Pilot Channel and Beneficial Reuse of Sediments for a Time Critical Removal Action

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Background/Objectives. A Time Critical Removal Action (TCRA) for sediment and bank remediation for PCBs was performed at a Superfund site in Michigan within a 1.7 mile river reach. At the downstream end of the TCRA reach there was a temporary water control structure (WCS) that had been installed by the State to avoid the risks associated with a potential dam failure. At the downstream end of the TCRA area, where the influence of the impoundment is greatest, is also where bedload had dropped out to form a thick layer of largely non-PCB impacted sediment. There were areas along the banks where channel edge sediment contained PCBs greater than 1 mg/kg and required removal. Otherwise, sediment PCB concentrations were less than 1 mg/kg as demonstrated from the pre-design sampling results and required no further action (non-PCB impacted sediments). A pilot channel was dredged in the mid-channel area through unimpacted sediments to control development of the river thalweg as the WCS was lowered to facilitate construction of the new banks on either side of the river. Excavation of the pilot channel coupled with a slow drawdown of the WCS also mitigated the risk of slope failure of the steep bank on one side of the downstream reach.

Approach/Activities. . During design, the team developed a three-dimensional (3D) model that was used to estimate the various sediment types within the pilot channel. The sediment lithology model was developed using adaptive indicator kriging with slight anisotropy oriented in the northwest-southeast direction, consistent with the river flow in the downstream reach. Based on the material type from the sediment lithology model, dredging process calculations were performed to estimate the physical quantities of dredged material (e.g. bulking factor, weight, volume, etc.) to be encountered during the hydraulic dredging of the pilot channel. Various in- situ physical characteristics of the sediment deposits were used along with basic assumptions about the hydraulic dredging equipment to estimate the percent solids of the dredged material and its eventual dewatered percent solids. These estimates were used to support equipment sizing, scheduling, and material handling.

Results/Lessons Learned. The 3D model and dredging process calculations supported reuse of the dredge spoils from the pilot channel in the scour hole at the downstream side of the former dam spillway. With agency approval, the unimpacted dredge spoils were re-located via pumping to the downstream side of the former dam spillway where a scour hole had formed and would, in the future, be relatively cut off from the main river channel. During removal of the WCS, the pilot channel directed the river flow to the center of the channel, preventing the potential for the channel to undermine the adjacent steep bank and cause a slope failure. Following relocation of the non-PCB impacted sediments, the material was graded and restored using native plants and bioengineering techniques. Additional benefits included removal of a portion of the impounded sediments to reduce downstream impacts, improved access for recreational users, and cost savings associated with not dewatering, stabilizing, and transporting and disposing of non-PCB impacted sediments.