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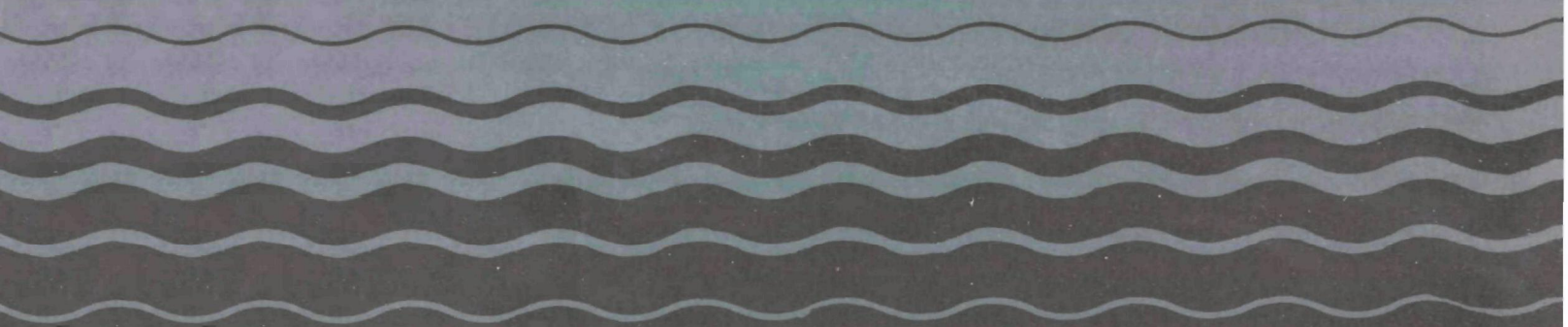
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Office of Water



EPA Workshop to Recommend A Minimum Set of Data Elements for Ground Water

Workshop Findings Report



**EPA WORKSHOP TO RECOMMEND
A MINIMUM SET OF DATA ELEMENTS
FOR GROUND WATER**

WORKSHOP FINDINGS REPORT

**Office of Ground-Water Protection
Office of Water
U.S. Environmental Protection Agency**

**Washington, D.C.
August, 1988**

PREFACE

This document summarizes the results of a workshop held in Washington, D.C. on June 6-8, 1988.

The Environmental Protection Agency sponsored the workshop and wishes to extend its appreciation to the individuals who attended the workshop and the organizations they represent. A list of who participated in the workshop is included in this report.

The Agency personnel responsible for planning and overseeing the workshop were Ms. Marian Mlay, Dr. Norbert Dee, and Caryle Miller of the Office of Ground-Water Protection.

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EXECUTIVE SUMMARY

Background

The Ground-Water Data Requirements Analysis which was completed in April of 1987 recommended actions be taken to improve EPA's capabilities in three critical areas: data management standards, policy, and guidance; data access and automation; and data analysis. Because data management standards are the fundamental building blocks necessary for use and sharing of ground-water data to make more informed decisions, one of the Office of Ground-Water Protection's initial efforts was to begin the development of these standards. The first step in this process is the identification and agreement within the Agency on a minimum set of data elements to be used in ground-water data collection. Once the minimum set of data elements has been selected the development of appropriate standards, formats, and policy can follow.

The project to develop a minimum set of data elements was initiated in the fall of 1987. A Work Group consisting of representatives from EPA program offices, States, Regions, and other Federal Agencies was formed to provide information on current practices concerning the use of ground-water data elements, and to recommend to EPA a minimum set for ground-water data. The Work Group recommendations for this minimum set are provided in this report.

Definition and Purpose

The minimum set of data elements is defined as those elements necessary to use data from wells and springs across ground-water related programs. It is the common set of elements which forms the basis for making ground-water decisions. Individual programs can, however, add elements to this base to meet their special program needs.

In addition, this minimum set is characterized by elements that:

- o Are needed to communicate ground-water data across programs,
- o Are common to all programs, but completely adequate for some programs,
- o Provide a road map to other data, and
- o Provide a link between water quality and well location information.

The Work Group successfully reached consensus on a minimum set of data elements for ground water, as follows:

- Latitude
- Longitude
- Method of Measure for Latitude/Longitude
- Source Agency for Latitude/Longitude Data
- State FIPS Code
- County FIPS Code
- Altitude
- Unique Well/Spring and Facility ID
- Use of Well
- Depth of Well at Completion
- Depth to Top of Open Interval
- Depth to Bottom of Open Interval
- Location of Log
- Type of Log
- Source Agency for Sample Data
- Sample Date
- Parameter Measured
- Concentration/Value (in standard units)
- Confidence Factor (including field and lab quality assurance)
- Sample ID
- Depth to Water
- Measurement Quantification

A number of implementation issues were identified by the Work Group that would need to be resolved if a decision to implement the minimum set of data elements were made by the EPA, including:

- o The need for EPA to determine the degree of commitment within the Agency and how it would be implemented across EPA programs,
- o The need for the commitment and cooperation of all other relevant Federal agencies to ensure the collection of a minimum set of data elements for ground water,
- o The need to develop as soon as possible a data dictionary containing definitions of the elements. Early development of the dictionary would increase the probability of its incorporation into many data management systems currently under development,
- o The need to develop a common format for key minimum data elements to compensate for the present lack of data standardization, and

- o The need to establish links among key ground-water data systems which would allow data managers to store data locally but easily transfer data among systems.

TABLE OF CONTENTS

	<u>Page</u>
I. INTRODUCTION AND WORKSHOP BACKGROUND	1
II. HOW THE WORKSHOP WAS CONDUCTED	2
III. FINDINGS RELATED TO THE MINIMUM SET OF DATA ELEMENTS FOR GROUND WATER	3
A. Organization of Discussion Topics	3
B. Workshop Results on the Selection of a Minimum Set of Data Elements	3
C. Minimum Set of Data Elements Discussion Highlights	4
D. Reaching Consensus on a Minimum Set of Data Elements	7
IV. FINDINGS RELATED TO PROGRAMMATIC AND TECHNICAL ISSUES CONCERNING IMPLEMENTATION OF THE MINIMUM SET OF DATA ELEMENTS	9
A. Results of Session A: Programmatic, Organiza- tional Issues Associated with Deciding Whether to Implement the Minimum Set	9
B. Results of Session B: Technical Implementation Issues	10
C. Specific Implementation Suggestions	11
D. Final Review of Minimum Set of Data Elements ..	12
APPENDIX A: Workshop Attendees	
APPENDIX B: Preliminary List of Data Elements for a Minimum Set	
APPENDIX C: Statements of Meaning for Elements in Recommended Minimum Set of Data Elements	

**MINIMUM SET OF DATA ELEMENTS FOR GROUND WATER:
WORKSHOP FINDINGS REPORT**

I. INTRODUCTION AND WORKSHOP BACKGROUND

The protection of our nation's ground-water resources is receiving widespread attention at all levels of government; accurate and accessible ground-water data are essential to the effective protection and management of these valuable resources. As part of the continuing implementation of the Environmental Protection Agency's (EPA) Ground-Water Protection Strategy and Ground-Water Monitoring Strategy, a Ground-Water Data Requirements Analysis was completed in 1987. An issue consistently identified during the conduct of the requirements analysis was the need to improve access to ground-water data.

In response to this issue, EPA's Office of Ground-Water Protection has been engaged in an ongoing project to identify the tools and mechanisms necessary to provide access to ground-water data across offices and programs -- at both the State and Federal level -- and to improve the consistency of the data collected. In the fall of 1987, a Work Group consisting of representatives from EPA program offices, States, Regions, and other Federal agencies was formed to provide information on current practices concerning the use of ground-water data elements, and to recommend to EPA a minimum set of data elements for ground water. To facilitate the Work Group's efforts, EPA conducted a workshop to discuss development of a minimum set of data elements for ground water. The specific goals of the workshop, as stated to the workshop participants, were:

- To achieve consensus on a minimum set of data elements that would facilitate the collection and sharing of ground-water and related data across agencies.
- To identify implementation issues that must be resolved to encourage collection of a minimum set of data elements throughout the ground-water community.

Work Group members who participated in the workshop (see Appendix A, list of Workshop Attendees), were asked to represent not only the specific interests of their particular State or Federal organization, but to reflect the interests of the broader community of ground-water related programs and agencies. The workshop, held in Washington, D.C., from June 6, 1988 through June 8, 1988, concluded the Work Group's activities.

II. HOW THE WORKSHOP WAS CONDUCTED

EPA selected a workshop structure which would maximize the interaction of the diverse perspectives represented at the workshop. Work Group members were divided into small "work groups" designed to generate detailed discussion on workshop issues and provide EPA with the benefit of their experience in ground-water data management. Briefly, the workshop consisted of several key parts:

- **Plenary Session** -- All attendees were convened in an opening plenary session to clarify the principal issues presented in the workshop background materials (i.e., discussion guide, dictionary of elements, resource book) and to prepare the workshop participants for the detailed discussions to be held in the work groups.
- **Work Group Sessions** -- Workshop participants were divided into four broadly representative work groups. Led by a team leader from each group, work group discussions focused on a series of topics related to the composition and implementation of a minimum set of data elements for ground water.
- **Brief Reports of the Work Groups** -- At the conclusion of each of the work group sessions, each work group presented a brief oral report to the plenary session on the conclusions they reached.
- **Team Leaders Meeting** -- The team leaders from the four work groups developed a tentative proposal for a minimum set of data elements for ground water during a facilitated working lunch, which was then presented to the entire group for its review.
- **Review of Tentative Minimum Set of Data Elements for Ground Water** -- A plenary session was held to discuss and make additions to or deletions from the minimum set of data elements proposed by work group team leaders.
- **Review of Minimum Set of Data Elements Programmatic and Technical Implementation Issues** -- Work group and plenary sessions were held to discuss minimum set of data elements programmatic and technical implementation issues.
- **Final Discussion** -- A last plenary session of the workshop was held to provide a forum for summary comments on ideas raised during the workshop.

III. FINDINGS RELATED TO THE MINIMUM SET OF DATA ELEMENTS FOR GROUND WATER

Workshop participants successfully developed consensus on a minimum set of data elements for ground water. This section of the workshop findings report:

- Documents the organizational structure used to discuss the minimum set of data elements;
- Summarizes the results of the minimum set of data elements selection process; and
- Highlights the key issues considered in the plenary sessions on this topic.

A. Organization of Discussion Topics

Each work group was provided with a preliminary list of data elements for a minimum set (see Appendix B) to serve as a basis for discussion. The list reflected months of meetings and interviews with State and Federal officials as well as items requested by Work Group members. To facilitate consideration of the list, the ground-water data elements were divided into four general descriptor groups:

- **Geographic Descriptors** -- Those elements that describe a place, a region, an area, or a point in relation to the earth's surface.
- **Well/Spring Descriptors** -- Those elements that describe various features of a well or spring.
- **Sample/Analysis Descriptors** -- Those elements that describe different aspects of obtaining or analyzing a sample.
- **Hydrogeologic Descriptors** -- Those elements that provide information on characteristics such as geologic structure and topography.

B. Workshop Results on the Selection of A Minimum Set of Data Elements

Workshop participants believed that it was important to define what they meant by a minimum set of data elements in order for that set to have meaning. The participants agreed that the set would be characterized by elements that:

- Are needed to communicate ground-water data across programs;
- Are common to all programs, but completely adequate for some programs;

- Provide a road map to other data; and
- Provide a link between water quality and well location information.

The participants also agreed to define a minimum set of data elements as: **The elements necessary to use data from wells and springs across ground-water related programs.** The focus of this definition is to make more informed ground-water decisions. Based on the above characteristics and definition, the workshop participants selected a list of data elements for inclusion in the minimum set of data elements for ground water. See Exhibit 1 on the following page for this list.

Subsequent to the workshop, the Office of Ground-Water Protection (OGWP) developed for this Workshop Findings Report statements of meaning for the minimum set of data elements. These statements, contained in Appendix C, are intended to clarify the general meaning of the data elements as discussed in the workshop. These statements of meaning are not intended, however, to constitute an actual "data dictionary," an implementation initiative suggested by workshop participants (see page 10).

C. Minimum Set of Data Elements Discussion Highlights

The workshop structure provided the opportunity for workshop participants to discuss their preferences and concerns regarding a minimum set of data elements in several plenary sessions. This section highlights the general concerns and conclusions expressed in those plenary sessions. The sessions are organized below in chronological order of their discussion.

Geographic Descriptors Plenary Session

- All work groups agreed that latitude and longitude should be included in the minimum set of data elements.
- Participants from States that traditionally use the Township, Range, Section, Quarter locational system asserted that this should also be included as a geographic descriptor, but most participants agreed this element was not universal enough to include in a minimum set of data elements.

EXHIBIT 1

**LIST OF MINIMUM SET OF DATA ELEMENTS FOR GROUND WATER
SELECTED BY WORKSHOP PARTICIPANTS**

Geographic Descriptors

- Latitude
- Longitude
- Method of Measure for Latitude/Longitude
- Source Agency for Latitude/Longitude Data
- State FIPS Code
- County FIPS Code
- Altitude

Well/Spring Descriptors

- Unique Well/Spring and Facility ID
- Use of Well
- Depth of Well at Completion
- Depth to Top of Open Interval
- Depth to Bottom of Open Interval
- Location of Log
- Type of Log

Sample/Analysis Descriptors

- Source Agency for Sample Data
- Sample Date
- Parameter Measured
- Concentration/Value (in standard units)
- Confidence Factor (including field and lab quality assurance)
- Sample ID
- Depth to Water
- Measurement Quantification

- Participants agreed that use of FIPS State and county codes in conjunction with the use of latitude and longitude serves as a good data quality assurance check.
- There was a general discussion about the possible use of zip codes to identify the location of a well or spring. It was determined that since zip codes can change, this would not be a useful locational data element.
- Participants from one work group suggested that a unique well number be used to identify all wells and springs in a State and that this number should also be associated with the other descriptor groups (i.e., well/spring descriptors, sample/analytic descriptors and hydrogeologic descriptors). This suggestion was reinforced throughout later sessions.

Well/Spring Descriptor Plenary Session

- There was no consensus among participants on the definitions for a variety of data elements, including depth of well, use of well, and depth to the top/bottom of open interval. As a consequence, many work group members recommended the development of a data dictionary to ensure that the data elements under consideration had a common definition
- Some participants believed that the use of aquifer code and hydrogeologic unit code could also be used as a good data quality check on the location of a well or spring. Others noted that for some sections of the country, like the Northwest, the aquifer is not easily identified.
- Participants noted that there can be many different types of logs associated with a given well and therefore the field in a data system for "location of log" and "type of log" should be a repeating field. Similarly, since there can be more than one opening in a single well, the field for "depth to top/bottom of open interval" should also be a repeating field.
- It was evident from the discussion that participants wanted as much well construction information as could reasonably be made available. There was, however, great difficulty in drawing the line defining how much data is appropriate for a minimum set of data elements. In the course of this discussion many participants noted that much construction information is available in the well log.

Hydrogeologic Descriptors and Sample/Analytic Descriptors Plenary Session

- Most participants agreed that although hydrogeologic descriptors were informative, they were not absolutely necessary and therefore should not be a part of the minimum set of data elements for ground water. If they were to be included, then only basic information or key words (e.g., location of study, type of study and abstract) would be necessary.
- Work groups noted again the essential need to establish a solid link between the sample and well. It was pointed out that USGS uses a combination of well number, sample date, and time to provide a unique sample identification number linking the water quality sample to the well.

D. Reaching Consensus on a Minimum Set of Data Elements

Team Leaders' Meeting

Prior to the next plenary session, work group team leaders met to develop a proposed minimum set of data elements for consideration by all workshop participants. In formulating this proposal, work group team leaders were asked to carefully consider all of the perspectives expressed in the workshop, and in particular, to represent the views of their respective work groups. To aid in the development of the tentative minimum set of data elements, the team leaders developed a working definition for that set, based on the workshop participants' discussion in previous sessions. Team leaders then examined each element and determined whether it met the definition of being a "necessary element to use data from wells and springs across ground-water related programs." Using this process, the team leaders developed a tentative minimum set of data elements to serve as a point of departure for the plenary discussion which followed.

Minimum Set of Data Elements Plenary Session

The recommended minimum set of data elements that appears in Exhibit 1 was agreed to by workshop participants after their review and modification of the tentative minimum set of data elements in the plenary session held after the team leaders' meeting. Highlights of this plenary session include the following:

- Many participants encouraged the inclusion of "Source Agency" in the required group of data elements. The

data managers in the workshop stated that an agency source code was essential to good data management. This recommendation was accepted by the group and Source Agency was included in the minimum set under geographic descriptors.

- Participants believed that a unique well or spring ID is an essential element for data use. While unable to define the specific nature of this identifier, participants felt strongly that without it, it would be difficult to tie locational data to water quality data.
- The definition of a minimum set of data elements is "The elements necessary to use data from wells and springs across ground-water related programs." The focus of this definition is to make more informed ground-water decisions. Some participants were concerned about the elements necessary for entry into a computer data base. This is not a minimum set for making decisions but a "gatekeeper" similar to a password for computer entry.¹
- Although many participants use or create hydrogeologic data, none of the descriptors in this category were considered absolutely necessary to use data from wells and springs across ground-water related programs. As a consequence, the hydrogeologic descriptor category was dropped from the minimum set of data elements.
- Participants discussed the difficulty of providing a unique well ID at sites with many wells. For example, the amount and location of monitoring wells at some sites change over time, making individual well identification difficult. Despite these difficulties, participants agreed the concept was important and identified two essential characteristics for a unique well ID: (1) the well ID should never change; and (2) the well ID should not be duplicated.
- There was a general discussion about geopositioning and the efforts by cartographers to better define the relationship between a real world physical location and its map location.

¹ Computer entry gatekeeper elements are: latitude, longitude, method of measure for latitude/longitude, source agency for latitude/longitude data, State FIPS code, county FIPS code, unique well/spring and facility ID, source agency for sampling data, sample date, parameter measured, concentration/value, and confidence factor.

IV. FINDINGS RELATED TO PROGRAMMATIC AND TECHNICAL ISSUES CONCERNING IMPLEMENTATION OF THE MINIMUM SET OF DATA ELEMENTS

After reaching tentative closure on a minimum set of data elements, participants were asked to consider issues that would affect its implementation. These issues were divided into two general topic areas and discussed in separate work group and plenary sessions. Session "A" was designed to discuss the broader programmatic, organizational, and resource issues associated with deciding whether to implement the minimum set of data elements. Session "B" was based on the assumption that EPA or another agency had reached an agreement to implement a minimum set of data elements (Session A). Therefore, Session B addressed the more day-to-day implementation issues such as: technical issues of collection, software access, coding, and other technical barriers to implementing a minimum set of data elements.

A. Results of Session A: Programmatic, Organizational and Resource Issues Associated with Deciding Whether to Implement the Minimum Set

Plenary presentations by work groups on this topic overlapped considerably, with most groups identifying a similar set of programmatic, organizational, and resource issues affecting the implementation of the minimum set of data elements. The issues presented by the work groups in this session, as summarized below, fell into two general categories: Federal commitment and education and training.

- **Federal Commitment** -- Workshop participants were concerned that without the commitment of all relevant Federal agencies, implementation of the minimum set of data elements would be difficult, if not impossible. To resolve this issue, participants suggested that EPA "lead by example" and demonstrate a commitment to implementation of the minimum set of data elements by implementing the set within its own programs. To further demonstrate Federal commitment, participants stated that EPA should cooperate with USGS and other Federal agencies (e.g., NOAA, USDA) to ensure collection and implementation of the minimum set of data elements at the Federal level.
- **Education and Training** -- Workshop participants discussed the issue of how to encourage agencies and others in the ground-water community to collect the minimum set of data elements. Participants agreed that one solution was to educate Federal, State, local government organizations, and others on the benefits of

the minimum set of data elements. They stated that education and training is a key to developing a spirit of cooperation and a clear recognition of the benefits accrued through the use of the minimum set of data elements.

B. Results of Session B: Technical Implementation Issues

Workshop participants were also given the opportunity in work groups and a plenary session to discuss the technical issues involved in the implementation of the minimum set of data elements if the decision were made by EPA or another agency to implement a minimum set of data elements (Session A). It was recognized that a number of implementation issues are affected by the practical, day-to-day factors involved in data collection, storage, and transmission. For example, ground-water data is frequently collected in a variety of forms using different definitions and codes. Because many States and programs are currently developing ground-water data management systems, workshop participants also stated that the timing of ground-water data management initiatives is critical, i.e., rapid implementation of a minimum set of data elements will increase the probability of its incorporation into many data management systems currently under development.

The workshop participants agreed that the first implementation issue that needed to be addressed after the decision to proceed had been made was the development of a data dictionary containing definitions of the elements in the minimum set of data elements for ground water. While there was some disagreement about whether the use of common codes and formats was necessary in every case, there was consensus on the need for development of a data dictionary as soon as possible.

In addition to the data dictionary, workshop participants commented on technical implementation issues in the areas of data standardization, data repositories, and organizational commitment, as summarized below.

- **Data Standardization** -- Workshop participants agreed that a lack of data standardization could hinder efforts to implement a minimum set of data elements. As mentioned above, participants agreed that the first step in data standardization should be the development of a data dictionary for the minimum set of data elements. Participants also highlighted the need for key minimum data elements, such as latitude/longitude, date, and altitude, to have a common format. Beyond this agreement, there were various opinions regarding the necessity of using common codes and formats for ground-

water data. Some believed that software conversion programs could remedy the problem of different codes. Others felt that common codes and formats were more important and should be developed and implemented.

- **Data Repositories** -- Participants noted that implementation of the minimum set of data elements may be hampered because there are few central storage locations for ground-water data and a general lack of automation of ground-water data. To improve the storage of ground-water data, some work groups suggested EPA should encourage the use of existing repositories, establish links among key ground-water data systems, and plan for the future consolidation or linkage of major ground-water data systems. It was also noted that a central repository for ground-water data was not required and may be unrealistic. Rather than use a central repository, participants emphasized that data managers could store data locally and employ standard communication protocols to transfer data among systems.
- **Organizational Commitment** -- As mentioned in Session A, workshop participants emphasized the need for EPA to implement the minimum set of data elements within its own programs and for USGS and EPA to obtain agreement on collection and use of the minimum set of data elements across their programs. Workshop participants noted, however, that the need for organizational commitment was not limited to the Federal and State arenas. They stated that professional organizations would also need to be involved in encouraging implementation of a minimum set of data elements. Participants suggested that organizations such as ASTM could be used to train its members and help disseminate information about the collection and use of the minimum set of data elements for ground water.

C. Specific Implementation Suggestions

Throughout the discussion of implementation issues, a number of specific implementation suggestions were agreed to by a majority of the participants which were not related specifically to a particular issue. These suggestions are listed below to provide examples of the types of initiatives that participants believed would facilitate implementation of a minimum set of data elements.

- Develop GIS capabilities applicable to ground-water data.
- Develop implementation guidance for the minimum set of data elements.

- Enhance STORET to incorporate the minimum set of data elements.
- Develop an index of ground-water data holdings in each State.
- Develop a pilot program or demonstration on the use of a well index using a unique well or spring ID in a State.

D. Final Review of Minimum Set of Data Elements

After discussing issues affecting implementation, workshop participants were given a final opportunity to review and modify the minimum set of data elements based on the implementation discussions. Although there was some discussion of whether specific elements in the set should be excluded or included if the minimum set of data elements were required, no additions or deletions were made to the set agreed to the previous day.

APPENDIX A
WORKSHOP ATTENDEES

WORKSHOP ATTENDEES

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APPENDIX B

PRELIMINARY LIST OF DATA ELEMENTS FOR A MINIMUM SET

PRELIMINARY LIST OF DATA ELEMENTS FOR A MINIMUM SET

GEOGRAPHIC DESCRIPTOR GROUP

- Latitude
- Longitude
- Method of Measure for Latitude/Longitude
- Confidence Code for Latitude/Longitude
- Altitude
- Method of Measure for Altitude
- Confidence Code for Altitude
- State FIPS Code
- County FIPS Code
- Township, Range, Section, Quarter*

WELL/SPRING DESCRIPTOR GROUP

- Unique Site Identifier
- Legal Contact: Name, Address, Telephone
- Date Well was Completed
- Construction Method
- Depth of Hole
- Depth to Top of Interval
- Depth to Bottom of Interval
- Depth to Top of Casing
- Depth to Bottom of Casing
- Type of Log
- Source of Log Data
- Location of Well Log
- Status of Well or Spring
- Use of Well or Spring
- Aquifer Code
- Hydrologic Unit
- Casing Material*
- Depth of Well*
- Source Agency*

SAMPLE/ANALYSIS DESCRIPTOR GROUP

- Unique Sample Identification Number
- Purpose of Sample
- Confidence Factor
- Date of Sample
- Time of Sample
- Method of Taking Sample
- Type of Sample
- Depth to Water
- Date Water Level Measured
- Method of Water Level Measurement

* Indicates elements that were added to the list by request of a workshop participant after reviewing the original list sent to participants prior to the workshop being held.

SAMPLE/ANALYSIS DESCRIPTOR GROUP (continued)

- Source of Water Level Data
- Laboratory Identification Number
- Method of Analysis
- Date of Analysis
- Type of Analysis
- Parameter Measured
- Concentration/Value
- Measurement Quantification
- Confidence Code for Parameter Analyzed
- Conductivity*
- pH*
- Suspected Origin of Constituent*

HYDROGEOLOGIC DESCRIPTOR GROUP

- Type of Hydrogeologic event (A hydrogeologic study is an example of a hydrogeologic event)
- Abstract of Hydrogeologic Event
- Location of Hydrogeologic Reports

* Indicates elements that were added to the list by request of a workshop participant after reviewing the original list sent to participants prior to the workshop being held.

APPENDIX C

STATEMENTS OF MEANING FOR ELEMENTS IN RECOMMENDED MINIMUM SET OF DATA ELEMENTS

STATEMENTS OF MEANING

The following statements of meaning are meant to provide some clarification as to possible definitions that will be developed for the elements in the Minimum Set of Data Elements.

Latitude

The angular distance north or south from the Earth's equator measured through 90 degrees. The length of a degree varies from 68.704 statute miles at the equator to 69.407 at the poles because of the flattened configuration of the Earth. The length of a second is approximately 100 feet. [USGS]

Longitude

The angular distance, measured in degrees, due east or west from the prime meridian that runs between the north and south poles and passes through Greenwich, England. The length of a degree varies from 69.65 statute miles at the Equator to zero miles at the poles. The length of a second is a little over 100 feet at the equator and about 78 feet at the 40 degree latitudinal parallel which passes through the approximate middle of the United States. [USGS]

Method of Measure for Latitude/Longitude

The method used to determine the latitude/longitude such as surveyed, from a USGS quad sheet, and so forth.

Source Agency for Latitude/Longitude Data

The Agency that reported the data.

State Federal Information Processing Standard Code (FIPS)

An established standard that is a two digit number representing the state in which the well or spring is physically located.

County Federal Information Processing Standard Code (FIPS)

An established standard that is a three digit number of the county or county equivalent in which the well or spring is physically located.

Altitude

The altitude of the land surface at the well or spring above or below mean sea level, in feet, National Geodetic Vertical Datum.

Well/Spring and Facility Identification

An identification to be developed for each well or spring, that never changes and is never duplicated.

An identification, where applicable, that establishes a tie or linkage between a well or a spring and the facility on which it is located.

Use of Well

The principal use of a well or spring or the purpose for which the well was constructed (the former always holds precedence over the latter).
[after USGS]

Depth of Well at Completion

The elevation at the completion depth of the well in feet above or below mean sea level (NGVD).

Depth to Top of Open Interval

Depth to the point where the opening begins, in feet below land surface. The first section of the opening always begins at depth 0.
[after USGS]

Depth to Bottom of Open Interval

Depth to the bottom of the open interval, in feet below land surface.
[after USGS]

Location of Well Log

The physical location of the well log, such as the Agency name and address where the log is located.

Type of Well Log

Identifies the type of well log: a physical description of the rock cuttings of the different formations penetrated, such as a driller's log; or a continuous recording of the electrical, radioactive, acoustic and/or other properties of the penetrated formations, such as an electric log.

Source Agency for Sample Data

The Agency that reported the data.

Sample Date

The date on which the sampling event occurred.

Sample Identification

An identification to be developed to uniquely identify each sample taken, it may include several factors, such as sampling purpose, field conditions, field protocol.

Parameter Measured

The specific chemical for which an analysis is made.

Concentration/Value

The numerical value (concentration or quantity) detected by the parameter test (in standard units).

Confidence Factor

An element that can include field and laboratory quality assurance, and other factors that provide the degree of confidence the data source has in the value reported.

Depth to Water

The water level at the well or spring, in feet below land surface.
[after USGS]

Measurement Quantification

A method of quantification of a parameter.