

Quantifying NAPL Mobility Using NAPL-Specific Hydraulic Conductivity (K_{NAPL}) Measurements in Sediment at the Quanta Superfund Site

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Background/Objectives. The Quanta Resources Superfund Site is located along the Hudson River in Edgewater, New Jersey. Operable Unit 2 (OU2) of the site consists of river sediments and the overlying surface water. The upland area (OU1) immediately west of the river has a long history of industrial operations, including the manufacturing of paving and roofing materials and oil recycling. These historical activities resulted in the presence of polycyclic aromatic hydrocarbons (PAHs) and nonaqueous phase liquids (NAPLs) within the 26 acre OU2 Study Area. This presentation discusses the results of site investigations that were used to characterize NAPL mobility in OU2.

Approach/Activities. Site investigations were conducted in 2018 to identify and delineate the distribution of site-related NAPL and PAHs in river sediments and identify specific sediment areas that may pose unacceptable human or ecological risks associated with the presence of NAPL. These results were integrated with existing information (offshore chemical, hydrological, and ecological conditions) to define the limits of site-related impacts that warrant Early Action remediation. Field methods included the collection of 30-foot sediment cores for field assessment by visual inspection, hydrophobic FLUTE liner and UV light screening for presence of NAPL, and photoionization detector screening. Total PAH (TPAH) concentrations were measured in the upper 5 feet below the sediment surface (bss) at 0 to 6 inches, 6 to 12 inches, 1 to 3 feet, and 3 to 5 feet. Deeper deposits were analyzed at 5-foot intervals. Field screening results were used to select sediment intervals for NAPL mobility testing by water-drive method. Water-drive tests were performed on 33 test samples to measure NAPL mobility by passing three porewater volumes through 1.6-inch-diameter and 2-inch-long sediment test samples at aggressive hydraulic gradients. The water drive tests included TPAH measurements using sediments collected adjacent to the 33 selected water-drive intervals, porosity measurements, and pre- and post NAPL saturation measurements using the "Dean Stark" method.

Results/Lessons Learned. Twenty-five of the 33 NAPL mobility tests produced no NAPL. The remaining samples indicated some NAPL production during mobility testing. NAPL mobility test results were used to calculate NAPL-specific hydraulic conductivity (K_{NAPL}) values, which were combined with field hydraulic gradient, NAPL saturation, and sediment porosity data to calculate the potential rate of NAPL migration under field conditions (if any). K_{NAPL} measurements for samples that produced some NAPL ranged from 2×10^{-11} to 2×10^{-6} centimeters per second (cm/sec). Two samples with K_{NAPL} values in the 10^{-6} cm/sec range were from the same borehole, which was located in an area well documented as having been significantly affected by NAPL releases. The other six samples that produced some NAPL had calculated K_{NAPL} measurements ranging from 2×10^{-11} to 1×10^{-9} cm/sec, indicating that the NAPL is very likely to be immobile under field conditions. The results were used to identify areas where NAPL mobility may pose a risk of migrating to the sediment surface. This presentation focuses on the site-specific measurement of NAPL hydraulic conductivity and its application for characterizing the potential for NAPL migration.