

Site Name: Manistique River and Harbor

Location: Manistique, Michigan

Type of Site: State-lead remediation project by Michigan Department of Environment, Great Lakes, and Energy (EGLE)

Contaminants of Concern: PCBs

Remedy: Removal and disposal and amended cover placement with activated carbon

Current Site Status: Remediation of OU1 and OU2 were completed in 2016 and 2020, respectively

Case Study Objectives: Remove the Beneficial Use Impairments (BUIs) from the site, which include “Restrictions on Fish and Wildlife Consumption” and “Restrictions on Dredging Activities”.

Site Description: The Manistique River located in Schoolcraft County, Michigan, was designated as an Area of Concern (AOC) because it is subject to BUIs under the 2012 Great Lakes Water Quality Agreement due to the presence of PCBs. Historical discharges from operations along the river resulted in the deposition of sediments contaminated with PCBs into the river. Additionally, wood slabs and sawdust / wood chips from previous sawmilling operations were discarded into the Manistique River. The site, which includes approximately 1.7 miles of impacted river sediments and the Manistique Harbor, is divided into seven separate zones (Zones 1 through 7 within two Operable Units [OU]). EGLE collaborated closely with the USEPA, the National Oceanic and Atmospheric Administration, and the USACE on this project.

Site Investigation and Conceptual Site Model Summary: Source evaluation, feasibility study, predesign investigation, remedial design, and construction have been completed. Investigations began within the Manistique River AOC in 1993. A series of remedial actions, including the placement of an interim cover and removal of more than 175,000 cy of sediment, were conducted in OU2 between 1993 and 2001 to remove PCBs. This resulted in the removal of a number of BUIs from the site; however, two BUIs remained prior to the implementation of remediation activities (EA and Foth 2013). The remaining two BUIs for the Manistique River AOC were “Restrictions on Fish and Wildlife Consumption” and “Restrictions on Dredging Activities.” Additional investigations and predesign investigation were conducted from 2001 to 2017 to support the OU1 and OU2 remedial design.

The conceptual site model identified Zone 1 (upland terrestrial properties) as the primary historical source of PCBs to the AOC with potential ongoing contribution to the AOC through bank erosion. PCB transport to the remaining areas of the AOC (Zones 2 through 7) occurred via erosion and deposition of PCB-contaminated sediment and debris. A majority of the PCB mass was located in Zones 3, 5, and 6 prior to remediation. Bioaccumulation studies indicated that Zones 3, 4, and 6 were the areas with the greatest bioaccumulation potential. Based on modeling performed during the CSM, a 0.2 milligram per kilogram (mg/kg) sitewide (OU1 and OU2) SWAC for total PCB Aroclors in sediment was selected as the preliminary remedial goal for use in this Focused Feasibility Study as sufficient to facilitate removal of the fish consumption BUI. In order to remove restrictions on dredging activities in OU2, no restrictions can exist on the disposal or reuse of sediment (e.g., sediment sampling and analysis was conducted in the upstream portion of Zone 5 in 2016, and it was determined that PCB levels were less than 1.0 mg/kg for the proposed dredging area).

Remedy Design and Construction: Remedial design and remedy implementation for OU1 was completed in 2016. The remedy consisted of removal and disposal of approximately 9,400 cy of sediment removal and sand cover placement in Zones 3 and 4. Remedial design and remedy implementation for OU2 was completed in 2019, and final upland restoration was completed in 2020. The OU2 remedy consisted of the removal and disposal of approximately 40,000 cy of sediment and amended cover placement with activated carbon in OU2 and placement of supplemental amended cover with activated carbon in OU1. The cover for both OUs included 9 inches of clean sand with 0.5% GAC (by weight) placed within the limits of removal over any residuals remaining in the Dredge Management Units above the sediment cleanup goal.

Post-Remedy Monitoring: To document whether the remedial activities are effectively meeting the RAO of removing the fish consumption BUI from the site, monitoring activities will be conducted to measure the levels of PCBs within fish tissue. Fish monitoring activities are conducted on a routine basis under the State of Michigan's Fish Contaminant Monitoring Program and will continue following the completion of remedial activities. In 2020, sediment sampling was conducted by USACE in support of routine navigational dredging. The final process to remove both BUIs will follow the State of Michigan delisting guidance document.

RAOs/Project Objectives Achievement: The overall RAO for the Manistique River AOC is to remove the BUIs from the site. The BUIs serve as a reference point to indicate detrimental change in the chemical, physical, or biological integrity of the water body and nearby water bodies, including Lake Michigan. Modeling was completed to inform the preliminary remedial action levels of total PCB Aroclor concentration within each OU to achieve the preliminary remedial goal of 0.2 mg/kg sitewide (OU1 and OU2) SWAC for total PCB Aroclors in sediment to facilitate removal of the fish consumption BUI. The remedial action levels for PCB Aroclor concentrations in sediment were identified as 1.0 mg/kg in OU1, 0.5 mg/kg in surface sediments, and 0.3 mg/kg for all sediment depth intervals in OU2. As of 2022, the fish consumption BUI remains in place.

By removing sediments to 0.3 mg/kg within the navigation channel (and 100-foot buffer), all sediments with PCB concentrations above the 1.0 mg/kg restricted disposal limit will be removed. In 2020, sediment sampling was conducted by USACE in support of routine navigational dredging. Results from this sampling showed that dredge spoils from the Manistique Harbor do not require disposal at a confined disposal facility or Toxic Substances Control Act–level landfill, thereby meeting the removal of the Restrictions on Dredging BUI. In 2021, USEPA approved the removal of the BUI, removing restrictions on dredging in the Manistique River AOC.

Reference:

Arcadis of Michigan, LLC, 2018. OU1 Construction Completion Report, Manistique River AOC.
Arcadis of Michigan, LLC, 2020. OU2 Construction Completion Report, Manistique River AOC.
EA and Foth. 2013. Final Conceptual Site Model for the Manistique River Area of Concern, Schoolcraft County, Michigan. Revision 01. April.
Riley, John (Manistique River AOC Coordinator). 2021. Removal Recommendation Restrictions on Dredging Activities Beneficial Use Impairment Manistique River Area of Concern.

Figures/Photos:



Dredging in OU1.



Dredging in OU2.



Sand and activated carbon cover placement in OU1.