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Standard Guide for Field Quality Assurance in a Groundwater Sampling Event¹

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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 groundwater 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 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, health, and environmental practices and 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.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

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 Groundwater and Vadose Zone Investigations.

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2. Referenced Documents

2.1 ASTM Standards:²

- D653 Terminology Relating to Soil, Rock, and Contained Fluids
- D3740 Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
- D5088 Practice for Decontamination of Field Equipment Used at Waste Sites
- D5608 Practices for Decontamination of Sampling and Non Sample Contacting Equipment Used at Low Level Radioactive Waste Sites
- D5903 Guide for Planning and Preparing for a Groundwater Sampling Event
- D6089 Guide for Documenting a Groundwater Sampling Event
- D6452 Guide for Purging Methods for Wells Used for Ground Water Quality Investigations
- D6517 Guide for Field Preservation of Ground Water Samples
- D6564 Guide for Field Filtration of Groundwater Samples
- D6771 Practice for Low-Flow Purging and Sampling Used for Groundwater Monitoring
- D7929 Guide for Selection of Passive Techniques for Sampling Groundwater Monitoring Wells

3. Terminology

3.1 *Definitions*—For definitions of terms used in this specification, refer to Terminology D653.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 Information on the purposes of the various QA samples is provided in Section 5.

3.2.2 *equipment blank or rinsate blank, n*—deionized water that is passed sequentially through each component of the equipment system used for collecting and processing the environmental samples.

3.2.3 *field blank or ambient blank, n*—laboratory water that is exposed to the same environmental conditions as the samples.

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.

*A Summary of Changes section appears at the end of this standard

3.2.3.1 *Discussion*—Both terms are used by different entities and are included here for completeness.

3.2.4 *field duplicates*, *n*—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.

3.2.5 *field split samples*, *n*—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.

3.2.6 *matrix spike*, *n*—a groundwater sample to which a spike solution of known concentrations of selected analytes is added either in the field or in the laboratory.

3.2.7 *microbiological blank or sterile container blank*, *n*—deionized water in a sterile container that is taken to the field and opened prior to being shipped to the laboratory with the other groundwater samples.

3.2.8 *quality assurance (QA)*, *n*—actions taken to increase the likelihood that standards and procedures are adhered to and that delivered products or services meet performance requirements (reference 1).

3.2.9 *temperature blank or temperature control*, *n*—containerized water that is kept with the samples from the time of collection until the samples are refrigerated at the laboratory.

3.2.9.1 *Discussion*—Both terms are used by different entities and are included here for completeness.

3.2.10 *trip blank or travel blank*, *n*—laboratory-grade water that is poured into the sample bottle at the laboratory prior to the sampling event and remains unopened as it travels with the sample containers to the field and is stored and shipped with the samples.

3.2.10.1 *Discussion*—Both terms are used by different entities and are included here for completeness.

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 defensible 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 groundwater sampling.

NOTE 1—The quality of the results produced by this standard is dependent on the competence of personnel performing it, and the suitability of the equipment and facilities used. Agencies that meet the criteria of Practice D3740 are generally considered capable of competent and objective testing/sampling/inspection/etc. Users of this standard are cautioned that compliance with Practice D3740 does not in itself assure reliable results. Reliable results depend on many factors; Practice D3740 provides a means of evaluating some of those factors.

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 groundwater samples and the associated QA groundwater 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 groundwater 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*—The field or ambient blank is a sample consisting of laboratory-supplied water that is intended to mimic as closely as is practical the sample-collection (see 5.1) and environmental conditions as the actual groundwater samples. Field/ambient blanks are typically collected by pouring the laboratory-supplied water into the same types of sample containers used for collecting the groundwater samples (and with the same preservatives), not maintaining it in the original laboratory container used for transport of the water.

5.1.4 *Equipment Blank or Rinsate Blank*—This type of QA sample is a container of laboratory-supplied water that is passed through each piece of sampling equipment after it has been decontaminated and directly placed into sample containers that are the same as those being used in the monitoring event. The number of equipment blanks is determined by the types and amount of sampling equipment used in the groundwater 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-supplied water with preservatives as required. The blanks are not unsealed until they are ready to be