

GREAT LAKES LEGACY ACT SEDIMENT REMEDIATION RESEARCH



US Army Corps of Engineers®

The Importance of Correctly Analyzing Sediment Pore Water for Contaminants in Sediment Sites

Introduction

This fact sheet is one of a series on the collaborative research efforts of U.S. EPA's Office of Research and Development (ORD) and Great Lakes National Program Office (GLNPO), the USACE Engineer Research and Development Center (ERDC), the University of Texas, Purdue University, and Tetra Tech EMI. This research supports the Great Lakes Legacy Act (GLLA) and its mission of cleaning up of the most polluted areas in the Great Lakes.

In an effort to clean up the most polluted areas in the Great Lakes, this factsheet provides a brief summary of different analytical methods to correctly characterize pore water.



Great Lakes contaminated sediment sites contain elevated concentrations of contaminants of concern (COCs), such as metals and hydrophobic organic compounds. These sites often encompass large areas, and may require some form of containment or sediment treatment. Sediment pore water contains natural organic material (NOM), including dissolved and colloidal fractions. The analysis of sediment remediation options such as containment (sand capping) and active capping (sorption onto activated carbon or organoclays) depend upon accurately determining sediment pore water characteristics, since NOM may compete with sorption sites. While several methods exist for analyzing sediment pore water, a more uniform method is suggested to determine the true pore water concentration.

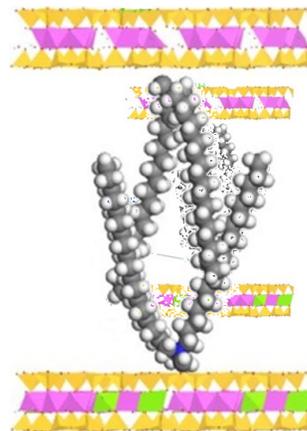
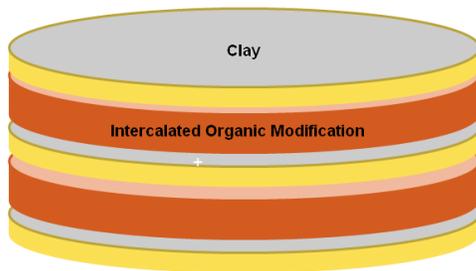
Methods

- ❖ Three different pore water characterization methods were evaluated, including:
 - Digested Sediment
 - Extruded Pore Water (unfiltered, filtered through 0.45-um Teflon filter)
 - Centrifuged Pore Water
- ❖ Pore water characterization also included determination of pH, DO, DOC, sediment moisture content and Specific Ultra-violet absorbance (SUVA).

Results

- ❖ An increase in pore water DOC was correlated with increased COC concentrations.

- ❖ The Extruded Pore Water followed by direct injection is probably the true value.
- ❖ The Centrifuged Pore Water may be artificially higher due to more rigorous sample processing.
- ❖ Filtration removes higher molecular weight COCs.
- ❖ If the SUVA is less than 2.0, the sample is characterized by low molecular weight organic acids, and sorption treatment would be less affected. If the SUVA is greater than 2.0, the sample is dominated by fulvic acids and humic acids, and may affect sorption treatment processes.
- ❖ For the five GLNPO sites evaluated, the pH ranged from 6.6-7.1; the DOC ranged from 40-150 mg/l; and the sediment moisture content ranged from 50-80%.
- ❖ The Grand Calumet pore water contains high molecular weight PAHs that were attached to the colloids, which were eliminated from the sample by filtration, resulting in a less accurate characterization.
- ❖ The Torch Lake pore water contains many colloids; however, sorption was enhanced because certain sorbents attracted the colloids.



Summary

- ❖ The most appropriate pore water analytical method needs to be considered when evaluating sediment containment or treatment options, though other methods may also provide useful information.

For Further Information

- ❖ <http://epa.gov/greatlakes/aoc/torchlake/index.html>
- ❖ <http://www.erdc.usace.army.mil/>
- ❖ <http://www.epa.gov/nrmrl/>

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