

## **Sediment Cap Design and Placement: Site 19, Former Derecktor Shipyard Marine Sediment (Operable Unit 5)**

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**Background/Objectives.** Former ship building and maintenance operations led to sediment contamination around and beneath Pier 2 at Site 19, Former Derecktor Shipyard at Naval Station Newport in Rhode Island. The primary contaminants detected in sediments are high molecular weight polyaromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and lead. Pier 2 is home port to multiple vessels and is the location of the Bi-Annual International Seapower Symposium, which brings numerous non-home ported US and foreign vessels to NAVSTA Newport. The 1,600-foot long and 200-foot wide Pier 2 was constructed in Coddington Cove in the 1950s with three functional berths, concrete decking, and concrete pilings. Water is approximately 30 feet deep with 3 to 4 feet of clearance below pier at high tide. Remedial action objectives included reducing human health risks from ingestion of benzo(a)pyrene-impacted shellfish and reducing the exposure of aquatic organisms to lead, PCBs, and PAHs. While dredging addressed contamination in sediment in open water areas, dredging beneath Pier 2 was not feasible due to the number and spacing of pilings, depth of water and clearance beneath Pier 2 during high tide, and safety concerns related to diver-assisted dredging methods. As part of the selected remedy for this CERCLA project, a cap was designed and placed under portions of Pier 2 to provide protection from contaminants under the pier without demolition of the pier.

**Approach/Activities.** This project required consideration of challenging site conditions including concrete pilings, water depth, tidal and 100-year storm velocities, and the Navy's requirement for unrestricted use of Pier 2 (no vessel restrictions). The design balanced the need for aggregate to resist scour due to tides, storms, and vessel movement (yet not impede vessel movement) and it considered the need to slurry the cap material for placement by hoppers and hosing. Accurate verification of the installed cap profile was also a requirement. Divers placed a 2-foot thick cap over two target areas beneath the east end of Pier 2 within turbidity curtains with real-time turbidity monitoring. The cap was constructed of 12,000 tons of 1.5-inch aggregate placed over a 136,000-square foot area. A barge-mounted excavator was used to place stone at the edges of the pier to create berms on the north, south, and west sides of the cells, working inward. Aggregate was loaded into a barge-mounted placement hopper and mixed with water to create an aggregate slurry, which was then pumped via diver-assisted hosing to target areas. The aggregate slurry was conveyed utilizing specialized pumps. Divers placed the slurry in two lifts to ensure controlled, uniform placement.

**Results/Lessons Learned.** Brightly colored nylon straps attached to pilings 3 feet above the mudline were used by the divers to gauge thickness of the stone placed and amount of settlement due to consolidation of underlying sediments. The final surface elevation was obtained via single-beam bathymetric survey (multi-beam could not be used). A series of test pits were performed by divers to verify the cap met or exceeded the design thickness requirements. Test pitting activities were filmed to document results.