

Balancing Remedial and Restoration Objectives for Sediment Capping on an Urban River

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Background/Objectives. Barr Engineering Co. provided river restoration design services as part of a sediment dredging and capping project conducted at a former manufactured gas plant (MGP) site in Flint, Michigan during the 2017 construction season. The project was completed on a 1,700-foot reach of river flowing through an urban area. Hamilton Dam, classified as a high hazard dam by the Michigan Department of Environmental Quality, defined the downstream end of the work zone. The main objectives of the remediation were to remove MGP-related impacts in the riverbed and riverbanks, install an impermeable cap along the riverbed to prevent groundwater from venting into the river, restore the riverbed and riverbanks to meet flood stage requirements, and minimize secondary impacts to the public.

The project reach is within a college campus on an urban stretch of the Flint River, with an incised channel that lacked bedform diversity and bound laterally by adjacent urban development. The banks were fairly steep with roads on either side of the river. Plans to modify Hamilton Dam were in the works by others, but the design was conceptual at the time of the remediation design. The river restoration design needed to work within these constraints to meet the remedial objectives while still improving the function of the channel corridor.

Approach/Activities. The project constraints created challenges for river restoration that were met through an iterative design process, hydraulic modeling, and stakeholder collaboration. The restored channel bed was designed to prevent potential downcutting into deeper sediments and habitat features were incorporated to improve floodplain connectivity, sediment transport, and habitat. The design of the restored channel was tailored to address a range of proposed modifications to Hamilton Dam. Consumers Energy collaborated with state and local regulators and dam designers so that the two projects could be sequenced in a manner that protected human health and the environment while improving the river corridor.

Newberry riffles composed of cobble-sized rock and a bankfull bench with an elevation tailored for the post-dam removal condition were incorporated. An existing pedestrian bridge was removed and replaced with a single span pedestrian bridge, which resulted in the removal of bridge piers within the channel. To protect the sediment cap, the restored channel and lower river banks were armored with riprap. Native vegetation was planted in the upper river banks and, following dam removal, along the floodplain bench. Native trees and shrubs will be established to reintroduce native landscape to the area.

Results/Lessons Learned. Dredging and construction were substantially completed in late 2017, with final site restoration occurring in 2018. Throughout the design and construction process, regular stakeholder collaboration resulted in multiple iterations of design, supported by hydraulic modeling and analysis in order to address input. Although modification of the Hamilton Dam was imminent, the design and hydraulic characteristics were not finalized at the time the remediation project was completed. Therefore, channel geometry and floodplain bench were designed to provide flexibility for the likely range of scenarios resulting from the Hamilton Dam removal. The final restoration improved the geomorphic function of the channel, maintained appropriate sediment transport, improved floodplain connectivity, created bedform diversity, and maintained adjacent riparian wetlands.