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EAST AFRICAN STANDARD

Standard guide for field quality assurance in a ground-water sampling event

EAST AFRICAN COMMUNITY

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Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in East Africa. It is envisaged that through harmonized standardization, trade barriers which are encountered when goods and services are exchanged within the Community will be removed.

In order to meet the above objectives, the EAC Partner States have enacted an East African Standardization, Quality Assurance, Metrology and Test Act, 2006 (EAC SQMT Act, 2006) to make provisions for ensuring standardization, quality assurance, metrology and testing of products produced or originating in a third country and traded in the Community in order to facilitate industrial development and trade as well as helping to protect the health and safety of society and the environment in the Community.

East African Standards are formulated in accordance with the procedures established by the East African Standards Committee. The East African Standards Committee is established under the provisions of Article 4 of the EAC SQMT Act, 2006. The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the private sectors and consumer organizations. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the procedures of the Community.

Article 15(1) of the EAC SQMT Act, 2006 provides that "Within six months of the declaration of an East African Standard, the Partner States shall adopt, without deviation from the approved text of the standard, the East African Standard as a national standard and withdraw any existing national standard with similar scope and purpose".

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

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Introduction

In the preparation of this East African Standard, the following source was consulted extensively:

ASTM D7069:2004, *Standard guide for field quality assurance in a ground-water sampling event*

Assistance derived from this source and others inadvertently not mentioned is hereby acknowledged.

Designation: D 7069 – 04

Standard Guide for Field Quality Assurance in a Ground-water Sampling Event[1]

This standard is issued under the fixed designation D 7069; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide covers the quality assurance (QA) methods that may be used to assure the validity of data obtained during the sampling of a ground-water monitoring well. QA is any action taken to ensure that performance requirements are met by following standards and procedures. Following QA practices becomes even more critical if the data must be validated in a court of law. Under certain conditions, it may be necessary to follow additional or different QA practices from those listed in this guide. QA practices should be based upon data quality objectives, site-specific conditions, and regulatory requirements.

1.2 *This standard addresses QA procedures used in the field and does not refer to laboratory QA procedures*

1.3 *This standard also does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to use.*

1.4 *This standard provides guidance for selecting and performing various field QA procedures. This document cannot replace education or experience and should be used in conjunction with professional judgement. Not all of the procedures are applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "standard" in the title of this document means only that the document has been approved through the ASTM consensus process.*

2. Referenced Documents

2.1 *ASTM Standards:* [2]

D 5903 Standard Guide for Planning and Preparing for a Groundwater Sampling Event

D 6089 Standard Guide for Documenting a Ground-Water Sampling Event

D 6452 Guide for Purging Methods for Wells Used for Ground-Water Quality Investigations

D 6517 Guide for Field Preservation of Ground-Water Samples

D 6564 Guide for Field Filtration of Ground-Water Samples

D 5088 Practice for Decontamination of Field Equipment Used at Nonradioactive Waste Sites

D 5608 Practice for Decontamination of Field Equipment Used at Low Level Radioactive Waste Sites

3. Terminology

3.1 *Definitions:* For definitions of terms used in this specification, refer to Terminology D 653.

3.2 *Definitions of Terms Specific to This Standard:* Note that these are basic definitions. Information on the purposes of the various QA samples is provided in section 5.

3.2.1 *quality assurance (QA)*—actions taken to ensure that standards and procedures are adhered to and that delivered products or services meet performance requirements (reference 1).

3.2.2 *Field Duplicates*—a set of samples that are collected close in time and space and in a manner so that the samples are thought to be representative of the ambient water composition at the time of collection.

3.2.3 *Field Split Samples* —samples obtained by dividing one sample into two or more subsamples either before or after sample preservation and are subject to identical handling and analysis.

3.2.4 *Field Blank or Ambient Blank*—laboratory water that is exposed to the same environmental conditions as the samples.

3.2.5 *Equipment Blank or Rinsate Blank*—deionized water that is passed sequentially through each component of the equipment system used for collecting and processing the environmental samples.

[1] This guide is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.21 on Ground Water and Vadose Zone Investigations.

Current edition approved July 1, 2004. Published July 2004.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3.2.6 *Trip Blank or Travel Blank*—laboratory-grade water that is poured into the sample bottle at the laboratory prior to the sampling event and remains unopened as is travels with the sample containers to the field and is stored and shipped with the samples.

3.2.7 *Microbiological Blank or Sterile Container Blank*—deionized water in a sterile container that is taken to the field and opened prior to being shipped to the laboratory with the other ground-water samples.

3.2.8 *Temperature Blank or Temperature Control*—containerized water that is kept with the samples from the time of collection until the samples are refrigerated at the laboratory.

3.2.9 *Matrix Spike*—a ground-water sample to which a spike solution of known concentrations of selected analytes is added either in the field or in the laboratory.

4. Significance and Use

4.1 Field QA demonstrates the effectiveness of field quality control procedures. Effective QA facilitates the collection of statistically significant data that is defendable scientifically and in a court of law. QA also involves the use of consistent procedures, increasing the validity of data comparison among sampling locations and events.

4.2 This guide should be used by a professional or technician who has training or experience in ground-water sampling.

5. Procedure

5.1 *Field QA Samples.* There are several types of QA samples including duplicates, blanks, temperature controls, and matrix spikes. The numbers and types of QA samples to be collected should be specified in the Sampling and Analysis Plan (SAP). QA samples that are collected from monitoring wells should be obtained using the same method of collection as the other samples. The same preservatives should be used for both the ground-water samples and the associated QA ground-water samples.

5.1.1 *Field duplicate*—The field duplicate is an independent sample collected as close as possible to the location of a sample that is part of the sampling scheme at approximately the same time as the sampling scheme sample. It is a widely accepted practice to collect one set of field duplicates for every ten samples or at least one set per sampling event if less than ten samples are collected. The field duplicate is analyzed for the same parameters as the original sample and therefore may comprise a set of sample containers. Duplicates should be collected in the same order each time, such as following the collection of the original ground-water sample. This QA sample is used to assess the analytical precision by comparing the relative percent difference in values between the sample concentration and the sample duplicate concentration. The field duplicate sample results are also an indication of the reproducibility of the sampling procedures.

5.1.2 *Field Split Samples*—Field split samples are collected into a single container, then split between two or more containers. Splits should not be taken when the action of splitting could affect the concentration of the analyte(s) of interest. Results of split sample analyses can be used to compare the data generated by different laboratories or different analytical methods.

5.1.3 *Field Blank or Ambient Blank*—This type of QA sample is a container of laboratory water which is opened in the field to expose the water to field conditions during sampling. This QA sample is used to determine contamination of samples from atmospheric conditions during sampling. The lid is also removed to add the same preservatives found in the ground-water samples. Some QA programs may also require the field blank be passed through the sampling equipment.

5.1.4 *Equipment Blank or Rinsate Blank*—This type of QA sample is a container of laboratory water that is passed through each piece of sampling equipment after it has been decontaminated. The number of equipment blanks is determined by the types and amount of sampling equipment used in the ground-water sampling trip. The exact number of equipment blanks and the procedure for collecting the equipment blank(s) should be specified in the SAP. Equipment blank results indicate if the contaminants have been introduced to the samples by the transfer of residuals on the sampling equipment between sampling locations due to incomplete decontamination. Equipment blanks are not required if dedicated or disposable sampling equipment is used.

5.1.5 *Trip Blank or Travel Blank*—Trip blanks are prepared and sealed in the laboratory prior to the sampling event. These blanks contain laboratory water with preservatives as required. The blanks are not unsealed until they are ready to be analyzed. Trip blanks accompany the other sample containers throughout the sampling event including transport to and storage at the laboratory. Results of trip blank analyses indicate contamination that may have been introduced by the sample container or during sample handling, shipment, or storage.

5.1.6 *Microbiological Blank or Sterile Container Blank*—This blank is used when ground-water samples are collected for bacteriological tests. A sterile container with deionized water is taken to the field and opened prior to being shipped to the laboratory with the other ground-water samples. No preservatives are added to this type of blank. Some QA programs may also require the microbiological blank be passed through the sampling equipment. Results of microbiological blank analyses are used to determine if microorganisms are introduced to the samples during handling, shipment, and storage.

5.1.7 *Temperature Blank or Temperature Control*—This blank is containerized water that is kept with the samples from the time of collection until the samples are refrigerated at the laboratory. One temperature blank should be included in each shipping container. The laboratory will then use this control to verify the temperature of the ground-water samples so that the other samples need not be tampered with for this purpose. Measuring the temperature of these blanks is used to determine if the temperature requirements for samples were met during shipping.

5.1.8 *Matrix Spike*—his QA sample involves the collection of another sample at an already established sampling point using the procedures described for the field duplicate. The volume and number of matrix spike samples varies depending on the type(s) of sample parameter(s) that are analyzed. Matrix spike sample results are used to determine if the results are biased (such as by interference in the measurement of one chemical by the presence of another or by turbidity) for a

particular sample matrix. Matrix spike duplicates are also taken at the location of the matrix spike. They are collected using the same procedures as the matrix spike. Matrix spike duplicates are used by the laboratory to assess the analytical precision while analyzing a given sample matrix. Requirements for matrix spikes and matrix spike duplicates are dictated by the lab QA program.

5.2 *Procedures Affecting the Quality and Consistency of Samples.* There are many procedures performed during a ground-water sampling event that can affect the consistency and quality of the data. Field procedures for ground-water sampling should be documented in a sampling and analysis plan (SAP). Field QA practices should facilitate meeting the data quality objectives. The sampling plan should be kept up to date to reflect any changes in on-site conditions or procedures. The sampler should be familiar with the procedures outlined in the SAP prior to the sampling event and should have a copy available in the field. Established procedures for collecting the samples, documenting field procedures (D 6089), and decontaminating the equipment (D 5088 and D 5608) should be followed to yield valid data. Use of consistent procedures over time facilitates valid comparison of changes in ground-water chemistry over time. Most or all of the procedures that follow should be addressed in the SAP, and are those that can affect the data quality.

5.2.1 Contact the laboratory to coordinate sampling and the collection of QA samples prior to sampling. On some projects, an additional person may be designated as the liaison between the laboratory and the project manager during the sampling event to ensure that samples are being handled, collected, and shipped according to QA procedures.

5.2.2 Conduct real-time documentation of all sampling activities (Guide D 6089) including a record of all QA samples collected.

5.2.3 Wear clean personal protective equipment (PPE) and change PPE that could affect the samples between sampling points.

5.2.4 Ensure that all sampling equipment is calibrated and in good working condition.

5.2.5 Determine holding times prior to sampling. Samples should be collected and shipped so that the laboratory extractions and analyses can be performed within the holding times. Holding times begin when the sample is collected, not when the samples reach the laboratory.

5.2.6 Purge the monitoring well prior to ground-water sample collection using the procedures recommended in Guides D 6452 and D 6771.

5.2.7 Label sampling bottles in a consistent manner. Ensure that the integrity of the labels will be maintained until the samples are analyzed.

5.2.8 Collect samples in the order prescribed in the SAP. The SAP may specify the order of filling containers at each well and may also specify in what order to sample the wells. If not specified, if there is some knowledge of the ground-water chemistry it is generally a good procedure to sample wells from the least to the most contaminated to minimize possible cross-contamination.

5.2.9 Follow the field filtration and preservation procedures outlined in Guide D 6564. Filtration and preservation should be performed the same way for each sample and for each sampling event.

5.2.10 Follow decontamination procedures specified in the SAP and in Guide D 5088.

5.2.11 Document collected samples on the appropriate chain of custody forms and any other forms required by the shipper or laboratory. Before a group of samples is shipped, make copies of all forms in case any of the forms are lost or damaged.

6. Keywords

6.1 ground-water sampling; quality assurance; sampling and analysis plan