# Welcome to
# Clear Creek Systems

## Your Partner in PFAS Treatment

Creating Clean Water

Together

# PFAS Stormwater Management

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Clear Creek Systems, Inc

# Agenda

- What are PFAS
- Why the concern
- Current Regulatory Requirements
- PFAS Management Objectives

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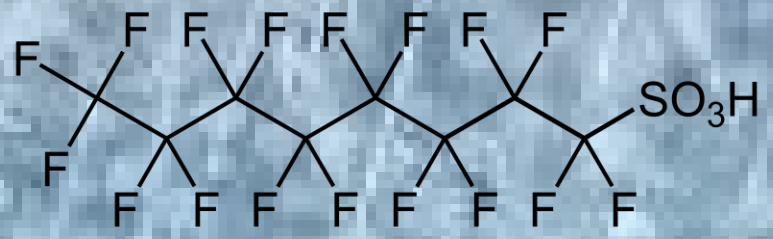
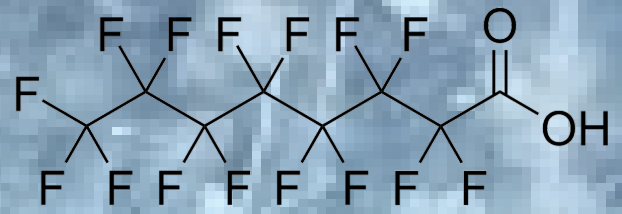
# What are PFAS?

## Per and polyfluoroalkyl substances




PFOS




PFOA

And more than 15,000 other species!

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# Why are PFAS a Concern?

- Man-Made Polymer
  - The CF bond does not form in nature
- Persistent – “Forever Chemical
- Resists degradation by design
- Accumulates in the Environment
- Highly Mobile
- Difficult to Remediate

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# Bio-Accumulative

## Associated with

- Low Fetal Birth Weight
- Certain Cancers (Kidney and Testicular)
- Immune System Deficits
- Decreased Fertility
- Higher Cholesterol
- Impaired Thyroid Function
- Liver and Kidney damage
- Cognitive Impairment in Children
- Early Onset Puberty
- Type 2 Diabetes
- And so much more

# Where do we find PFAS

| | | | | | |
|---|---|---|---|---|---|
| Airports | Industrial sites | Well waters | Landfills | Transfer stations | Material recovery facilities |
| Leachate treatment plants | POTW's | Paper production | Semiconductor industry | Cogen facilities | Recycling centers |
| Groundwater remediation projects | Construction dewatering | Lakes, streams, or running waters | Air | Yes, EVEN RAINWATER | EVERYWHERE |

# How Does Stormwater Serve as a Pathway for PFAS into the Environment?

| | |
|---|---|
| Run off from Industrial and Urban Areas | • Impacts streams and other bodies of water<br>• Enters the sewer system |
| Deposition and Accumulation | • Biosolids from WWT facilities are deposited on Farms<br>• Air deposition on surfaces |
| Leaching from Soils and Landfills | • Can move downward into the groundwater<br>• Can move laterally into surface waters |
| Industrial Discharges | • Residual contamination of soils and other surfaces<br>• May impact sewers, rivers, wetlands etc. |
| Dust | • Storms wash dust from the air that may be contaminated |

Stormwater increases both the concentration and variety of PFAS

Mobilizes and transports PFAS into clean water (lakes, streams, rivers)

Can result in degraded water quality

Impact on fish and wildlife

Can enter drinking water supplies

Biosolids contain PFAS and are used for soil fertilizers

Can enter the food supply

Can impact crop production by reducing the quality of a field

Harms the biological balance in soils

May impact the recreational use of waterways

Difficult to remove

# Regulatory Requirements

There are NO NATIONAL ENFORCEABLE LIMITS ON PFAS IN STORMWATER

Rely on STATES to direct enforcement

State actions:

- Rely on the Clean Water Act via NPDES permits
- Require MONITORING only, especially around industrial sites
- May set site-specific limits where appropriate
- Minimize releases by enforcing best practices

Upcoming actions

- Draft aquatic life criteria for PFOA/PFOS
- Implement EPA Method 1621 to measure adsorbable PFAS

# State Regulations for Stormwater PFAS Management Still Evolving

## Clean Water Act

- NPDES permits to regulate point source discharges from industrial sites
- MSGP proposed regulations for industrial stormwater will include PFAS

## Specific State Regulations

- Surface Water Quality Standards (SWQS) being imposed by some states
- Eight States have authorized SWQS for PFAS – more are coming

## States with SPECIFIC REGULATIONS

- Michigan - monitor and control PFAS in industrial runoff
- SPECIFIC LIMITS SET  PFOS 12 PPT  PFOA 420 PPT
- Wisconsin – monitor and report PFAS levels in industrial runoff
- New Jersey, Minnesota, and New Hampshire may require treatment if impacting drinking water
- Facilities must adapt BMPs if PFAS shows an exceedance

**MORE STATES ARE EXPECTED TO ADOPT STRICTER STANDARDS BY 2027**

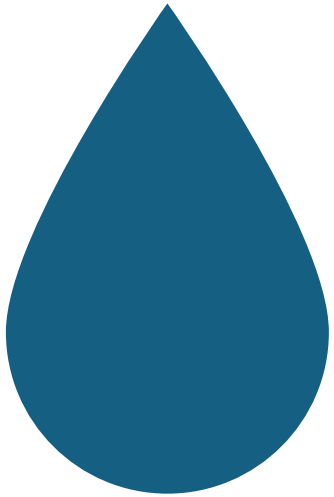
# Goals

Pollution Prevention

Sediments, Nutrients, Heavy Metals, PFAS

Flood Control

Manage volume and rate of runoff



Restore Natural Hydrology

Support infiltration and groundwater recharge

Preserve the natural water cycle

Support environmental health

Sustainable Drainage

Prevent erosion

Maintenance

Ease of access

enhances performance

Regulatory Compliance

# Reuse of Stormwater

- Capture
- Storage
- Treatment

Landscape irrigation

Cleaning outdoor spaces

Groundwater replenishment

Industrial and commercial uses

- Cooling tower make-up
- Process water
- Non–potable consumption

# Collecting Stormwater

# Treatment options for Stormwater Management

# Stormwater Treatment Methodology for PFAS

- Assessment and Characterization
  - Analyze stormwater for PFAS
  - If present, determine the source and mitigate if possible
- Pretreatment
  - Solids (TSS) removal
    - Settling
    - Filtration
  - pH management
- Technology options
  - Granular Activated Carbon
  - IX Resins
  - FluoroSorb Organoclay
  - Reverse Osmosis
- Waste Management
  - Landfill disposal of spent media
  - Incineration or deep well disposal of R/O concentrate
- Monitoring and Maintenance
  - Keep the system in good working order

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# What are our options for PFAS treatment in Stormwater?

Granular Activated Carbon- best on long-chain PFOA and PFOS

- Reactivated – low cost but not as effective
- Coconut fiber – does work, but not as long
- Bituminous lasts longest and is most effective for PFAS
- Organic contact of the source water can reduce effectiveness

Ion Exchange Resins (IX) Effective on Long and Short Chain PFAS

- Synthetic engineered specifically for PFAS
- Not impacted by organics
- Lasts 3X longer than Carbon materials
- Smaller vessels/less media = lower overall cost

FluoroSorb proprietary (FS) Organoclay Effective on Long and Short chain PFAS

- Modified organoclay specifically targets PFAS
- 2X as effective as IX resins less media = less cost
- US made

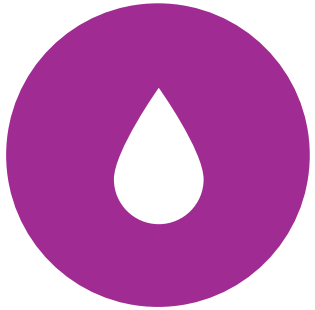
# Treatment Train Approach

Complex stormwater requires a complex solution

COLLECTION

FILTRATION

MEDIA TREATMENT



REVERSE OSMOSIS

# Treatment Design

Everything revolves around FLOW
- System size
- Media life
- Waste produced
  - Exhausted media
  - Waste concentrates

Installation Options
- Above ground
- Below ground
- Self contained
- Permanent or temporary

All must be considered

Water Treatment is a Science, Not a Commodity

Science does not lend itself to
“Lowest Cost Bid”
The “lowest cost” solution is frequently not the least expensive!

When developing a treatment system, the focus should be on:

Thoroughly understanding the source water
Collaborating closely with your supplier to develop the BEST solution
Agree on clear, measurable outcomes
Prioritize performance, safety, and sustainability
Consider lifecycle costs over upfront expense

# Contact Information

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