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EAST AFRICAN STANDARD

Standard guide for set of data elements to describe a ground-water site — Part 1: Additional identification descriptors

EAST AFRICAN COMMUNITY

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".

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Introduction

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

ASTM D5408:1993(2004), *Standard guide for set of data elements to describe a ground-water site — Part 1: Additional identification descriptors*

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

Draft for comments only — Not to be cited as East African Standard



Standard Guide for Set of Data Elements to Describe a Ground-Water Site; Part One—Additional Identification Descriptors¹

This standard is issued under the fixed designation D 5408; 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 Part One of three guides to be used in conjunction with Practice D 5254 that delineates the data desirable to describe a ground-water data collection or sampling site. This guide describes additional information beyond the minimum set of data elements that may be needed to identify a ground-water site. Part Two identifies physical descriptors, such as construction, for a site, while Part Three identifies usage descriptors, such as monitoring, for an individual ground-water site.

NOTE 1—A ground-water site is defined as any source, location, or sampling station capable of producing water or hydrologic data from a natural stratum from below the surface of the earth. A source or facility can include a well, spring or seep, and drain or tunnel (nearly horizontal in orientation). Other sources, such as excavations, driven devices, bore holes, ponds, lakes, and sinkholes, that can be shown to be hydraulically connected to the ground water, are appropriate for the use intended.

NOTE 2—Part Two (Guide D 5409) includes individual site characteristic descriptors (7 data elements), construction descriptors (56 data elements), lift descriptors (16 data elements), geologic descriptors (26 data elements), hydraulic descriptors (20 data elements), and spring descriptors (11 data elements). Part Three (Guide D 5410) includes monitoring descriptors (77 data elements), irrigation descriptors (4 data elements), waste site descriptors (9 data elements), and decommissioning descriptors (8 data elements). For a list of descriptors in this guide, see Section 4.

1.2 These data elements are described in terms used by ground-water hydrologists. Standard references, such as the Glossary of Geology and various hydrogeologic professional publications, are used to determine these definitions. Many of the suggested elements and their representative codes are those established by the Water Resources Division of the U.S. Geological Survey and used in the National Water Information Systems computerized data base (1-9).²

NOTE 3—The purpose of this guide is to suggest data elements that can be collected for ground-water sites. This does not uniquely imply a computer data base, but rather data elements for entry into any type of permanent file.

NOTE 4—Component and code lists given with some of the data elements, for example “Format of Other Data,” are only suggestions. These lists can be modified, expanded, or reduced for the purpose intended by the company or agency maintaining the ground-water data file.

NOTE 5—Use of trade names in this guide is for identification purposes only and does not constitute endorsement by ASTM.

1.3 This guide includes the data elements desirable to identify a ground-water site beyond those given in the “Minimum Set of Data Elements.” Some examples of the data elements are map identification, permitting facts, and supporting information. No single site will need every data element, for example, many ground-water sites do not need the data elements described in the legal record group. Each record (group of related data elements) for a site has mandatory data elements, such as the date for the ownership record. However, these elements are considered necessary only when that specific record is gathered for the site.

1.4 The values stated in inch-pound units are to be regarded as the standard. The SI units given in parentheses are for information only.

1.5 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This guide offers an organized collection of information or a series of options and does not recommend a specific course of action. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this guide may be 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 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. Originally approved in 1993. Last previous edition approved in 1998 as D 5408 - 93 (1998).

² The boldface numbers in parentheses refer to a list of references at the end of the text.

2. Referenced Documents

- 2.1 *ASTM Standards:*³
- D 653 Terminology Relating to Soil, Rock, and Contained Fluids
- D 5254 Practice for Minimum Set of Data Elements to Identify a Ground-Water Site
- D 5409 Guide for Set of Data Elements to Describe a Ground-Water Site; Part Two—Physical Descriptors
- D 5410 Guide for Set of Data Elements to Describe a Ground-Water Site; Part Three—Usage Descriptors

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms applicable to this guide, see Terminology D 653.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *code*—a suggested abbreviation for a component, for example, “F” is the code suggested for the “Files (Raw Data)” component of data element “Format of Other Data.”

3.2.2 *component*—a subdivision of a data element, for example, “Files (Raw Data)” is one of four components suggested for data element “Format of Other Data.”

3.2.3 *data element*—an individual segment of information about a ground-water site, for example, “Format of Other Data.” The data element is in the “Other Data Record” record.

3.2.4 *record*—a set of related data elements that may need to be repeated to fully describe a ground-water site. For example, a ground-water site that has a series of separate data files will need more than one “Other Data Record” record (the record includes data elements, other data type, other data location, and format of other data) to fully document the history of the site. However, if only a single separate data file exists for the well, the record is utilized once.

3.2.5 *record group*—a set of related records. For example, the “Supporting Information Record Group” includes the owner record, site visits record, other identification record, other data record, and remarks record. Some record groups consist of only one record, for example, the “Legal Record Group” includes only the legal record.

4. Summary of Guide

4.1 This guide includes the following additional identification descriptor data elements to describe a ground-water site. The universal element accompanies any data element requiring a confidence classification. Single elements usually need one entry for a site, while repeated elements commonly require several records to fully describe the conditions and history of the site:

- Universal Element
- Data Confidence Classification
- Single Elements
- Geographic Location:
 - Land-Net Location
 - Location Map

- Map Scale
- Method Altitude Determined
- Political Regimes
- Congressional District
- Source Identifiers:
 - Mean Greenwich Time Offset
 - Site Reference in Report
 - Site in a Computer Data Base
 - Photography/Sketch Available of Site
- Repeated Elements
- Legal Record Group:
 - Legal Record:
 - Permitting Agency
- Priority Date
- Application Number
- Application Date
- Certification Number
- Certification Date
- Permit Number
- Permit Date
- Water Allocation
- Supporting Information Record Group
 - Owner Record:
 - Date of Ownership
 - Owner's Name
 - Site Visits Record:
 - Date of Visit
 - Person Who Made Visit
 - Purpose of Visit
 - Other Identification Record:
 - Other Name, Number, or Identification
 - Assigner
 - Other Data Record:
 - Other Data Type
 - Other Data Location
 - Format of Other Data
- Remarks Record:
 - Remark Date
 - Remark
 - Remark Source

5. Significance and Use

5.1 Data at ground-water sites are gathered for many purposes, each of which generally requires a specific set of data elements. For example, when ground-water quality is a concern, not only are the minimum set of data elements required for the site, but information concerning the sample collection depth interval, method of collection, and date and time of collection are needed to fully qualify the data. Another group of elements are recommended for each use of the data, such as aquifer characteristics or water-level records. Normally the more information that is gathered about a site by field personnel, the easier it is to understand the ground-water conditions and to reach valid conclusions and interpretations regarding the site.

5.2 The data elements listed in this guide and Guides D 5409 and D 5410 should assist in planning what information can be gathered for a ground-water site and how to document these data.

NOTE 6—Some important data elements may change during the existence of a site. For example, the elevation of the measuring point used for the measurement of water levels may be modified because of repair or replacement of equipment. This frequently occurs when the measuring point is an opening in the pump and the pump is modified or replaced. Because changes cannot always be anticipated, it is preferable to reference the height of the measuring point to a nearby, permanent altitude datum. The measuring point is referenced by being the same altitude (zero correction) or above (negative correction) or below (plus correction) the altitude datum. All appropriate measurements should be corrected in

³ 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.

reference to the altitude datum before entry into the permanent record. Care must be exercised to keep the relationship of these data elements consistent throughout the duration of the site.

5.3 Some data elements have an extensive list of components. For example, the aquifer identification list described in Guide D 5409, has over 5000 components. Lengthy lists of possible components are not included in this guide, however, information on where to obtain these components is included with the specific data element.

NOTE 7—This guide identifies many sources, lists, etc., of information required to completely document information about any ground-water site.

6. Documentation of Universal Element

6.1 For any element that requires a Confidence Classification, document the data confidence classification for that specified critical data element for the ground-water site. Field-measured or laboratory-determined values have varying degrees of accuracy depending upon the methods used to obtain the information. This subjective or judged confidence should be documented for each measured data element by the agency or company that gathered or recorded the information, or both. Suggested components for the data confidence classification and representative codes are as follows:

- A—Value is accurate to within the tolerance of the measurement instrument.
- I—Value is judged to be inaccurate due to improper instrumentation or bias instrumentation or laboratory methods.
- N—Not verified, value was obtained from another source and due to the nature of the data, cannot be verified.

NOTE 8—At a minimum, it is important, and often sufficient, that data be classified subjectively by experienced professionals. It is not always possible or necessary to objectively quantify the confidence that a data user might have in a data value, but a professional classification can be useful. For the purposes of the three guides, the word confidence refers to a subjective professional judgment on data accuracy as represented by the three data confidence classification components, and does not imply the more rigorous confidence limits or interval as used by statisticians.

NOTE 9—A critical data element is one that the value can be field measured or laboratory determined with an instrument that has a statistically resolved degree of precision. Many data elements gathered for ground-water sites require no accompanying confidence classification, for example, owner's name, location map, type of lift, etc. Each data element that generally requires an accompanying confidence classification will be so noted in these guides.

7. Documentation of Miscellaneous Singular Data Elements

7.1 *Introduction*—A vast number of data elements can be documented about a ground-water site to thoroughly describe its location, physical features, relationship to other features on the earth's surface, and to designate what information is gathered at the site. These data elements typically are transcribed once for a site, in contrast to data elements that may be repetitive, such as water levels. Many of these data are extremely valuable in the characterization of sites that fall into certain categories, for example wells, for which the location map is an essential element to assist in properly positioning the well.

7.2 Geographic Location:

7.2.1 *Land-Net Location*—In addition to the locational data required by the minimum set of data elements, land-net

location may be a general land office description of the site's position on the surface of the earth. This description is used in many parts of the United States to subdivide the land into sections, townships, and ranges for the purpose of governmental administration and originally was used (beginning in 1786) as a systematic method for the disposal of unoccupied land (10). An abbreviated form of this description is used by many water agencies, in the many parts of the country, as the primary method of systematically cataloging ground-water sites. The method allows for the location of sites to a minimum of a 2½-acre (one hectare) tract (¼th of a section) within a specified section, township, range, and meridian. The meridian designation must be included to denote where the township and range are located in the National grid system. An example of a 2½-acre (one hectare) location is "Northeast ¼ of the Southeast ¼ of the Northwest ¼ of the Southwest ¼, Section 22, Township 45 South, Range 87 West, Boise meridian." This location is usually abbreviated to a form similar to "NESEN-WSW Sec. 22, T45S, R87W B." A number of formats comparable to this abbreviation have been established by the various agencies that use the system, however, they basically communicate the same results (5, 6, 11, 12).

NOTE 10—The accuracy of this location method for the minimum 2½-acre (one hectare) area is about 230 ft (70.104 m), that corresponds to between 2 and 3 s of latitude or longitude. Surveying errors are common in the original measurements. See FIPS PUB 70-1.⁴

NOTE 11—To supplement the description of the location of a ground-water site, a common method used is to draw a sketch showing the relationship of the site to other features in the immediate area, such as roads, buildings, etc. In addition, a sketch of the measuring point can assist in defining its exact location at the site. Photographs of the site and measuring point commonly are used as a part of the description.

7.2.2 *Location Map*—The location map name that is documented is that or the best available map of the area where the site is located. Much of the United States is covered by U.S. Geological Survey (USGS) topographic quadrangles. However, for those areas without USGS maps, the name of the map that shows the site's location should be documented. In addition, record the map's source, such as county highway or Army Map Service. The availability and identification of the USGS maps are given on individual State topographic map indexes. These indexes and the individual topographic maps can be obtained from USGS Public Inquires Office (5, 9, 13).⁵

NOTE 12—Many mapped areas are available on a computer-stored Geographical Information System (GIS). Document information required to identify and obtain the GIS map of the area where the site is located.

7.2.3 *Map Scale*—Document the scale of the map that is used to locate the site. This value helps to define the accuracy of the site location data (5).

NOTE 13—The map scale is the ratio between the linear distance on a map and the corresponding distance on the surface being mapped. For example, 1 in. = 1 mile (1 mm = 1 m) or the equivalent 1:63 360, are ways

⁴ FIPS PUB 70-1, *Representation of Geographic Point Locations for Information Interchange*, is available from National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161.

⁵ Public Inquires Office, U.S. Geological Survey, 503 National Center, Room 1-C-402, 12201 Sunrise Valley Drive, Reston, VA 22092.

of expressing the same ratio.

7.2.4 *Method Altitude Determined*—Document the method used to determine the altitude of the reference datum at the ground-water site. Suggested method altitude determined components and representative codes are as follows (5):

- A—Altimeter,
- L—Level or other surveying method,
- M—Interpolated from topographic map, and
- Z—Other, explain (for example, historical local datum).

7.3 *Political Regimes*—Document the political regime (for example, Congressional district) where the site is physically located. The date of documentation should be included because of changes that are commonly made in the boundaries of the districts. This allows for determining the legislative responsibility of the site. A guide to these districts is defined in FIPS PUB 9-1 (14).⁶

NOTE 14—Congressional district boundaries can be modified over time because of population changes. Care must be exercised in using this data element to ensure that the ground-water site is still in the originally assigned District.

7.4 *Source Identifiers:*

7.4.1 *Mean Greenwich Time Offset*—Much of the data collected at a ground-water site is time related, such as water-level measurements or water-quality samples. Document, where applicable, the mean Greenwich time offset or United States time zone of the site, so that the time-dimension can be reduced to a common denominator.

7.4.2 *Site Referenced in Report*—If this site has been used or is referenced in a report, document the data concerning the published or unpublished report(s) and, if available, the identification of the report and the address of where to obtain a copy.

7.4.3 *Site in a Computer Data Base*—Document whether or not the information concerning the site has been entered into a computer data base and, if in a data base, the location. Show the data base management system (DBMS) used to organize the data base, for example, “INGRES,” a relational DBMS. Give the name assigned to the data base containing the site, for example, “WATSTORE,” the U.S. Geological Survey water data base.

7.4.4 *Photography/Sketch Available of Site*—Document the existence of a photograph or sketch of the site, or both. Photographs and sketches of the site and associated facility, including the measuring point, are valuable pictorial material to enhance the site description.

NOTE 15—An example of a form (see Fig. 1) for documenting the data elements as described under “Miscellaneous Singular Data Elements” is illustrated here to show a method of design for this tool. These forms are commonly known as field forms or as coding forms (for computer entry). This type of form is routinely used for transcribing field data while at the ground-water site and entering non-field information at the agency’s or company’s office. It should be noted that each form has the site identification (primary identification as used by the agency or company), date of field visit, and person that recorded the data as the first entries.

GROUND-WATER SITE MISCELLANEOUS SINGULAR DATA ELEMENTS	
Site Identification _____	Date Prepared _____
Prepared by _____ (Name)	
Geographic Location:	
Land-net Location _____	(U.S. General Land Office)
Location Map _____ (Name)	
Map Scale _____ (Ratio of Map to Land Surface Distance)	
Method Altitude Determined _____ (Altimeter, Surveyed, Interpolated, or Other)	
Political Regimes:	
Congressional District _____ (Name)	
_____ (Date)	
Source Identifiers:	
Mean Greenwich Time Offset _____ (Hour Offset or U.S. Time Zone)	
Site Used in Report _____ (Title)	
Site in a Computer Data Base _____ (Name)	
_____ (Location)	
Photograph or Sketch Available _____ (Identify)	

FIG. 1 Example Form

These three data items are mandatory to ensure correct filing of the information, either in cabinets or in a computer data base, and for quality control.

8. Documentation of Miscellaneous Repetitive Data Elements

8.1 Introduction:

8.1.1 Many of the ground-water elements require multiple records to completely describe a site. Time-related elements, such as water levels, discharge measurements, and water chemistry, may need hundreds or thousands of records for a period of many years to document measurements at a single site. These time-related data help to determine historical trends and serve to establish bench-mark standards for the site.

8.1.2 Other data elements that are not time related, such as casing, lengths, spring openings, and an array of geophysical logs, require a sequence of records to thoroughly describe the site. These data are extremely valuable in site characterization, for example, wells for which the construction components are essential to understand the source of the water.

8.2 Legal Record Group:

8.2.1 *Legal Record*—The legal record includes information about any regulatory agencies or authorities, such as for establishment of the right-to-use water and the amount of water allocated for use at a ground-water site. This legal record is normally administered by a government agency or government authorized agency (for example, ground-water management district or health department) within the specific state. Some states use the method of permitting to assemble site records.

8.2.1.1 *Permitting Agency*—If applicable, document the name and address of the agency that is responsible for issuing the permit for the legal development of water at the site.

8.2.1.2 *Priority Date*— If applicable, document the date, in year, month, and day (YYYYMMDD), that establishes the legal priority for use of water at the ground-water site. If necessary, show the time of day that the priority was authorized.

⁶ FIPS PUB 9-1, *Congressional Districts of the United States* is available from National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161.

8.2.1.3 *Application Number*—If applicable, document the number or identification assigned by the agency to the application for the permit.

8.2.1.4 *Application Date*—If applicable, document the application date, in year, month, and day (YYYYMMDD), for the ground-water site. If necessary, document the time of day.

8.2.1.5 *Certification Number*—If applicable, document the number or identification assigned by the agency to the certification credential.

8.2.1.6 *Certification Date*—If applicable, document the certification date, in year, month, and day (YYYYMMDD), for the ground-water site. If necessary, document the time of day.

8.2.1.7 *Permit Number*—If applicable, document the number or identification assigned by the agency to the permit for the use of water at the site.

8.2.1.8 *Permit Date*—If applicable, document the date, in year, month, and day (YYYYMMDD), the permit was issued for the ground-water site by the responsible agency. If necessary, document the time of day.

8.2.1.9 *Water Allocation*—If applicable, document the amount of water allocated by the permitting agency to the permit holder for the subject permit. Include the measurement unit utilized for the water allocation.

8.3 *Supporting Information Record Group:*

8.3.1 *Owner Record*—The owner’s record is used to document a history of ownership of the ground-water site. This record is important to aid in the proper identification of the site and to assign the responsibility for the facility. The following data elements are required to document the history of ownership (5).

8.3.1.1 *Date of Ownership*—If applicable, document the date, in year, month, and day (YYYYMMDD), that the owner acquired possession of the ground-water site.

8.3.1.2 *Owner’s Name*—Document the name of the owner and owner’s address that corresponds with the date of ownership for the event record.

8.3.2 *Site Visits Record*—The sites visits record is used to document data collection, verification, and quality-control visits to the ground-water site. The following data elements are required to document the history of these site visits (5).

8.3.2.1 *Date of Visit*—If applicable, document the date, in year, month, and day (YYYYMMDD), that the site was visited. If necessary, document the time of day.

8.3.2.2 *Person Who Made Visit*—If applicable, document the name, title, and address of person who made the visit to the ground-water site for the record event.

8.3.2.3 *Purpose of Visit*—If applicable, document a description of the purpose of the visit to the ground-water site.

8.3.3 *Other Identification Record*—Many ground-water sites have more than one identification. These identifiers can be assigned by a company, state agency, or federal agency to conform with an internal file system. To aid in the tracking of data for a site, the following data elements may be required (5).

8.3.3.1 *Other Name, Number, or Identification*—If applicable, document the ground-water site identification that was assigned by the other company or agency.

8.3.3.2 *Assigner*—Document the name and address of the person, company, or agency that assigned the other identification for this event record.

8.3.4 *Other Data Record*—The other data available record is used to indicate the availability of additional data pertinent to the ground-water site. Many sites have detailed information, such as continuous water-level recorder charts, geophysical logs, detailed geological logs, and extensive water-quality analyses, that may not be filed at a central location. These data are valuable in understanding conditions at the site (5).

8.3.4.1 *Other Data Type*—If applicable, describe the type of other data available for the ground-water site.

8.3.4.2 *Other Data Location*—If applicable, document the location of the other data for the ground-water site. The complete name and address of the holder of the data should be documented.

8.3.4.3 *Format of Other Data*—If applicable, document the format of the other data available. Suggested other data available components and representative codes are as follows

- F—Files (raw data),
- M—Machine readable (computer),
- P—Published (report or basic-data release), and
- Z—Other (describe).

8.3.5 *Remarks Record*—The remarks record is used for documenting meaningful information about the site for which no specific data elements are defined (5).

8.3.5.1 *Remark Date*—If applicable, document the date, in year, month, and day (YYYYMMDD), of the origin of the remark.

8.3.5.2 *Remark*—If applicable, document information concerning the site that does not conform to any of the data elements that are listed in these guides.

8.3.5.3 *Remark Source*—Document the name and address of the person, company, or agency that wrote the remark for this event record.

9. Keywords

9.1 data confidence classification; data element; ground water; monitoring location; sampling site; site identification; site location; water allocation; water quality

REFERENCES

- (1) Bates, R. L., and Jackson, J. A., *Glossary of Geology*, Third Edition, American Geological Institute, Alexandria, Virginia, 1987.
- (2) Bureau of Reclamation, *Ground-Water Manual, A Water Resources Technical Publication*, Revised Reprint, U.S. Department of Interior, Bureau of Reclamation, Washington, DC, 1981.
- (3) Campbell, M. D., and Lehr, J. H., *Water Well Technology*, McGraw-Hill, New York, NY, 1973.
- (4) Heath, R. C., *Basic Ground-Water Hydrology, U.S. Geological Survey Water-Supply Paper 2220*, 1983.
- (5) Mathey, S. B., Editor, *National Water Information System User's Manual*, Vol 2, Chapter 4, Ground-Water Site Inventory System, U.S. Geological Survey, Open-File Report 89-587, 1990.
- (6) Texas Natural Resources Information System, *Ground-Water Data INTERFACE, Users Reference Manual*, Texas Natural Resources Information System, Nov. 20, 1986.
- (7) U.S. Environmental Protection Agency, *Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells*, Office of Research and Development, U.S. Environmental Protection Agency, March 1991, Washington, DC, 1991.
- (8) U.S. Geological Survey, *National Handbook of Recommended Methods for Water-Data Acquisition*, Chapter 2—Ground Water, Office of Data Coordination, Reston, Virginia, 1980, pp. 2-1 to 2-149.
- (9) van der Leedan, F., Troise, F. L., and Todd, D. K., 1990, *The Water Encyclopedia*, Geraghty and Miller Ground-Water Series, 2nd Edition, Third Printing, Lewis Publishers, Inc., Chelsea, Michigan, 1991.
- (10) Stewart, L. O., *Public Land Survey*, Iowa State University Press, Ames, Iowa, 1936.
- (11) Morgan, C. O., and McNellis, J. M., *FORTRAN IV Program KANS, for the Conversion of General Land Office Locations to Latitude and Longitude Coordinates*, Kansas State Geological Survey Special Distribution Publication 42, 1969.
- (12) U.S. Department of Commerce, *Representation of Geographic Point Locations for Information Interchange*, Federal Information Standards (FIPS) Publication 70-1, National Institute for Standards and Technology, Washington, DC, June 23, 1986.
- (13) U.S. Geological Survey, *Guide to Obtaining USGS Information*, U.S. Geological Survey Circular 900, 1989.
- (14) U.S. Department of Commerce, *Congressional Districts of the United States*, Federal Information Standards (FIPS) Publication 9-1, National Institute for Standards and Technology, Washington, DC, Nov. 30, 1990.

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