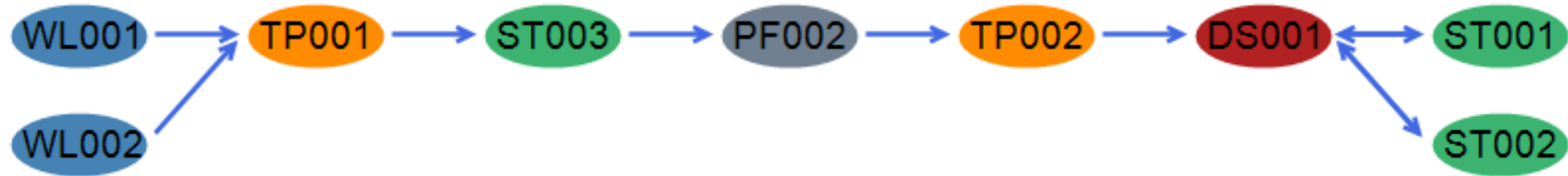
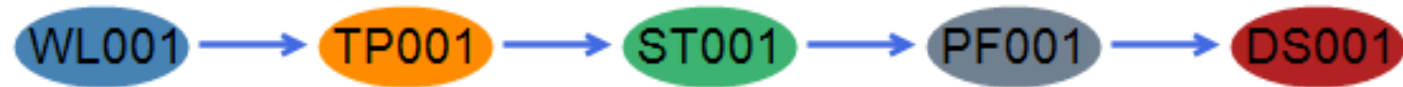
An entry point to distribution sample (entry point) is to be collected from finished water after all treatment and storage, at or before the first user

Every water system should have a dedicated finished water sampling tap

ENTRY POINT EXERCISE

44

Where is the entry point in each of these water system examples?

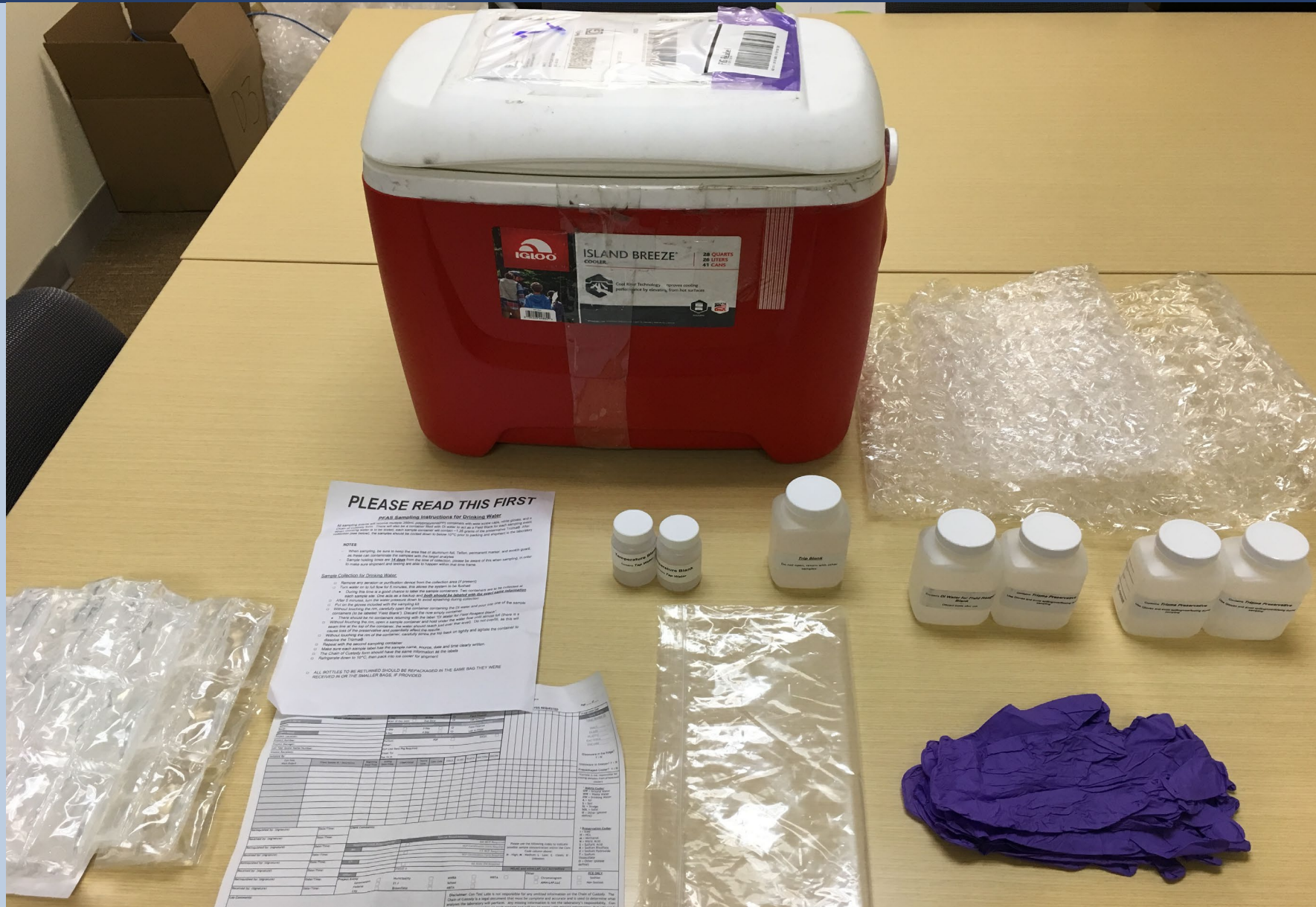


PFAS SAMPLE KIT

45

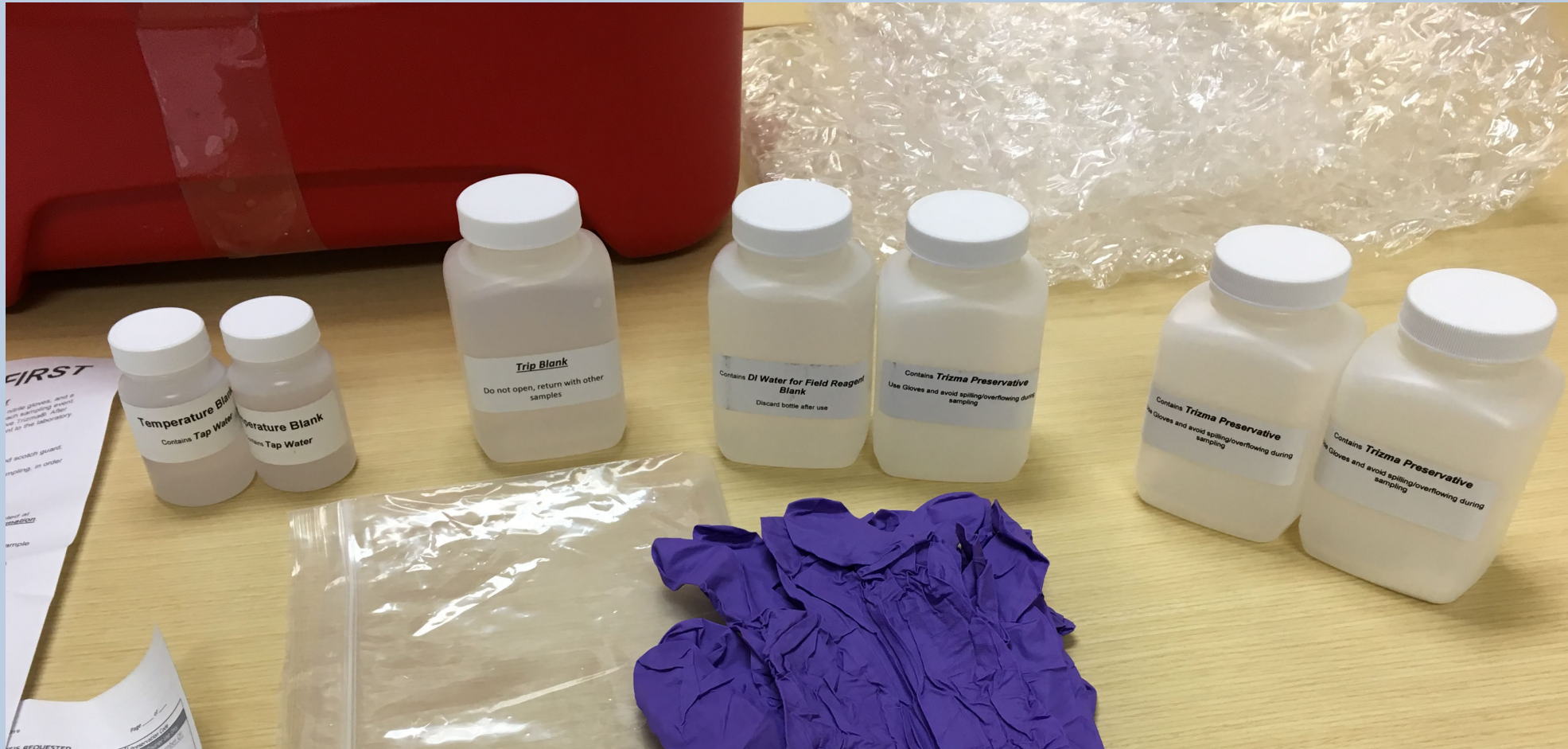
- Multiple (at least two provided) pre-preserved 250mL high-density polyethylene (HDPE) or polypropylene sample bottles with polypropylene screw caps (must be unlined caps)
 - Bottles should contain Trizma crystals which act as a buffer and dechlorinating agent
- Laboratory reagent field blank with PFAS-free water for each entry point sampling location (to be prepared by sampler in field)
 - Should include an empty unpreserved container to pour in field
- Laboratory prepared trip blank (NOT to be opened) – 1 per kit (if confirmation sample)
- Sample cooler (may contain PFAS free ice packs that need to be frozen before returning sample to lab)
 - Otherwise use regular “wet” ice
- Powderless nitrile gloves (1 new pair for each sampling location)
- Multiple resealable polyethylene storage bags (i.e .Ziploc bags) to store sample containers after sampling and for shipping
- Lab paperwork for sample number tracking and chain of custody

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PFAS SAMPLE KIT

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FIELD BLANK PREP

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In order to determine whether PFAS may have been introduced during sample collection and handling, a field reagent blank shall also be collected from each sampling site and at the same time of sampling. Prepare your field blank first before collecting your sample and collect PFAS samples before any other sampling parameter that day due to higher contamination potential.

Field blanks shall be prepared as follows:

- a) Open the Field Reagent Blank (contains PFAS-free water from lab) at the location of the sampling site and pour the reagent water into the empty sample bottle provided
- b) Seal the field blank sample bottle.
- c) Label the sample bottle as the Field Reagent Blank for the associated sampling site and ship it back to the laboratory along with the sample for that sampling site.

TRIP BLANKS

Required only on confirmation samples!

Trip blanks shall be prepared by the laboratory (using PFAS-free water) in advance and follow the sample containers and same shipping containers as the samples and returned to laboratory.

Trip Blanks shall **NOT** be opened.

***Field Blanks and Trip Blanks will only need to be analyzed/reported if any of the 5 regulated PFAS are detected in the samples.**

(Labs may need to extract/analyze due to short method holding time)

CONFIRMATION SAMPLES

50

- When required, confirmation samples must be collected as soon as reasonably possible, but not to exceed 10 business days after receipt of the lab report by the system.
 - Must include field and trip blanks
 - Shall be analyzed by same laboratory as the original
- If initial sample concentration for any of the 5 regulated PFAS is 40.5 ng/L or higher, immediate DND notice issued to the system users and quarterly monitoring required
- Do Not Drink notice is being issued based on the detections of the 5 regulated PFAS (PFOA, PFOS, PFHxS, PFHpA, and PFNA) only

HOW TO SAMPLE?

51

1. The sampler shall wash their hands before sampling and wear new powderless nitrile gloves while filling and sealing the sample bottles. Collect PFAS samples first before any other sampling parameter!
2. Turn on the tap and flush the cold water (with aerator removed) until the water temperature stabilizes (approximately 5 minutes). Reduce flow to avoid splashing. Do not sample from a garden hose, analyzer tubing, or irrigation devices. Use only cold water for sampling.
3. Fill sample bottles such that sample preservation reagent is not flushed out. It is acceptable for the sample bottle to have headspace.
4. After collecting the samples, cap the bottle and agitate by hand until the preservative is dissolved.
5. Label the bottle with the associated sampling location and indicate Facility ID, Sample Point, and WSID on the chain of custody (lab paperwork).
6. Keep the sample sealed from the time of collection until delivered to the laboratory (Ziploc bags are recommended).
7. Chill samples during shipment; samples shall not exceed 10 degrees Celsius (50 degrees Fahrenheit) until received by the laboratory. Do not allow samples to freeze!

CONTRACT SAMPLING INFO

This sampling is **NOT** being paid for by the state



State contractor is acting as a “consultant” who is experienced in taking PFAS samples

Weston and Sampson (Waterbury)- \$1,096

Cost per additional sample if more than one entry point to distribution \$475

Contact: Steven LaRosa 802-244-5051 x6007 or larosas@wseinc.com

Aquaterra (North Ferrisburgh) - \$535

Cost per additional sample if more than one entry point to distribution \$265

Contact: Roland Luxenberg 802-238-0071 or roland@luxenberg.us

ITEMS TO AVOID WHEN SAMPLING

53

Some items you might find at or around a monitoring location which you should avoid contact with during sampling:

- ⊘ pumps and tubing with Teflon® - PTFE and other fluoropolymer containing materials**
- ⊘ glass or low-density polyethylene (LDPE) sample containers**
- ⊘ permanent markers**
- ⊘ contact with carpeting or upholstery inside buildings and vehicles**
- ⊘ waterproof paper or field books, Post-it notes**
- ⊘ Clothing and boots treated with a water repellant or stain resistant material like Goretex®, Scotchgard® or Tyvek®**

OTHER PRODUCTS TO AVOID WHEN SAMPLING

54

Other PFAS-containing products to avoid prior to sampling:

- Personal Care Products used (on day of sample collection) such as cosmetics, moisturizers, hand cream and other related products
- pre-packaged food, fast food wrappers, pizza boxes or food containers
- chemical gel or (blue) ice packs



WHAT'S OK

55

Powderless Nitrile gloves

HDPE and polypropylene materials, silicone tubing

Plain Paper, metal clipboard, ball-point pens

Clothes made of synthetic or cotton material untreated with water or stain repellants and previously laundered (preferably washed greater than six times) without the use of fabric softeners

Polyethylene storage bags such as Ziploc® –
Sample containers should be stored inside
sealable bags provided from the lab and transported in
coolers



Try to collect samples within 4 days of
receiving your sample kit

Use PFAS free ice packs if provided by lab or
regular ice when preparing for shipping

WHAT'S OK

56

Below are examples of products that have been reported to be PFAS-free. However, there is no guarantee and you should avoid using these types of products if possible.

Sunscreens:

Alba Organics Natural
Yes to Cucumbers
Aubrey Organics
Jason Natural Sun Block
Kiss My Face
Baby-safe sunscreens ('free' or 'natural')
Banana Boat Sport Performance
Neutrogena Beach Defense

Insect Repellents:

Jason Natural Quit Bugging Me
Repel Lemon Eucalyptus
Herbal Armor
California Baby Natural bug spray
Babyganics

Sunscreen and Insect Repellents:

Avon Skin So Soft Bug Guard-SPF 30

EPA Method 537.1

- The recommendations for determining a detection limit (DL) and reporting limit (RL) in method 537.1 shall be followed.
- The maximum acceptable laboratory reporting limit for each respective analyte for PFOA, PFOS, PFHxS, PFHpA, and PFNA is 2.0 ng/L
- Sampling results shall be reported to the nearest 0.1 ng/L.
- PFAS laboratory reports (at least for 2020) shall report all 18 analytes identified in EPA Method 537.1.

ALL (18) ANALYTES REQUIRED BY EPA METHOD 537.1

58

Analyte^a

Hexafluoropropylene oxide dimer acid

N-ethyl perfluorooctanesulfonamidoacetic acid

N-methyl perfluorooctanesulfonamidoacetic acid

Perfluorobutanesulfonic acid

Perfluorodecanoic acid

Perfluorododecanoic acid

Perfluoroheptanoic acid

Perfluorohexanesulfonic acid

Perfluorohexanoic acid

Perfluorononanoic acid

Perfluorooctanesulfonic acid

Perfluorooctanoic acid

Perfluorotetradecanoic acid

Perfluorotridecanoic acid

Perfluoroundecanoic acid

11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid

9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid

4,8-dioxa-3H-perfluorononanoic acid

Acronym

HFPO-DA

NEtFOSAA

NMeFOSAA

PFBS

PFDA

PFDoA

PFHpA

PFHxS

PFHxA

PFNA

PFOS

PFOA

PFTA

PFTTrDA

PFUnA

11Cl-PF3OUdS

9Cl-PF3ONS

ADONA



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VT
Regulated
PFAS

DIFFERENT EPA METHODS FOR DRINKING WATER PFAS ANALYSIS

59

- Method 537 version 1.1 (Rev. 2009) was used for monitoring under UCMR
- Method 537.1 (Rev. 2018) replaces 537
 - 537.1 achieves lower reporting and detection limits
 - 537.1 adds 4 additional analytes that have similar properties to previously identified PFAS and are still in use today
 - Hexafluoropropylene oxide dimer acid (GenX process chemical)
 - 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11CI-PF30UdS)
 - 9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid (9CI-PF30NS)
 - 4,8-dioxa-3H-perfluorononanoic acid (ADONA)
- 533 (December 2019)
 - Includes 11 analytes not included in 537.1
 - Focuses on the “short chain” PFAS

HOW TO SUBMIT DATA?

- Have laboratory directly submit data electronically by Excel or CSV file (we have a specific template for them to use for submittal)
- By email – scan or forward PDF of lab report to ANR.DWpfasdata@vermont.gov
- If you use the sampling contract, reporting the data is included as part of the cost.

Regardless of who is reporting results: confirm results have been received by the Division using the same link as to find your sample schedule.

HOW DO I FIND A VDH CERTIFIED LAB?

61

The following link has the most recent list:

https://www.healthvermont.gov/sites/default/files/documents/pdf/PHL_DW-Certified-Labs.pdf

Alpha Analytical
Mansfield, Massachusetts

Battelle Analytical Chemistry Services Laboratory
Norwell, Massachusetts

Eurofins Lancaster Labs
Lancaster, Pennsylvania

Eurofins Eaton Analytical
South Bend, Indiana

Eurofins Eaton Analytical
Monrovia, California

GEL Laboratories
Charleston, South Carolina

Regional Water Authority
New Haven, Connecticut

Con-Test Environmental Lab
East Longmeadow, Massachusetts

SGS North America Inc.- Orlando
Orlando, Florida

Vista Analytical Laboratory, Inc.
El Dorado Hills, California

Weck Laboratories, Inc. *Partial
El Dorado Hills, California

As of 4/24/2020

AFTER ANNUAL MONITORING

62



FIRST – CHECK FOR DETECTIONS

63

**If there is a detection in your routine compliance sample
the lab will run the Field Blank**

- **Was the same analyte detected in both the routine sample and field blank?**
 - **NO – the routine sample is likely valid**
 - **YES – the sample is reported invalid and must be recollected**

RESULTS ARE NON-DETECT

64

If the annual monitoring results for PFOA, PFOS, PFHxS, PFHpA or PFNA are not detected at or above the reporting level (i.e. non-detect):

- Reduce monitoring to every three years (triennial)



If two consecutive triennial monitoring results for PFOA, PFOS, PFHxS, PFHpA or PFNA are not detected at or above the reporting level:

- Reduce monitoring to every six years

RESULTS ARE DETECTED AT OR BELOW 15

65

If the sum of PFOA, PFOS, PFHxS, PFHpA or PFNA are detected between 2 and 15 parts per trillion (ppt):

- **Continue monitoring PFAS on an annual basis during the period identified on your monitoring schedule.**

RESULTS ARE DETECTED ABOVE 15

66

If the sum of PFOA, PFOS, PFHxS, PFHpA or PFNA are detected above 15 parts per trillion (ppt):

- monitor for PFAS on a quarterly basis starting next calendar quarter

Can I get reduced back to annual monitoring?

YES !

If four consecutive calendar quarters demonstrate results are at or below 15 ppt

RESULTS ARE DETECTED ABOVE 15

67

If your entry point routine sample represents water from more than one source:

- **A raw water source sample shall be collected from EACH source that supplied that entry point – or as directed by the Division.**
- **The raw water source sample(s) shall be collected within 30 days of receipt of the lab report for the entry point routine sample.**
- **These results shall not be used to determine compliance with the MCL.**

RESULTS ARE DETECTED ABOVE 20

68

If the sum of PFOA, PFOS, PFHxS, PFHpA or PFNA are detected above 20 parts per trillion (ppt):

- **Collect a confirmation sample as soon as possible but no later than 10 business days after receipt of lab report.**



The confirmation sample may be waived if a water system is out of compliance with the MCL and already on quarterly monitoring

CONFIRMATION SAMPLES

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- Each confirmation sample shall be accompanied by a field AND trip blank provided by the lab analyzing the samples.
- The confirmation sample shall be analyzed by the same lab as used for the original sample.
- Compliance with the MCL is based on the average of the original and confirmation sample.

NOTE: While waiting for the results of the confirmation sample, you will need to notify your users of the initial sample result and provide information on the next steps.

COMPLIANCE WITH THE MCL

70

A water system is out of compliance with the MCL if the average of the initial and confirmation sample is greater than 20 ppt.

My system exceeded the MCL. How can I return to compliance?

At a minimum, the following must occur:

- Analytical results for the prior four consecutive quarters of monitoring are at or below the MCL

AND

- There is a stable or decreasing trend in the concentration of the five regulated PFAS.

EXCEEDED THE MCL – NOW WHAT?

PUBLIC NOTICE WITHIN 24 HOURS

A DO NOT DRINK notice will be required if the average of the initial and confirmation samples exceed 20 ppt OR if initial sample is 41 ppt or higher.

Go to our website for the Do Not Drink public Notice template:

<https://dec.vermont.gov/water/drinking-water/water-quality-monitoring/pfas>

PUBLIC NOTICE **IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER**

Do Not Drink the Water at WATER SYSTEM NAME
Levels of PFAS above state drinking water standards

The standard for the combination of five PFAS: PFOA (perfluorooctanoic acid), PFOS (perfluorooctane sulfonic acid), PFHxS (perfluorohexane sulfonic acid), PFHpA (perfluoroheptanoic acid) and PFNA (perfluorononanoic acid) is 20 nanograms per liter (ng/L). That means the sum of the five PFAS levels must not exceed 20 ng/L in your drinking water. Routine water quality monitoring samples were collected from the WATER SYSTEM NAME Water System WSID=VT00XXXXX on DATE(S) and indicate that water being served contains PFAS above the drinking water standard. As of MONITORING PERIOD, the combined level of the 5 regulated PFAS is XX ng/L.

As water system users, you have a right to know what you should do, what this means, and what is being done to correct this situation. Due to the potential for impact to human health, the Vermont Department of Environmental Conservation (DEC) has required the Water System to provide this Do Not Drink notice to all users of the water system.

This DO NOT DRINK NOTICE remains in effect until further notice.

What should I do?

- DO NOT DRINK THE WATER. Do NOT use the water for drinking or cooking, brushing teeth, making ice cubes, making baby formula, washing fruits and vegetables, or any other consumptive use.
- Use another source of water for consumption which may include bottled water.
- Water may be used for other uses when you don't swallow the water, such as showering, bathing, or washing clothes or dishes. Try to limit the amount of water children swallow while bathing.
- Do NOT use water containing the five PFAS over 20 ng/L to water your garden. The PFAS could be taken up by the vegetables.
- DO NOT BOIL THE WATER. Boiling the water will not remove PFAS and may concentrate them.
- If you have specific health concerns, contact your health care professional.

What does this mean?

PFAS is a group of chemicals that may affect different systems in the body. Although more research is needed, some studies in people have shown that these chemicals may affect growth, learning, and behavior in babies and children; lower a woman's chance of getting pregnant; interfere with the body's natural hormones; increase cholesterol levels; affect the immune system; and increase the risk of cancer. These health effects may be the same for pets. If you are concerned, you can give your pet bottled water or water from a known safe source.

What happened? What is being done?

For questions about the health effects of PFAS visit www.healthvermont.gov/water/pfas or call 800-439-8550.

Additional information is also available at <https://dec.vermont.gov/water/drinking-water/water-quality-monitoring/pfas>.

For more information from the water system, please contact WATER SYSTEM CONTACT at PHONE NUMBER, or via email at EMAIL.

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.

DO NOT DRINK NOTICE

72

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73

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EXCEEDED THE MCL – NOW WHAT?

74

You have properly notified all user of the water system not to drink the water.

Next step: **Emergency Response Plan**

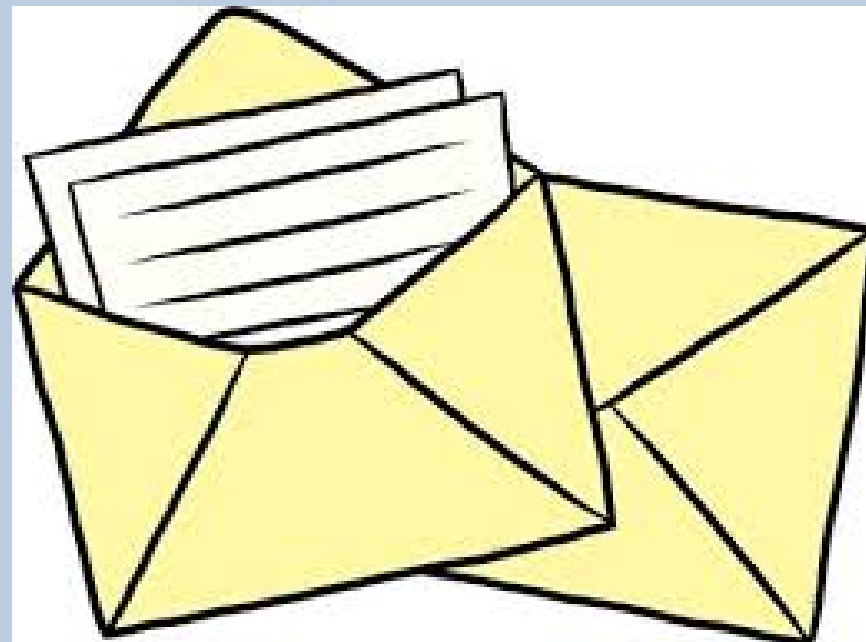
The plan must be developed and submitted to the Division for approval and includes interim and long-term measures to address the exceedance of the MCL. The plan may include but not limited to:

- Operational changes such as discontinuing use of a contaminated source, use an alternative source (if more than one permitted source), or water conservation;
- Drilling the existing well deeper
- Blend with an additional permitted well
- Construction or use of an emergency source or connecting to another public water system
- Treatment

NOTICE TO USERS OF A PFAS DETECTION

A special notice WILL need to be provided the first time the MCL is exceeded (>20 ppt) and while you are waiting for confirmation sample results.

Water systems are not required to provide special notice for sample results at or below 20 ppt.



PFAS RESOURCES/REFERENCES

PFAS Monitoring Results Received (<https://anrweb.vt.gov/DEC/DWGWP/license.aspx?Report=PFASData>)

dec.vermont.gov/water/drinking-water/water-quality-monitoring/pfas

dec.vermont.gov/pfas

<https://anrweb.vt.gov/DEC/DWGWP/>

pfas-1.itrcweb.org/fact-sheets/

www.epa.gov/pfas

[www.epa.gov/ground-water-and-drinking-water/supporting-documents-drinking-water-health-advisories-pfoa- and-pfos](https://www.epa.gov/ground-water-and-drinking-water/supporting-documents-drinking-water-health-advisories-pfoa-and-pfos)

www.nj.gov/dep/watersupply/pdf/pfna-pfas-sampling-guidance-for-nj-water-systems.pdf

www.asdwa.org/wp-content/uploads/2019/02/ASDWA-PFAS-Lab-Testing-Primer-02-14-19-Final-V2.pdf

www.stripes.com/news/us/maine-task-force-on-pfas-forever-chemicals-begins-work-this-week-1.581884/pfas-graphic-1.581886#gallery

www.awwa.org/Portals/0/AWWA/Government/AWWAPFCFactSheetPrevalenceandAssessment.pdf?ver=2018-12-13-101923-060

www.mz-store.com/blog/teflon-does-it-harm-health/

QUESTIONS?



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