

Background/Objectives

A pilot study application of colloidal activated carbon (CAC) was completed to address per- and polyfluoroalkyl substances (PFAS) from aqueous film-forming foam (AFFF) used to extinguish a large fire in the 1980s. In 2016, it was discovered barrier (PRB) could effectively stop the migration of PFOS and that PFAS had impacted public and domestic water supply wells PFOA, moving from the source area (i.e., the historical fire and that a highly concentrated source remained near the fire's location) at high concentrations. Pre-test baseline origin. The ensuing investigations showed that the PFAS had migrated through a thin, overburden soil layer and into a fractured siltstone/shale/argillite bedrock aquifer.

The movement of PFAS-impacted groundwater is primarily controlled by the fracture network. The goal of the pilot study was to demonstrate that a CAC in situ permeable reactive concentrations in the source area were as high as 90,000 nanograms per liter (ng/L) for perfluorooctanesulfonic acid (PFOS) and 1,400 ng/L for perfluorooctanoic acid (PFOA).

Timeline

• 1980s AFFF used to extinguish a large fire 2016

Sampling discovered PFAS in public and domestic wells

2016 - 2020 Investigation and remedia planning phases

2020

PADEP approves pilot study to treat PFAS

February 2021

RRS performs clear water injection test and dye tracer study

• April 2021 RRS installs PRB,

performance monitoring perio

Use of AFFF for Treating Large Fire Impacts Aquifer and Nearby Wells









Suspicious Tire Fire Quelled after **21 hours** By TOM LOWRY and The Morning Call • Nov 30, 1986

Twenty-one hours after the first fire company arrived at the scene, a burning mountain of tires in Bucks County was extinguished late testerday arternoon, but only after 300 firefighters from 33 companies were called to assist.

"It's the biggest one I've been at," said a weary Sellersville Fire Chief ThomasHufnagle lat night of the blaze that started among tens of thousands of tires.

Risk = Hazard x Exposure

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IMMEDIATE AND EFFECTIVE PFAS TREATMENT IN BEDROCK AQUIFER AT A HAZARDOUS SITES CLEAN UP ACT SITE

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Approach/Activities

Before the CAC PRB installation, an injection test using fluorescein dye was conducted to responses were recorded for each interval. Dye concentrations in nearby monitoring points determine the primary fracture-induced groundwater flow pathways controlling PFAS were compared to baseline. Following the injection test, the pilot test injection plan was movement within the top 100 feet below ground surface (bgs) near the source area. A straddle developed for the CAC PRB, detailing application CAC volumes and concentrations and an packer injection delivery system was used to isolate discrete intervals and gain resolution over injection sequencing strategy was calculated as follows DV = DVH/DVL. the 70 feet saturated zone targeted for treatment. Flow rates were adjusted, and aquifer



2019 Well Sampling

Timeline

1980s AFFF used to extinguish a large fire

Sampling discovered PFAS in

public and domestic wells 2016 - 2020 Investigation and remedial

planning phases





Design Verification testing

- Confirm distribution + acceptance of proposed reagents
- Observe influence + connections between fracture sets



Shallow **Groundwater Flow**

Brunswick Formation to 100 ft

Groundwater primarily to SE via fracture flow

Legend

- Monitoring Well Location --- Property Boundary Stream
- Retention Basin ---- Inferred Contour
- Groundwater Contour Interval (4ft) (492.90) Groundwater Elevation (ft)
- -----> Groundwater Flow Direction

Results

The combination of a fractured bedrock hydraulic environment combined 91,400 ng/L PFOS and PFOA were reduced to and an extensive target vertical treatment interval can present approximately 70 ng/L (99.9% reduction), after only one month following the injection event. These results demonstrate the challenges to an *in situ* remediation approach due to the wide-ranging secondary porosity controlling groundwater remedy's effectiveness to quickly, sustainably, and safely contain movement over the interval. The highly variable porosity high concentrations of PFAS in fractured bedrock, reducing the observed at this site was quantified during the injection test, risk to downgradient receptors. Expansion of the treatment leading to a sound CAC PRB injection strategy that achieved the approach at this site and other sites managed by the regulatory pilot test goal. Following the CAC PRB application, the agency is actively being considered.



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