

# Conceptual Site Model for PFAS Release, Occurrence, and Migration

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**Background/Objectives.** Per- and polyfluorinated substances (PFASs) related to aqueous film forming foams (AFFF) have been identified at various release sites as compounds of interest and are generally considered emerging contaminants due to their regulatory uncertainty. PFASs are the “active ingredient” in AFFF, which has been in common usage as a petroleum fire suppressant since the early 1970s. PFASs contamination is thought to be present at fire fighter training areas, fire stations and related storage facilities, and at sites where petroleum fires were extinguished or suppressed using foam (truck and aircraft crashes, petroleum handling facilities, refineries and aircraft hangers). The strength of the carbon-fluorine bond, as well as the complexity of the AFFF mixtures, which can contain more than 1,000 individual PFASs compounds, contribute to their recalcitrance and difficulty in being adequately addressed. The mobility of individual PFAS compounds is poorly understood. As we begin to evaluate PFASs-contaminated sites, we need to develop conceptual site models (CSMs) to help guide the investigation and remediation.

**Approach/Activities.** A CSM approach was used to identify and organize the current thinking on PFASs behavior in soil, sediment, surface water and groundwater to help investigators better understand issues related to PFASs occurrence and migration. A series of CSMs were created to depict how AFFF released from fire-fighting related activities can impact various media and how the individual PFAS compounds in the AFFF can remain or migrate in near-surface and subsurface systems. The focus is on modes of release and potential chemical and geochemical transformations of the compounds. Data were extracted from the literature, as well as CH2M testing of various transformation processes on AFFF mixtures.

**Results/Lessons Learned.** The models are intended to serve as an aid in the investigation and delineation of contaminants at PFASs-contaminated sites, and to help identify potential data gaps in defining PFASs fate in the environment. PFASs are compounds that are generally resistant to sorption, biodegradation, and other destructive mechanisms that may be present in all media, and therefore are expected to migrate freely in surface water and groundwater. However, depending on the individual PFASs compounds present in the AFFF mixture, as well as the transformation processes that have occurred since the time of release, a fair amount of PFASs mass may be present in source area soils or sediments. This mass may represent an ongoing source to surface water and groundwater contamination, and further transformation of some of these immobile compounds could release more mobile compounds (e.g., perfluorooctane sulfonate – PFOA, or perfluorooctanoic acid – PFOA), which are the most likely compounds to be regulated.