VERMONT

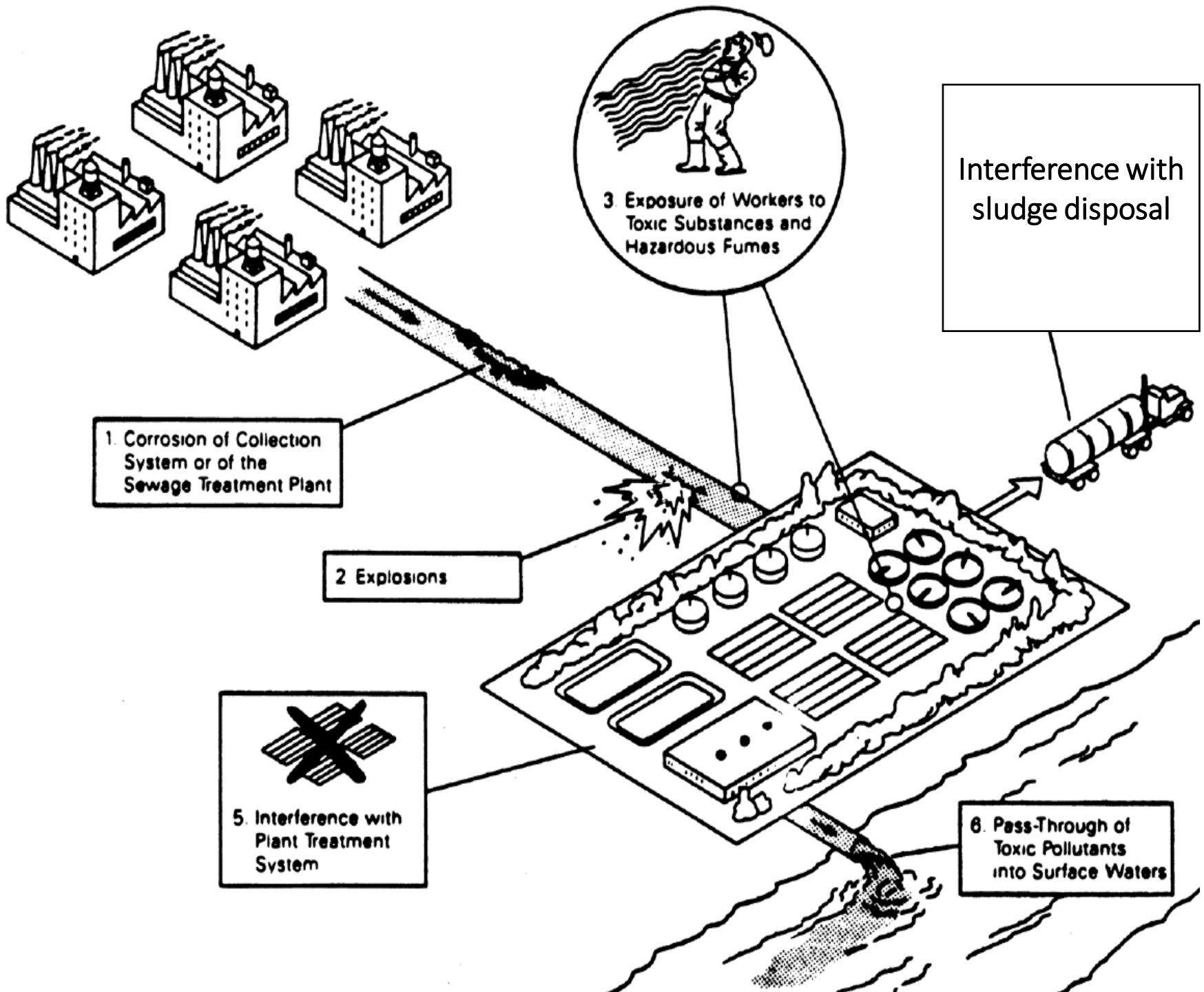
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Pretreatment Approach for Addressing PFAS in Vermont WWTFs

Nick Giannetti, Pretreatment Section Supervisor

Wastewater Management Program, Vermont Department of Environmental Conservation

NERPCA 2022

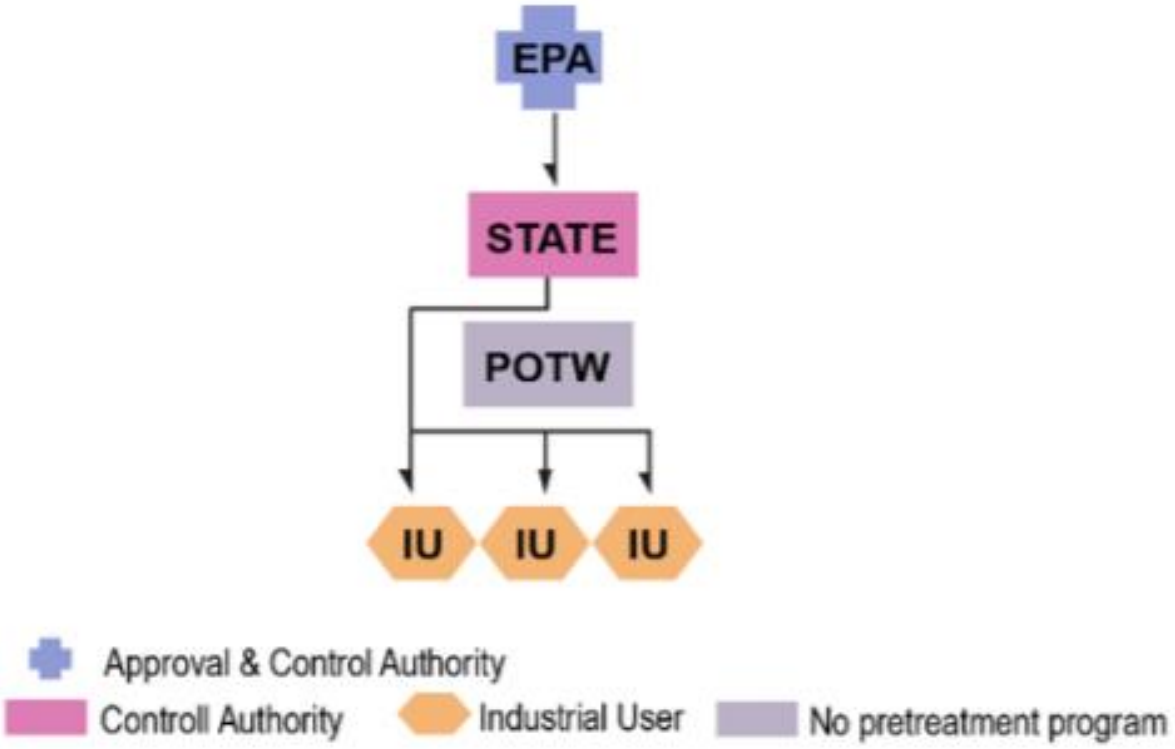


The Pretreatment Program

PFAS concerns:

Pass-through and biosolids quality

Vermont's Pretreatment Program

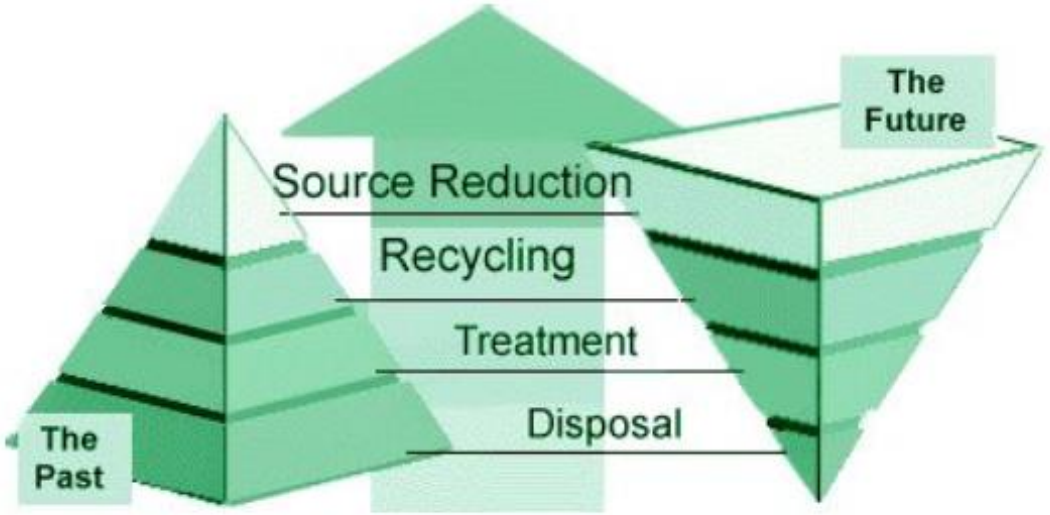


1of 5… Alabama, Connecticut, Mississippi, Nebraska, and **Vermont**

- **92 POTWs**
- **25 POTWS > 1 MGD**
- **6 POTWs > 5 MGD**
- **Small communities with single or sometimes part-time wastewater operator.**

Pollution Prevention, P2, or “Source Reduction”

Practices that reduces, eliminates, or prevents pollution at its source.

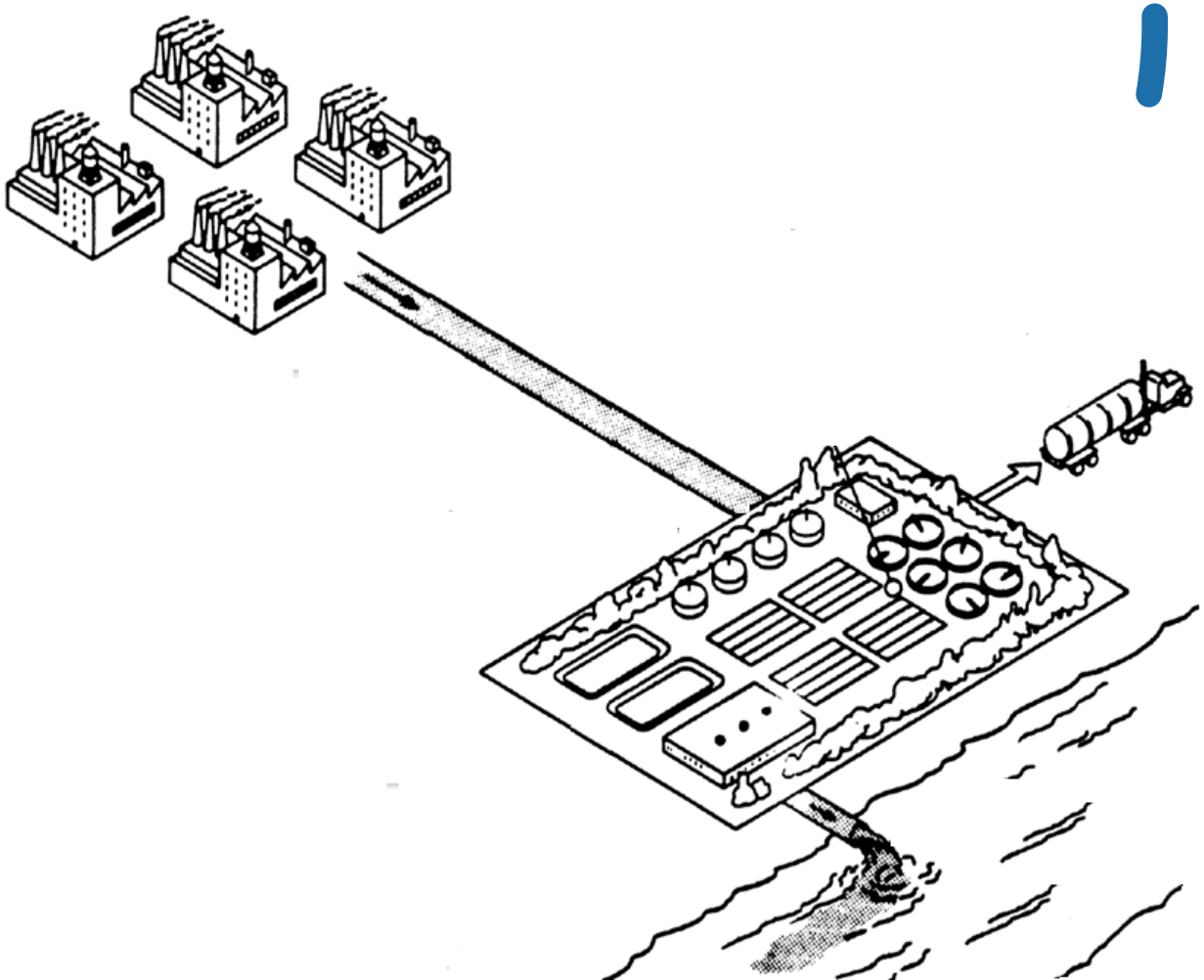


PFAS is a good candidate for P2:

- Conventional wastewater treatment does not remove PFAS;
- Ecological exposures associated with PFAS entering WWTFs;
- PFAS treatment options are expensive, and residuals and air emission management strategies are still in development;
- PFAS contamination is ubiquitous and widespread.

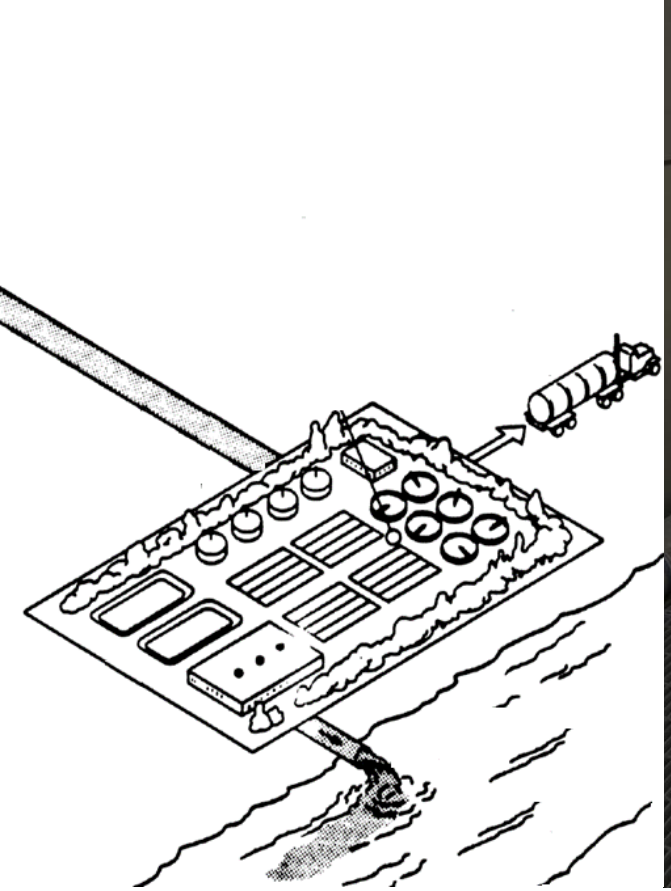
PFAS Road Map

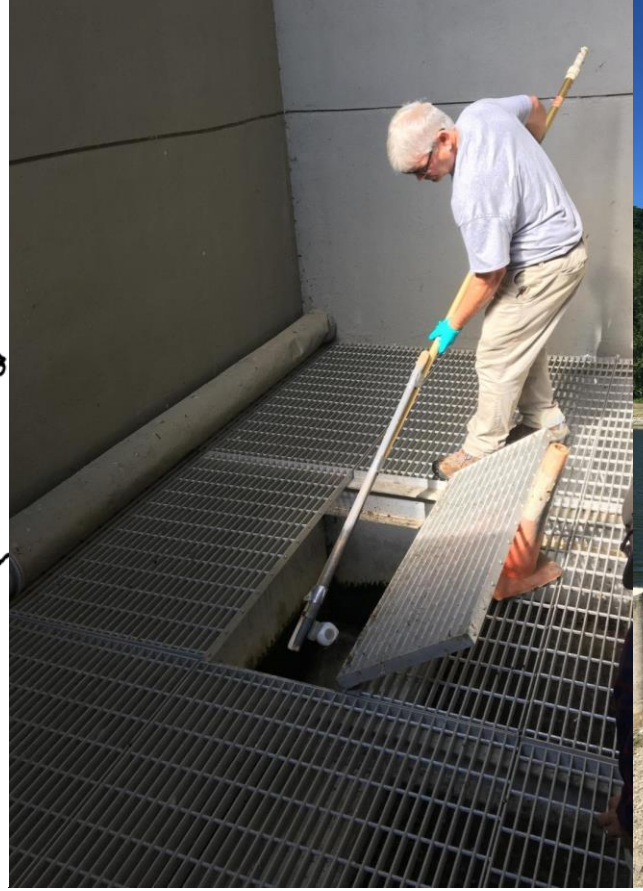
VERMONT
AGENCY OF NATURAL RESOURCES
Department of Environmental Conservation



Source Reduction Model for POTWs

1. Characterize Influent, Effluent, Solids
2. Characterize Inputs to WWTF
3. **Identify PFAS Sources at Industrial Users**
4. Implement Source Reduction Strategies





Step 1: Characterize PFAS in Influent, Effluent, & Solids

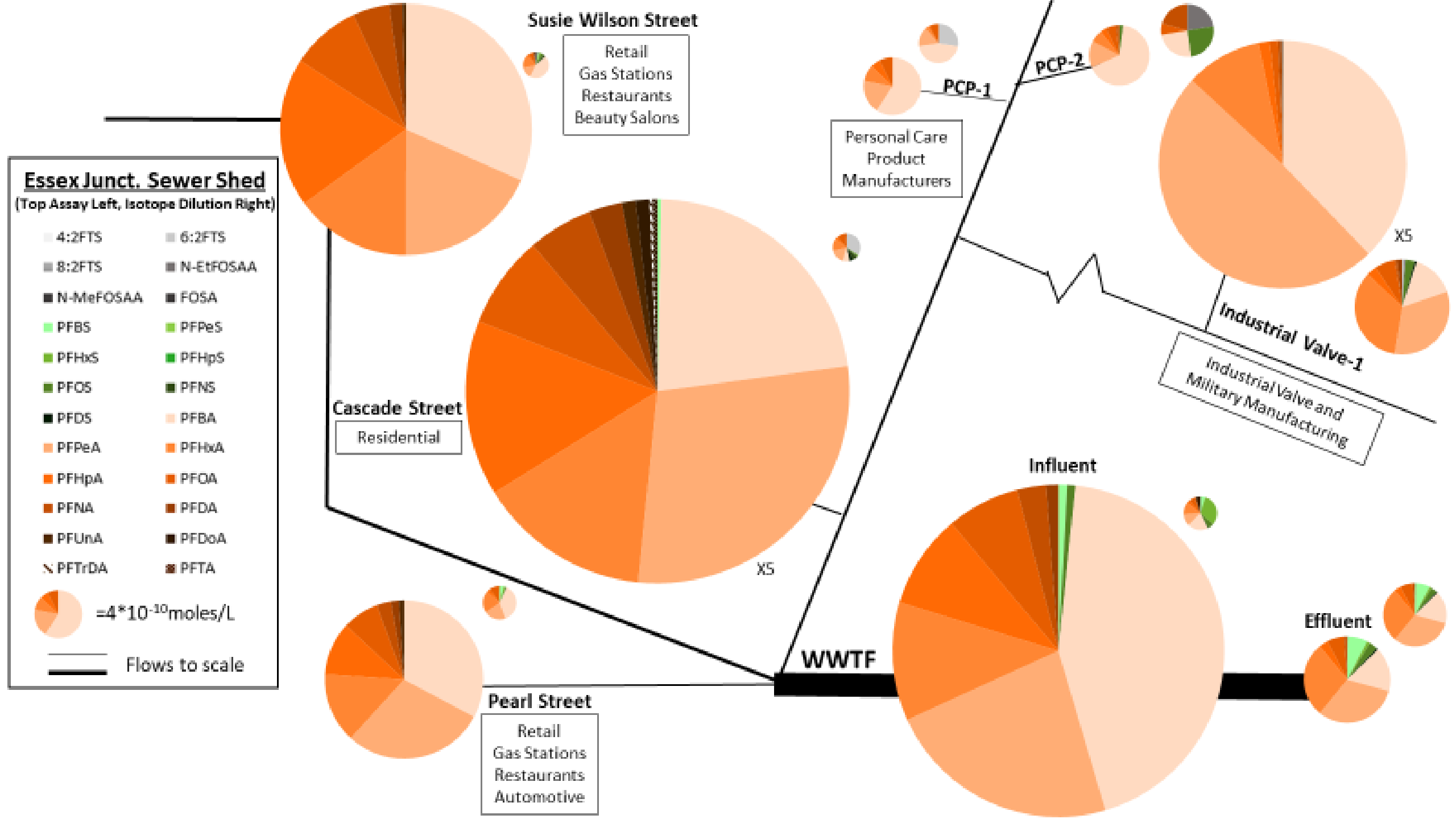
- Information gained: PFAS concentration, mass load, variability, & signature;
- Tools: Total Oxidizable Precursor (TOP) Assay & time-based composite samples.




Step 2: Characterize Residential, Industrial, and Commercial Sources

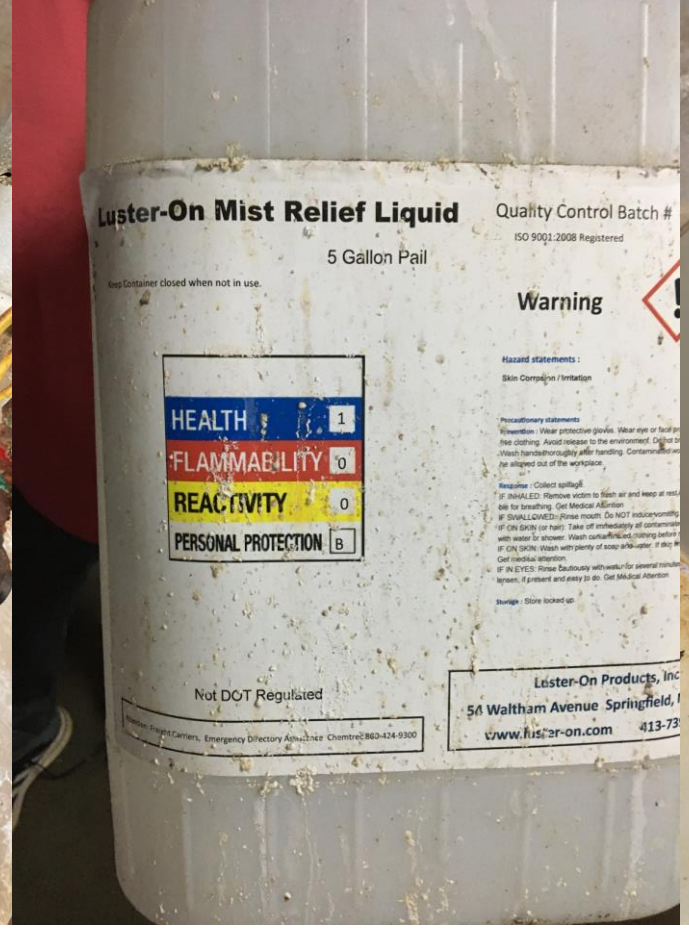
- Planning and representative sampling of collection system;
- Review: Sewer connection records and perform window surveys;
- Sampling: pump stations, manholes, individual users.

Town	Site	Sample Type/Freq	Sources
Essex Junction	Suzie Wilson Road	Grab (3)	retail, gas stations, restaurants, beauty salons
	Pearl Street (gravity)	Grab (3)	retail, gas stations, restaurants, automotive services
	Cascade Street	Grab (3)	residential only
	PCP-1	Grab (3)	Personal care product manufacturer
	PCP-2	Grab (3)	Personal care product manufacturer
	Industrial Valve-1	Grab (3)	Industrial valve manufacturer
	POTW Influent	Time Comp (3)	all the above
	POTW Effluent	Time Comp (3)	all the above
Middlebury	Rogers Rd/PS 7	Grab (3)	residential
	Porter	Grab (3)	hospital, medical clinics
	Pump Station 3	Grab (3)	hospital, college dorms
	Pump Station 9	Grab (3)	residential
	North Sector (gravity)	Grab (3)	restaurants, food & beverage manufacturers, fitness gym
	POTW Influent	Time Comp (3)	all of the above
	POTW Influent	Time Comp (3)	all of the above
	Total:	**45 Samples**	**Analysis: EPA M537 (Isotope Dilution), TOP Assay, TSS**


Essex Junct. Sewer Shed
(Top Assay Left, Isotope Dilution Right)
4:2FTS
6:2FTS
8:2FTS
N-EtFOSAA
N-MeFOSAA
FOSA
PFBS
PFPeS
PFHxS
PFHpS
PFOS
PFNS
PFDS
PFBA
PFPeA
PFHxA
PFHpA
PFOA
PFNA
PFDA
PFUnA
PFDoA
PFTrDA
PFTA
=4*10-10moles/L
Flows to scale
Susie Wilson Street
Retail
Gas Stations
Restaurants
Beauty Salons
PCP-1
PCP-2
Personal Care
Product
Manufacturers
X5
Industrial Valve-1
Industrial Valve and
Military Manufacturing
Cascade Street
Residential
X5
Influent
WWTF
Effluent
Pearl Street
Retail
Gas Stations
Restaurants
Automotive

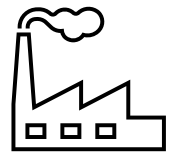
	ID		TOP	
	Grand Total (g/day)	Percentage of Influent	Grand Total (g/day)	Percentage of Influent
Essex Junction Wastewater Treatment Facility				
PCP-1	0.0015	0.50	0.0224	0.99
CASCADE STREET	0.0045	1.51	0.2942	12.93
PEARL STREET MANHOLE	0.0168	5.67	0.1492	6.56
SUSIE WILSON ROAD	0.0233	7.84	0.0056	0.24
PCP-2	0.0017	0.56	0.0002	0.01
INDUSTRIAL VALVE-1	0.0016	0.52	0.0042	0.19
TOTAL	**0.0493**	**16.59**	**0.4758**	**20.91**
INFLUENT	0.2974	100.00	2.2757	100.00
EFFLUENT	0.5218	175.46	0.1923	8.45
Middlebury Wastewater Treatment Facility				
NORTH SECTOR	0.0051	11.61	0.1279	54.47
PORTER	0.0067	15.29	0.0093	3.94
PUMP STATION 17	0.0236	53.95	0.1018	43.36
PUMP STATION 3	0.0017	3.81	0.0905	38.54
PUMP STATION 9	0.0013	3.02	0.0129	5.50
TOTAL	**0.0384**	**87.68**	**0.3422**	**145.81**
INFLUENT	0.0438	100.00	0.2347	100.00
EFFLUENT	0.1062	242.37	0.2578	109.83





Steps 3 & 4: Source Identification and Reduction at Industrial User

- Plant walkthrough, written survey, & wastewater sampling of effluent, process steams, & products;
- Voluntary vs. required participation;
- Acknowledge/promote benefits to business for participation;
- Take advantage of State and Federal funding sources (EPA P2 Grant, American Rescue Plan Act).



FY20 EPA P2 Grant

Implement source reduction technical assistance at businesses in National Emphasis Areas:

- **Aerospace Product and Parts Manufacturing and Maintenance**
- **Metal Manufacturing and Fabrication**

- FY20 Grant: 50% match
  - $200K each. $400K total. Spent about $150K.
- FY22 Grant: no match
- High administrative burden

- Recommend: leverage contractors, university students, or temp. staff to assist with analysis & report writing

Considerations when approaching businesses:

Education & transparency key to voluntary participation.

Marketable benefits for business participation:

- Free training;
- Getting ahead of regulatory requirements;
- Free technical assistance;
- Brand: increase commitment to socially and environmentally responsible practices;
- Joining an innovative team.

Can’t achieve voluntary participation?

- Authority: State Law, Sewer Use Ordinance, 308 Letter.

Participating Businesses	Plating Operations	Size (gallons per day)	Sources	# Samples
Bennington, VT	Semiconductor – tantalum capacitors. Formation process.	3,000 gpd		3 ID+TOP effluent
Brattleboro, VT	Chromate coating, anodizing, hardcoating, and passivation.	15,000 gpd	PTFE Anodal Paste – Teflon seal for Alum. parts	3 ID+TOP effluent 1 ID Seal Tank 3 ID sludge 1 ID Nickel cake
Burlington, VT	Nickel plating, passivation.	7,500 gpd		3 ID+TOP effluent
Rutland, VT	Electrochemical finishing (melt-out), acid etching.	100,000 gpd	None identified	3 ID+TOP effluent 2 ID sludge
Rutland, VT	Electrochemical finishing (melt-out), acid etching.	150,000 gpd	None identified	3 ID+TOP effluent 2 ID sludge
Rutland, VT	Acid etching, water jetting.	1,200 gpd		3 ID+TOP effluent
Springfield, VT	Hexavalent, chromium, black oxide, and nickel plating. Anodizing. Electropolishing process.	1,500 gpd	6:2 FTS Mist Suppressant	3 ID+TOP effluent
Swanton, VT	Black oxide coating, chrome plating, and acid etching.	2,000 gpd	6:2 FTS Mist Suppressant	3 ID+TOP effluent 1 ID+TOP stormwater
Vergennes, VT	Anodizing, passivation, electroless nickel plating.	18,000 gpd	Etching + stripping of Teflon coated wire + parts	3 ID+TOP effluent 1 ID+TOP Wire Strip 3 ID sludge
9 Businesses			4 sources	41 Samples

Written Survey Takeaways

8 question survey seeking:

- Description of production process and wastewater inputs;
- Mist suppressant current and historical use;
- Current and historical use of fluorinated, fluoro, and propriety surfactants;
    - Obtain SDS sheets;
- Process flow diagram.

Provide time for business to complete survey and conduct follow-up meeting.

Written Survey

- Does your facility conduct any of the following activities (please respond “Yes”, “No”, or “Don’t Know ”)?
  - □ Hexavalent Chrome plating
  - □ Chromating
  - □ Chromic acid anodizing
  - □ Chromic acid etching
  - □ Electroless copper and electroless nickel-boron baths
  - □ Other treatments to improve heat or corrosion resistance, reduce mechanical wear or enhance aesthetic appearance
  - □ Any processes that utilize polytetrafluoroethylene (PTFE) products
  - □ Any other processes that may utilize surfactants for purposes such as reducing friction/drag, changing surface tension in liquids, etc., through the use of additives

- If “Yes” to any activities in Question #1, please list any fluorinated compounds or PFAS-containing products your facility uses in these processes that you are aware of. Please also provide Safety Data Sheets. Be mindful that PFAS may not be explicitly called out by name for reasons of confidential business information, and so be on the lookout for chemicals that contain “fluor” as part of their names or list descriptions such as “proprietary surfactant.”

Written Survey

- If applicable, what other types of chemical and electrochemical finishing of parts are within your facility's capabilities? Please also describe typical parts treated at your facility, including size, substrate, and use.

- Perfluorooctane Sulfonate (PFOS) was commonly used as a mist suppressant or wetting agent until just a few years ago. Please indicate any current or previous use of products containing PFOS (please refer to the attached list of PFAS-Containing Products). Please indicate if the product is currently in use at the facility or was used within the last 10 years.

- Does your facility use any of the PFOS replacement products (i.e., products potentially containing 6:2-FTS) included on the attached list of PFAS-Containing Products?

Written Survey

- What other, if any, fluorocarbons are used at the facility? Any products you use with “perfluoro-” in the name? Please provide Safety Data Sheets.

- Does your facility have a fire suppression system that includes the use of foam, in particular a system that utilizes aqueous film forming foam (AFFF)? If so, what types of AFFF are used (or have been used in the past), and are there SDSs available for these products?

- For any processes or activities performed at the facility that use products known or suspected to contain PFAS, please provide a process flow diagram (PFD) showing the process inputs (e.g., chemicals, water, parts, etc.) and outputs (e.g., spent baths, wastewater, evaporation loss, parts to additional production step, etc.). Please see attached Metal Finishing “Process Unit” as an example. If you do not have a PFD available, please prepare a simple sketch in the space provided below or provide additional sheets as needed.

What Have We Seen?

- Mist suppressants
- PTFE seal coating
- Etching of Teflon parts
- Stripping of Teflon wire
- Propriety anionic surfactants used in nickel plating?

PTFE Paste

- Specialty dip coating used for finished aluminum aerospace parts
- Discharge rate <1 gallon per month from dragout
- Spent bath is drummed and shipped as haz. waste

Clariant

MATERIAL SAFETY DATA SHEET
Anodal PTFE liq

Substance key: COV231607
Version : 4 - 1 / USA

Revision Date: 11/06/2009
Date of printing :11/06/2009

Section 01 - Product Information

Identification of the company:
Clariant Corporation
4000 Monroe Road
Charlotte, NC, 28205
Telephone No.: +1 704 331 7000

Information of the substance/preparation:
Pigments and Additives
Product Safety 1-401-823-2366

Emergency tel. number: +1 800-424-9300 CHEMTREC

Trade name: Anodal PTFE liq
Material number: 161576

Formula: MIXTURE
Primary product use: Aluminum Surface Preparation Chemical

Chemical family: Fluoropolymer Dispersion

Section 02 - Composition information on hazardous ingredients

Hazardous ingredients:

Component	CAS-no. (Trade secret no.)	Concentration
Polytetrafluoroethylene	9002-84-0	50 - 70 %
Proprietary Ingredient	NJTSR#678290-00-2-7615-P PCP	1 - 5 %

Etching & Stripping of Teflon Wire + Parts

- Teflon wire stripping:
  - Molten salt bath used to strip fine wires.
  - 1x / week.
- Teflon surface etching (flouroetching) of Teflon parts in lab.
- Batch discharge of 1 – 10 gallons per month.

Presented courtesy of Aetna Plastics Corp. (www.aetnaplastics.com)

FluoroEtch® Safety Solvent

MATERIAL SAFETY DATA SHEET

SECTION 1 – CHEMICAL AND COMPANY IDENTIFICATION

IDENTITY FluoroEtch® Safety Solvent	**DATE PREPARED** 12/3/2012
SYNONYMS, CHEMICAL NAMES, COMMON NAMES Sodium Naphthalide in Glycol Ether	**USE** Fluoropolymer Etchant
SUPPLIER'S NAME Acton Technologies	**EMERGENCY TELEPHONE NUMBER** CHEMTREC: 1-800-424-9300 (Within Continental U.S.) CHEMTREC: 1-703-527-3887 (Outside U.S.)

ACTON TECHNOLOGIES

DEKRA ISO 9001:2008 Certification #110102.01 ISO 14001:2004 Certification #140102.01

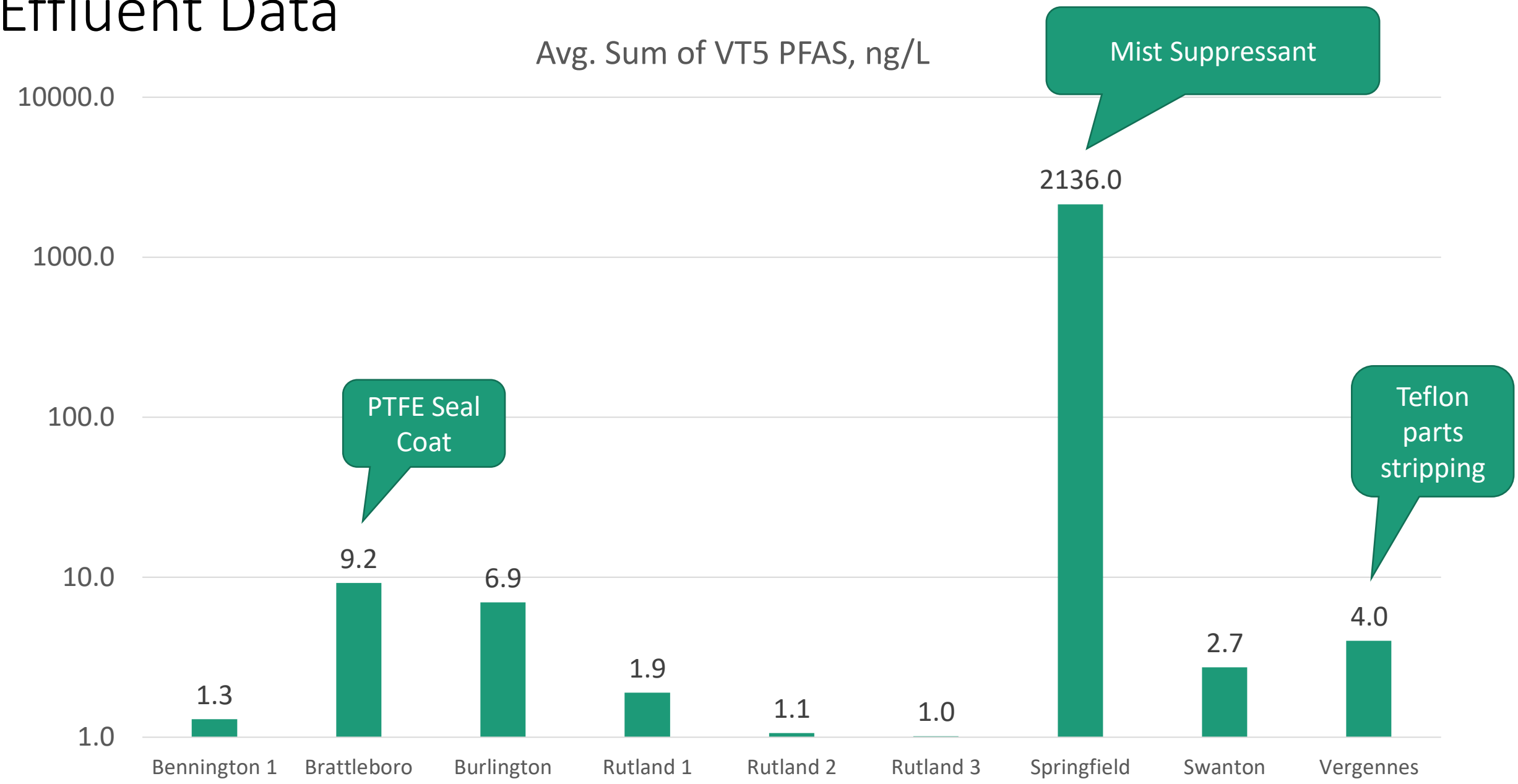
AN ISO 9001 CERTIFIED COMPANY
AN ISO 14001 CERTIFIED COMPANY

NORTH AMERICAN OPERATIONS	EUROPEAN OPERATIONS		
100 THOMPSON STREET ■ P.O. BOX 726 PITTSTON, PENNSYLVANIA ■ 18640 ■ USA PHONE: 570.654.0612 FAX:570.654.2810	ADARE ■ COUNTY LIMERICK IRELAND PHONE:+353.61.395.222 FAX:+353.61.395.333	VIA CARLO CATTANEO n° 76 ■ 25121 BRESCIA ■ ITALY PHONE: +39.030.2752447 FAX: +39.030.2750939	**ONLINE ORDERING:** **WWW.ACTONTECH.COM**

SECTION 3 – COMPOSITION/INFORMATION ON INGREDIENTS

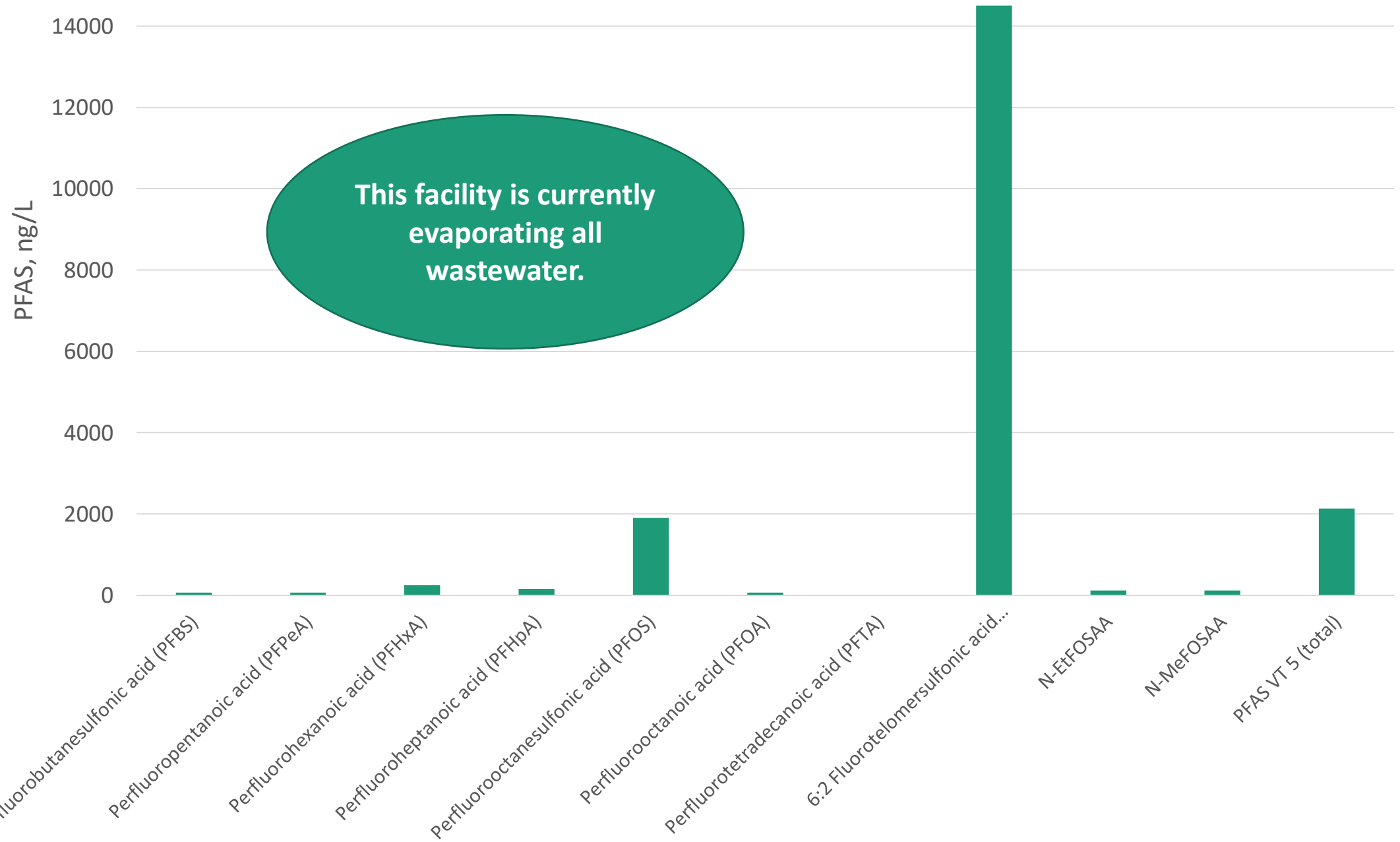
INGREDIENTS	CAS #	WT. %
Sodium naphthalide	3481-12-7	10.00-30.00
2-Methoxyethyl ether	111-96-6	70.00-90.00

Effluent Data

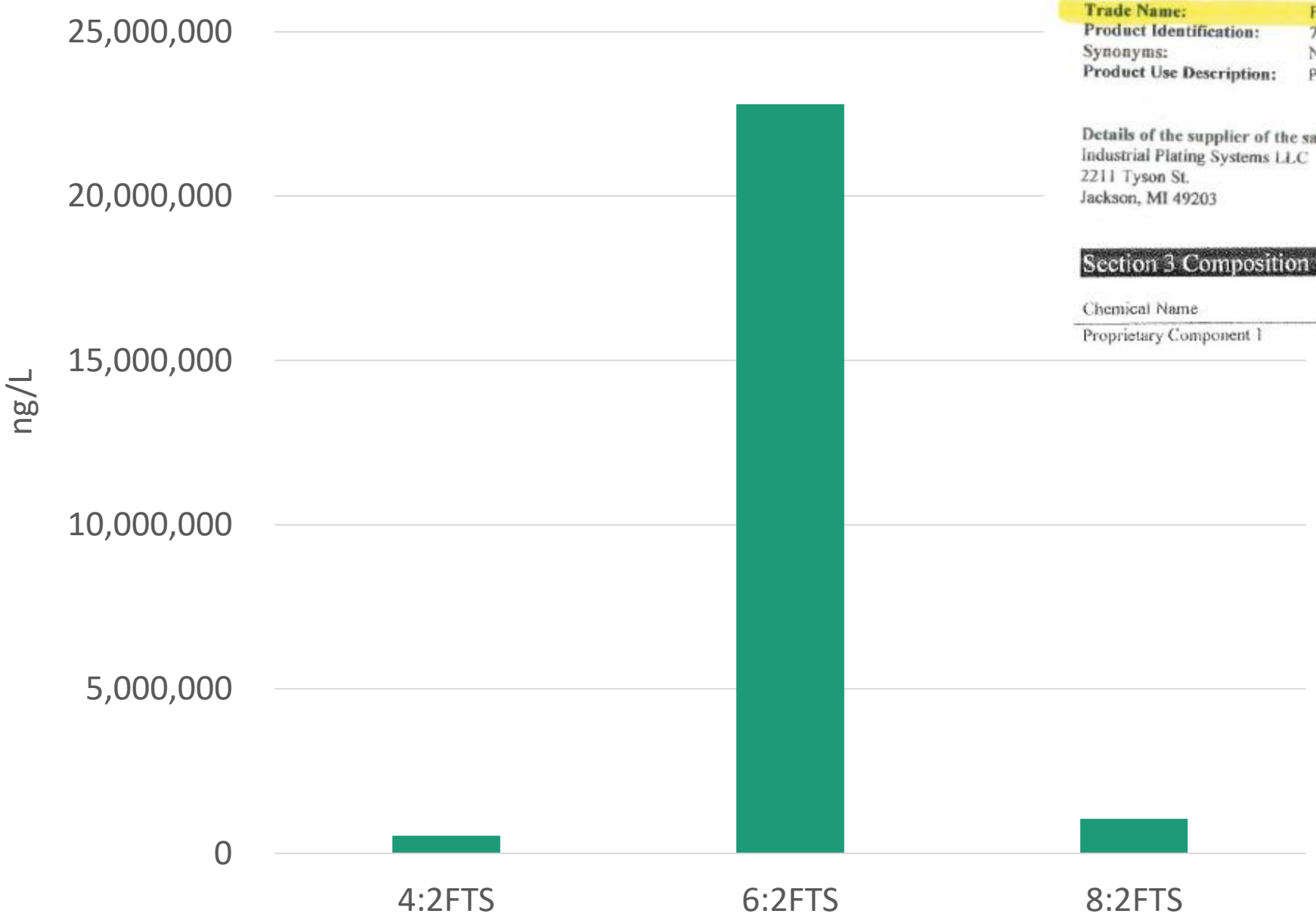


VT 5 groundwater standard = sum of PFOA, PFOS, PFNA, PFHxS, PFHpA not to exceed 20 ng/L

Metal Finisher Effluent with Mist Suppressant



Mist Suppressant



Section 1 Identification

Trade Name:	Fume Suppressant	**Date Prepared:**	5-12-16
Product Identification:	71417		
Synonyms:	None	**CAS No:**	Mixture
Product Use Description:	Plating Additive		

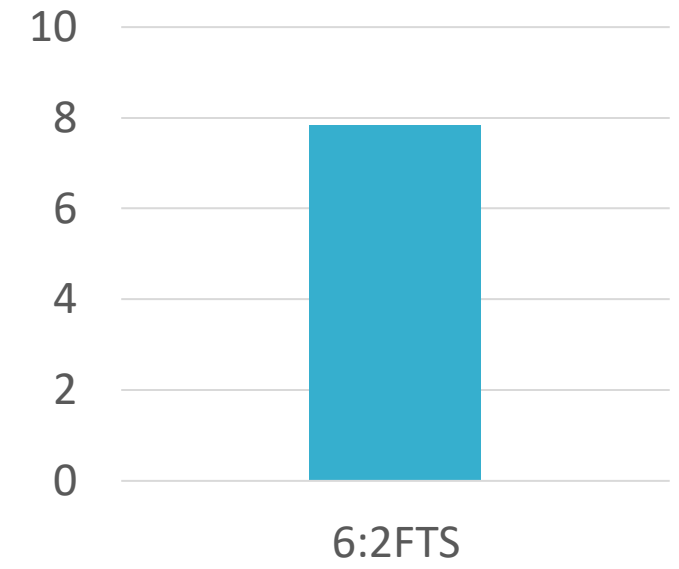
Details of the supplier of the safety data sheet
Industrial Plating Systems LLC
2211 Tyson St.
Jackson, MI 49203

Phone: (517) 206-0531
Website:

Section 3 Composition

Chemical Name	Common name and synonyms	CAS #
Proprietary Component 1		

Stormwater



Mist Suppressant Alternatives

- **Atotech Fumalock:**
  - fluorine-free, non-PFOS, non-PFAS fume suppressant;
- **TIB Chemical, TIB Suract CR-H:**
  - fluorine-free surfactant;
- **Dynamix, Inc., DYNAPLATE Cr FSN:**
  - PFOS, PFAS and fluoride free fume suppressant;
- **Haviland Products Company, Havachrome Mist Eliminator III**
  - Coconut oil – 1,4-dioxane byproduct;
- **MacDermid** may also offer PFAS-free/lower-PFAS alternatives.

Next Steps:

Trial Alternatives

1. Qualitative bench-top comparison of the performance of the chrome plating bath solution;

2. Select an alternative and conduct a full-scale pilot test using a new plating bath;

3. Monitor and record key performance indicators (e.g., surface tension, industrial hygiene measurements) from new and existing PFAS baths during the pilot test;

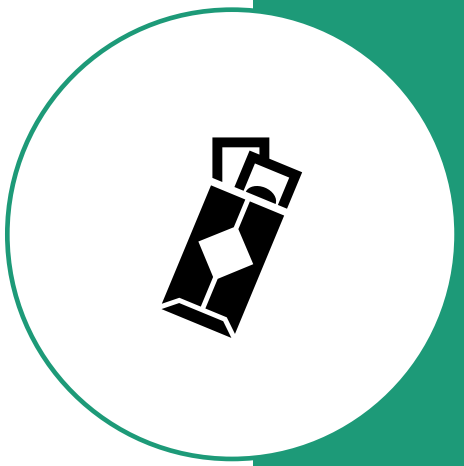
4. Compare performance and costs of PFAS-free to current PFAS-containing fume suppressant.

Leverage State and Federal Funding

EPA Performance Partnership Grant - $60K, no match

EPA P2 Grant - $400K, 50% match

Clean Water State Revolving Fund – 100% forgiveness on planning loans for IU Surveys & Local Limits



ARPA - VT State Grant Program to fund:

- Private Businesses: up to $1,000,000 for pretreatment
- Municipalities: up to $200,000
  - Industrial User Surveys
  - Local Limits Development

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Take Home:

NEW ENGLAND PRETREATMENT COORDINATORS ASSOCIATION
CT MA ME
NERPCA
NH RI VT

PFAS Reports:
https://dec.vermont.gov/pfas
P2 Grant:
https://dec.vermont.gov/pfas/p2-grant
ARPA – Pretreatment Initiative:
https://anr.vermont.gov/special-topics/arpa-vermont/pretreatment-capacity

1. P2 at industrial users is the most realistic method for preventing PFAS from entering the WWTF. Residential source reduction remains a challenge. P2 grant highlights methodology identify sources at IUs.

2. Metal finishers in VT are not a significant source of VT5 PFAS to POTWs. Metal finishers can perform a variety of specialized practices that contain PFAS, mist suppressant use being the most significant.

3. The methodology used in this study may be a suitable model for small – medium sized POTWs to identify and reduce sources of PFAS in wastewater generated by their communities.

4. Communities should leverage local, state, and federal funding sources to support source ID and reduction work.

Our Team

US EPA Pollution Prevention Grant (P2)

US EPA Performance Partnership Grant

VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION

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Joshua Burns, Residuals Management & Emerging Contaminants

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Jim Jutras, Water Quality Superintendent

Weston & Sampson

Steven LaRosa, Team Leader
Margaret Reilly, PE
James Gascoyne, PE

SANBORN HEAD

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Lindsay Guertin

Current Regulatory Landscape

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2 draft pretreatment permits with PFAS monitoring requirements:

- 1 metal finisher & 1 landfill
- PFAS treatment pilot project
- No effluent limits

No monitoring required in POTW permits at this time:

- 2023 study to monitor all WWTFs using ARPA funds
- Money reserved for follow-up source reduction work
- Some groundwater has been impacted at fields with land-applied biosolids

WQS development planned by 2024:

- Surface water & fish tissue monitoring conducted at target areas throughout the State
- PFOS detected in nearly all samples. Average PFOS 2.4 ppb, Max 15 ppb.

Following 2021 PFAS Roadmap focusing on Source Reduction.