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Project Summary

Eastern Lake Survey-Phase II and National Stream Survey-Phase I Processing Laboratory Operations Report

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The National Surface Water Survey was designed to characterize surface water chemistry in regions of the United States believed to be potentially sensitive to acidic deposition. The National Stream Survey was a synoptic survey designed to quantify the chemistry of streams in areas of the United States known to contain low alkalinity waters. Phase II of the Eastern Lake Survey was designed to address temporal variability of chemical and biological characteristics of a subset of Phase I lakes. This document describes the centralized processing laboratory operations associated with the 1986 surveys.

The processing laboratory was located in Las Vegas, NV. Personnel at the laboratory processed water samples received from the field and shipped prepared aliquots to contracted analytical laboratories for subsequent analyses. Dissolved inorganic carbon, pH, total monomeric aluminum, organically bound monomeric aluminum, true color, turbidity, and conductivity were measured at the processing laboratory. A total of 3,377 lake, stream, and snowpack samples were processed and analyzed during the 1986 studies.

The centralized laboratory operation was successful. Samples were prepared for shipment to the analytical laboratories within the specified holding time in all cases. No personnel safety incidents occurred during the study. Recommendations regarding laboratory operations are included in this report to assist in the preparation of similar projects.

This report was submitted in partial fulfillment of contract 68-03-3249 by Lockheed Engineering and Management Services Company, Inc., under the sponsorship of the U.S. Environmental Protection Agency.

This Project Summary was developed by EPA's Environmental Monitoring Systems Laboratory, Las Vegas, NV, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

The National Surface Water Survey (NSWS) was conducted under the direction of the U.S. Environmental Protection Agency (EPA). The NSWS, as part of the National Acid Precipitation Assessment Program's Aquatic Effects Research Program, was designed to characterize surface water chemistry in regions of the United States believed to be potentially sensitive to acidic deposition. The NSWS was composed of the National Lake Survey (NLS) and the National Stream Survey (NSS). The NLS consisted of the Eastern Lake Survey (ELS) and the Western Lake Survey (WLS).

Phase I projects of the NSWS were synoptic surveys designed to quantify the

chemistry of lakes and streams in areas of the United States known to contain low alkalinity waters. Phase II projects were designed to determine temporal variability of chemical characteristics of a subset of Phase I lakes and streams. Pilot studies were conducted prior to Phase I projects in order to test equipment, logistics, and protocols.

The EPA's Environmental Monitoring Systems Laboratory in Las Vegas, NV, has been charged with the responsibility for conducting NSWS field and processing laboratory operations. Laboratory, field sampling, managerial, and quality assurance (QA) personnel were provided by Lockheed Engineering and Management Services Company, Inc.

This report discusses the centralized processing laboratory operations for the following 1986 NSWS studies: Spring Variability Pilot Study (SVS-P), Snowpack Study, National Stream Survey-Phase I (NSS-I, and Eastern Lake Survey-Phase II (ELS-II) spring, summer, and fall seasonal studies. The objective of SVS-P was to obtain data describing the spatial and temporal variability of lake chemistry during snowmelt. The Snowpack Study was conducted in order to determine the relationship between snowpack conditions and the extent and severity of episodic lake acidification.

Procedures

Laboratory Preparation

Six mobile laboratory trailers were constructed for Phase I of the NLS. For the surveys conducted prior to 1986 (ELS-Phase I, WLS, and NSS Pilot studies), a field laboratory was stationed at each field site in order to process samples as soon as possible following collection. For logistical and financial reasons, the six laboratory trailers were centralized in one location (Las Vegas, Nevada) for the 1986 surveys. It was determined experimentally that the maximum sample holding time could be extended from 12 to 24 hours. This extension permitted the overnight shipment of samples to the processing laboratory. All sample information was tracked by a communications staff stationed in Las Vegas, Nevada.

For the centralized laboratory operations, the staff consisted of a coordinator, responsible for the overall operation of the laboratory, one or two supervisors, responsible for daily operations, and analysts, who prepared sample aliquots (for subsequent analyses at contracted analytical laboratories) and performed several chemical analyses.

The laboratory supervisor(s) conducted the training programs. These sessions included instruction in analytical methods, laboratory safety, and quality control (QC) protocols. Analysts were required to complete a written examination, undergo medical surveillance testing, and acquire certification in first aid and cardiopulmonary resuscitation. Safety eyeglass and respirator fittings were required also.

Laboratory Operations

The main function of the processing laboratory was to process water samples received from the field and to ship prepared sample aliquots to a contracted analytical laboratory for subsequent analyses. Dissolved inorganic carbon (DIC), pH, monomeric aluminum, true color, turbidity, and conductivity were measured at the processing laboratory. Two species of aluminum were determined by flow injection analysis (FIA): total monomeric and organically bound monomeric aluminum. The FIA-aluminum and conductivity methods were newly incorporated for the 1986 surveys. The laboratory staff also provided calibration and quality control check standards (QCCS), deionized water, and other supplies to support the field crews.

Each day, the processing laboratory staff organized supplies and equipment, prepared reagents and standards, and calibrated analytical instruments before samples arrived from the field. The laboratory coordinator organized samples into groups (sample batches) by survey type, then distributed the samples to the analysts. After sample processing was completed, the staff prepared the sample aliquots for shipment to the contracted analytical laboratories. The coordinator completed the data forms and forwarded the information to QA personnel. Laboratory personnel cleaned the facility and prepared for the next day's operations.

Results and Discussion

A total of 3,377 lake, stream, and snowpack samples were processed and analyzed during the six surveys conducted in 1986. Samples were prepared for shipment to the analytical laboratories within the specified holding time in all cases.

Based on the good precision and accuracy of the QCCS results from previous surveys, the number of samples that could be analyzed between C checks was increased for pH, DIC, a turbidity methods before the ELS summer seasonal study. Prelimina review of the processing laborato QCCS and audit sample (a sample with known chemical composition) resul during the laboratory operations indicat that the data are of acceptable quality.

Two pH meters were necessary analyze the large number of sampl received within the required holding tim This necessitated the development of protocol to monitor the comparability the pH meters which included th addition of an intermeter comparabili QCCS. Well-characterized lake sample used as natural audit samples for th surveys, were used as the intermet comparability QCCS during the sprir surveys. Because the natural auc samples required approximately minutes to reach pH equilibrium and d not always meet the meter agreeme criteria, a dilution of the pH calibrati buffer solution was substituted as th intermeter comparability QCCS for ELS summer and fall seasonal operations.

Instrument and method problem delayed the development of a viable Fl aluminum protocol. The method develo ment was successfully completed befo ELS-II summer seasonal operation including the optimization of th calibration procedure, sample flow rate reagent concentrations, and catio exchange column. Additional QC mea ures were instituted and a natural auc sample was used as a standard monitor the function of the FIA. The us of the audit material was necessa because no synthetic standard wa available to monitor measurement of th organically bound monomeric aluminu fraction.

Several modifications in the availab method and replacement of the co ductivity cell were necessary for th successful measurement of conductivit High-range methods were developed f true color and turbidity because the NS I sample results exceeded the upp limits of the available methods.

The NSS-I samples were extreme slow to filter using only fine (0.45 µr pore size filters. Therefore, the use of two-stage filtration unit, which includes coarse prefilter and a fine pore size filte is recommended for future large-sca operations. One day per week should b dedicated to instrument maintenance. W experienced difficulty attempting process samples and perform th necessary equipment upkeep concurre

ly. The development of specific daily data review procedures for each method was valuable because it reduced the chance of errors in data reporting.

Conclusions

The centralized laboratory operation was successful. Samples were prepared for shipment to the analytical laboratories within the specified holding time in all cases. No personal safety incidents occurred during the laboratory operations.

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***W. L. Kinney** is the EPA Project Officer (see below).*
The complete report, entitled "Eastern Lake Survey - Phase II and National Stream Survey - Phase I Processing Laboratory Operations Report" (Order No. PB 90-146 275/AS; Cost: $17.00, subject to change) will be available only from:
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