

Characterization of Contaminants of Potential Concern in NAPLs from Multiple Sources in a Superfund Site

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Background/Objectives: Newtown Creek is a 3.5-mile-long Creek located in New York City (the City) and creates the border between the boroughs of Brooklyn and Queens. Newtown Creek is a non-aqueous phase liquid (NAPL) impacted site. Current and historical potential sources of NAPLs adjacent to Newtown Creek include former manufactured gas plants (MGPs), petroleum-handling facilities, including refineries, pipelines, and bulk terminals, aluminum plants (ALCOA), and other industrial facilities. Additionally the second largest oil spill in the country, known as the Greenpoint Oil Spill, occurred at this Site. Illegal dumping of oil also has been documented recently. Observations of sheens indicating active NAPL transport, occur daily throughout the length of the Creek. There are a variety of ways for sheen-generating NAPL to migrate from sediment to surface water. These likely include NAPL migration due to advective flow, ebullition-facilitated migration, surface tension driven migration from shorelines, and buoyancy driven migration from sediment. Because NAPL is a significant source of contaminants of potential concern (COPCs), it is of utmost importance to understand the NAPL chemical characteristics and their migration pathways to the Creek so that a robust conceptual site model can be developed to evaluate remedial alternatives for the Site.

Approach/Activities: The City has conducted several studies in the Creek to assess migration of NAPL from upland Sites to the creek. The City conducted multiple surveys in the Creek at different low tides to identify presence of sheens from upland sites. Studies were also conducted in portions of the Creek, adjacent to NAPL impacted upland sites such as former MGP plants, petroleum refineries etc., to observe if ebullition-facilitated NAPL migration occurs in these areas. Finally, NAPL samples were collected during the additional surveys using Teflon nets and in sample jars to characterize the chemical patterns and concentrations of contaminant in the NAPL transported to the surface water. The NAPL samples were analyzed for polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), total petroleum hydrocarbons (TPH), organic carbon, black carbon and metals.

Results/Lessons Learned: The collected and available data and observations show that NAPL impact is widespread and its being transported into the surface water and sediment from upland Sites via gas ebullition and other mechanisms. NAPL is migrating from multiple upland Sites to the Creek, including Sites where upland remediation was completed. NAPL migration is pronounced in areas adjacent to and impacted by the former MGP site and refinery. Sporadic NAPL migration is also observed in areas with high contamination even at high tide. Subsurface sediment data supports the interpretation of direct observations of sheen migration. Based on the data collected to date, NAPL is the largest source of COPC concentrations to the Creek and is a likely mechanism for contaminating recent sediments in the Creek. While concentration of PAHs and PCBs concentrations in NAPLs vary widely the observed values can be several orders of magnitude higher than other point sources that discharge into the Creek. Overall, these observations indicate that a complete understanding of the nature and extent of the NAPL impact is needed in order to develop a robust conceptual site model and remedy for the contaminated sediments at the site.