United States Department of the Interior

U. S. GEOLOGICAL SURVEY
Reston, VA 20192

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July 11, 2017

OFFICE OF WATER QUALITY TECHNICAL MEMORANDUM 2017.06

SUBJECT: Guidelines for Collecting and Processing Suspended-Sediment Samples for Contaminant Analysis using Continuous-Flow Centrifugation

The U.S. Geological Survey Techniques and Methods Book 1, Chapter D6 "Continuous-flow Centrifugation to Collect Suspended Sediment for Chemical Analysis" provides guidelines for collecting and processing a large-volume water sample and concentrating the sediment fraction into a much smaller volume prior to laboratory analysis. The publication was authored by Kathleen E. Conn, Richard S. Dinicola, Robert W. Black, Stephen E. Cox, Richard W. Sheibley, James R. Foreman, Craig A. Senter, and Norman T. Peterson.

In the past, contaminant analysis of suspended sediment required the collection of large volume samples and separation of the water from the suspended sediment with a laboratory centrifuge to obtain enough contaminant for reliable chemical analysis in the laboratory. Separation of suspended sediment from water in a laboratory is time consuming and costly. It required shipping large amounts of water to a laboratory for separation or shipment of a large industrial centrifuge to the field. Consequently, few studies or monitoring programs have measured the chemical quality of suspended sediment because of the difficulty in consistently obtaining samples for laboratory analysis.

The new field technique overcomes these difficulties by utilizing a small portable continuous-flow centrifuge for the separation of suspended sediment from large volumes of water in the field. This results in a small solid sample that can be inexpensively shipped to the laboratory for chemical analysis.

The report describes project-scoping considerations such as determining the time required to obtain sufficient sediment mass, deployment of equipment and system layout options and results from various field and laboratory quality-control experiments. The testing confirmed the applicability of the technique for the determination of many inorganic and organic chemicals sorbed on suspended sediment, including trace elements, pesticides, polycyclic aromatic hydrocarbons and polychlorinated biphenyls. The particle-size distribution of the captured sediment changes to a more fine-grained composition during centrifugation. This shift in grain

size requires users of the technique to account for this change when extrapolating chemical concentrations on the centrifuged sediment sample to the environmental sample.

Data on suspended sediment-bound chemical concentrations produced using these protocols will support management decisions, such as chemical source-control efforts or in-stream restoration activities. When coupled with streamflow data, measurements of the mass of suspended sediment and the concentration of a contaminant in the sediment can be used to provide the amount of contaminant transported by the stream over a given time period. These data will improve estimates of the amounts and concentrations of trace-level contaminants being discharged by the stream to downstream freshwater and coastal marine ecosystems, and will aid in assessing the importance and impacts of suspended sediment-bound chemicals to human health and aquatic life.

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Distribution: All WMA Employees

This memorandum does not supersede previous OWQ memoranda.

Reference:

Conn, K.E., Dinicola, R.S., Black, R.W., Cox, S.E., Sheibley, R.W., Foreman, J.R., Senter, C.A., and Peterson, N.T., 2016, Continuous-flow centrifugation to collect suspended sediment for chemical analysis: U.S. Geological Survey Techniques and Methods, book 1, chap. D6, 31 p., plus appendixes, https://doi.org/10.3133/tm1D6