In Situ Treatment for PCBs in Sediment: Treatability to Implementation

Keir Craigie (Keir.Craigie@Tetratech.com), Gary Braun, and Senda Ozkan (Tetra Tech, Inc.)
Ernest Ashley (CDM Smith)
John Collins (AquaBlok)

Background/Objectives: In one of the largest applications of in situ treatment for PCBs in sediment to date, the project went from treatability study to implementation. Treatability studies demonstrated that the effectiveness of the application of activated carbon at doses of 2.5% and 5% dry weight of the sediment resulted in 95% reduction in porewater concentrations and invertebrate bioaccumulation. The Feasibility Study for the site determined that the in situ application could be applied across approximately 13.7 acres where the concentrations of total PCBs in the surface sediments exceeded the remedial goals and were below 2.5 mg/kg. The Remedial Design incorporated the application of activated carbon at a target rate of 5% of the sediment dry weight across 13.7 acres. The remedial design selected two potential weighted approaches to apply powder activated carbon (PAC) to the surface sediment where the water depths ranged from 6 to 12 feet. For the full-scale implementation AquaGate+PAC® was selected as the delivery approach for the PAC application.

Approach/Activities: A laboratory bench-scale study demonstrated the effectiveness of using activated carbon applied to the surface sediments to reduce the bioavailability of PCBs to benthic organisms and the concentrations in the porewater. Results from the treatability study were incorporated into the feasibility study and the design. The project was completed under an EPA-approved Risk Based Disposal Analysis. Field application of the in situ treatment material was completed over a period of 2 months using a cable assisted barge mounted roller drum to place the target loading of the AquaGate+PAC® to the surface sediments. A total of 2,504 tons of in situ material was placed over 13.7 acres of the site. Multiple quality control measurements and samples were collected to verify the AquaGate+PAC® material delivered and the application rate during placement. Monitoring of the in situ material and placement included verification of the delivered material, tracking of tonnage placed, area covered, material thickness, collection of samples for laboratory analysis, and the collection of material to collect, recover and measure the amount of activated carbon that reached the sediment surface.

Results/Lessons Learned: The collection of multiple measurements allowed for a full documentation of the in situ material placed over the 13.7 acres of the site. Verification of the PAC content in the material was completed over the several month period required for production and delivery to the site. Visual measurements of the in situ treatment layer via core samples a frequency of 15 locations per acre was able to confirm the activated carbon placement. The collection of samples from collected push cores for black carbon and total organic carbon were also used to verify the placement of the activated carbon. The collection of samples to measure the amount of activated carbon reaching the sediment surface confirmed that settlement occurred within the target placement areas as aggregate bound or unbound activated carbon. The results from the range measurement approached utilized provided multiple lines of evidence that the target amount of activated carbon was successfully placed within the target loading over the 13.7 acres. A long term monitoring program will measure the reduction in bioaccumulation of PCBs by benthic invertebrates and the reduction in sediment pore water concentrations. The just-finished first year of monitoring provides the first indications of progress to the remedial targets for the site. Subsequent monitoring in years 3 and 5 will verify the in situ treatment effectiveness and achievement of project goals.