

EXECUTIVE SUMMARY

The Seawolf Mound, located in the New London Disposal Site within Long Island Sound, was created in 1995/96 from the placement of material dredged from the Thames River, Connecticut that was deemed unsuitable for open water disposal due to trace metal and polycyclic aromatic hydrocarbon (PAH) concentrations. This sediment was then covered with suitable dredged material to form a cap layer and sequester the underlying unsuitable material from the environment. Periodic monitoring of the site has identified a stable layer of capping material over the mound, but a 2006 survey suggested more variable PAH concentrations in the cap layer than previously measured. However, the 2006 survey used a different PAH analytical preparation technique from previous investigations. A monitoring survey was conducted on the Seawolf Mound in September 2010 to compare PAH analytical and extraction methodologies from previous surveys and to further characterize the spatial variability of PAH concentrations in surficial sediments of the mound cap.

A total of 16 vibracores were collected in 2010 from nine stations across the mound and one station in a pre-defined reference area to characterize material within the cap layer of the mound. Two of the mound stations and the one reference station included sets of three co-located cores in order to assess small-scale spatial variability in cap sediments. The upper 0.5 m of each core was homogenized into a single sample and subsequently analyzed for grain size, total organic carbon (TOC), and PAHs. Grain size and TOC results were consistent with previous surveys and documented a surficial layer of relatively fine-grained material with low TOC levels.

PAH analysis was conducted in two phases in order to assess potential variability from different methods used on previous Seawolf monitoring surveys. Phase 1 consisted of two sediment cores with analysis by three different extraction methodologies: microscale extraction (MSE) by Method 3570, pressurized fluid extraction (PFE) by Method 3545A, and Soxhlet extraction by Method 3540C. Following extraction all samples were analyzed via GC/MS SIM (SW-846 Method 8270C). The Soxhlet extraction method achieved the highest PAH surrogate and quality control recoveries, PFE had the next highest recoveries, and MSE exhibited the lowest and most variable results. Based on these results the Soxhlet extraction method was used on the remaining samples to complete the second phase of PAH analysis.

Phase 2 of the PAH study involved analyzing the remaining cores with the Soxhlet extraction method; including assessment of compositional-level heterogeneity of the matrix and assessment of small-scale (10 m or less) spatial variability of field samples. PAH heterogeneity of Seawolf sediments at the matrix level was examined through triplicate sub-sampling of three individual cores that had each been well homogenized.

EXECUTIVE SUMMARY (CONTINUED)

Results from this exercise identified the potential for heterogeneity within a single capping dredged material sample to persist through the small sub-sample mass and homogenization techniques of PAH analytical methods.

Variability of PAHs at the field scale was examined through analysis of three sets of triplicate co-located cores, with cores of each set collected within a 10 m station tolerance. While two of the three stations sampled with co-located cores showed strong agreement between samples, there was considerable variation among cores from the third station. These results further supported the understanding of the potential for small-scale spatial variability among the heterogeneous cap material and suggest limitations on inter-survey comparisons between individual locations.

The 2010 survey results indicated that PAH concentrations were similar across the Seawolf Mound stations and were consistent with pre-dredge characterization of the capping material. Levels were also below the Sediment Quality Guideline Effects-Range Low (ERL) value indicating that there is a sufficient layer of cap material over the mound. It is likely that different PAH extraction methodologies, compositional-level variability, and small-scale spatial variability have all contributed to observed variations in PAH concentrations throughout the monitoring efforts at the Seawolf Mound. It is recommended that any future sediment investigations use analytical methods with larger sample size, high extraction efficiencies, and thorough homogenization techniques in order to reduce the impact of these factors and that sufficient samples are collected to allow for meaningful comparison of spatial and temporal means rather than comparing concentrations at individual locations.