Mitigating PFAS in Streams

Purshotam Juriasingani (purshotam.juriasingani@tetratech.com) (Tetra Tech, Inc., Austin, TX)
David Liu (National Aeronautics and Space Administration, Wallops Flight Facility, VA)
Christopher Pike (Tetra Tech, Inc., Pittsburgh, PA)
Daniel Forester (Tetra Tech, Inc., Cocoa, FL)

Background/Objectives. Per- and polyfluoroalkyl substances (PFAS) in surface water have received increased attention from the public and regulatory agencies due to their ubiquitous presence and persistence, and their potential toxicity to human and ecological receptors. Several treatability studies are being conducted at the National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF), Virginia in response to the presence of PFAS in on-site streams and seeps. The studies included design, construction, installation, and operation of temporary treatment systems to capture and/or passively treat the PFAS-contaminated surface water associated with select seeps, streams, and stormwater outfalls before they reach offsite water bodies.

Approach/Activities. Extensive sampling of the seeps, streams, and tributaries was conducted to determine the high PFAS concentration contributing areas that can be targeted for treatment.

Stream Treatment

The stream treatment systems consisted of a series of gabion baskets filled with a PFAS preferential adsorption treatment media, mats with embedded PFAS treatment media, pea gravel used to filter sediments, and existing nearby rocks to help control the water flow and secure the treatment equipment and material. All of these elements were built into the stream bottom and hillside using trench anchors and rebar pins to secure all of the treatment measures in place and isolate the flow path for water to only pass through the treatment media and prevent short circuiting around the treatment area. The treatment systems were designed and constructed after reviewing various treatment alternatives for capturing and treating, availability of materials, ease of construction, and minimal impact to the environment.

The mat supplied by the vendor was prefilled with reactive media and was placed first at the bottom of the stream 25 feet before the lead gabion, 15 feet between the gabions, and 50 feet after the lag gabion. Under the gabions, an isolation media was placed to prevent water up flow and bypass. Due to the location and geometry of the stream, the mat was cut into 5 feet x 20 feet lengths and rolled up and was keyed into the side slopes of the stream in an anchor trench 6 inch deep, pinned every 5 feet with landscape spikes, and weighted down with existing nearby rocks. The primary purpose of the mat was to treat the groundwater flowing into the stream through the stream bed.

The media placed in the gabion baskets was selected based on conducting several laboratory treatability studies. The selected media was used with the required contact time for treatment. The size of the media was similar to the size of pea gravel to minimize flow obstruction in the stream. To allow for the maximum amount of water to pass by and still provide the necessary treatment without water backing in the stream, 400-micron filter bags were filled with roughly 0.33 ft^3 of media and was placed in the gabions. The media filled filter bags were placed in a crisscrossing over lapping fashion to prevent the potential for short circuiting.

Seep Treatment

A seep treatment system was designed and installed to capture water from the seep in a capture box, gravity transferring the water from the capture box to the treatment box, and treating in the treatment box using commercially available PFAS adsorption media.

Results/Lessons Learned. Stream sampling is on-going to determine the effect of PFAS treatment downgradient of the installed systems. The larger scale seep and stream treatment systems will be designed and installed based on the results of this treatability study.