# Challenges during the Treatment of PFAS at a Wastewater Treatment Plant

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**Background/Objectives.** Conventional treatment processes for wastewater are ineffective for removing per- and polyfluoroalkyl substances (PFAS) and the effluent may be a source of PFAS to surface water and groundwater. A treatability study was conducted at the wastewater treatment plant (WWTP) at the National Aeronautics and Space Administration (NASA) Wallops Flight Facility (WFF) in Virginia to evaluate potential treatment methods and treatment media in response to the presence of PFAS in the WWTP effluent.

**Approach/Activities.** A multi-train column treatment system was installed at NASA WFF to demonstrate the treatment effectiveness and determine the most cost-effective treatment media for the removal of PFAS compounds from the WWTP effluent. The tested media included polymer, ion exchange resins, and granular activated carbon (GAC) with the objective to remove PFAS from WWTP effluent and to gather information required for full-scale treatment system design.

Effluent water from the WWTP was pumped to an equalization tank and then through a 5-micron cartridge filter. Each of the treatment trains used a separate progressive cavity pump. The cartridge filters were used to remove suspended solids from the WWTP effluent, preventing the treatment columns from becoming clogged. Once filtered, water entered the treatment train column. Each train contained different treatment media. Sample ports were installed at the influent, mid-treatment, and effluent of each column to collect water samples for PFAS analysis. These samples were analyzed for the 18 PFAS compounds using modified USEPA Method 537 and in accordance with the Department of Defense and Virginia Environmental Laboratory Accreditation Program (ELAP). Additional influent, mid, and effluent samples were collected intermittently during system operation and analyzed for water quality parameters that included total organic carbon (TOC), anions (bromide, chloride, fluoride nitrate, nitrate, and sulfate), iron, manganese, and chromium. PFAS data from this treatability study was used to determine if the selected media can treat WWTP effluent to below available screening levels for PFAS.

**Results/Lessons Learned.** Due to the characteristics of effluent water from the WWTP, cartridges were replaced frequently due to high pressure drops across the cartridge filters. The color of the cartridges was dark brown as observed during cartridge replacement events. The color of the polymer and ion exchange treatment media changed from lighter colors to dark brown after only a few days of operation as observed through the transparent columns. The treatment trains were run for approximately four months and were stopped due to high pressure build-up across all the treatment columns. This indicated the need for pre-treatment and the identification of the cause of column fouling. Subsequently, samples were collected from the WWTP effluent before the existing sand filter and effluent discharge point during dry weather and after a rain event. The samples were analyzed for several geochemical parameters including fulvic acid, humic acid, TOC, and tannins. Although TOC was in the range of approximately 6 to 8 mg/L, the results did not indicate the fulvic acids, humic acids, and tannins are of any concern. A pre-treatment test is proposed to use several media including sand, organoclay, a mix of GAC and organoclay, and reactivated GAC to determine if the column fouling can be reduced to allow prolonged removal of PFAS in treatment columns with limited fouling.