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## Standard Guide for Locating Abandoned Wells<sup>1</sup>

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### INTRODUCTION

This guide for locating abandoned wells, provides general procedures and suggestions for identifying the locations of wells that are installed for the purposes of oil and gas exploration or production, or for groundwater exploration, supply, monitoring, remediation, or injection, and subsequently have been abandoned. Not all areas require documentation of such abandonment; thus, this guide has been prepared to provide direction for determining the locations of those abandoned wells.

### 1. Scope

1.1 This guide provides an approach to selecting and implementing a program to identify the locations of abandoned wells. This guide provides descriptions of methods to be used as starting points in the search for these locations. It is not intended to be a step-by-step procedure to conduct the search program.

1.2 The described methods are approaches that have been used at many sites in the past. Other methods may be appropriate. Typically, several approaches are used to obtain acceptable confirmation of well locations. This guide is not limited to specific wells. The method chosen should be appropriate for the size of the area being searched and the type of well being located. Some well types and construction materials may preclude their detection by any of the methods described.

1.3 This guide offers an organized collection of information or series of options and does not recommend a specific course of action. This guide cannot replace education and experience and should be used in conjunction with professional judgment.

1.4 *This guide does not purport to address all aspects of exploration and site safety. It is the responsibility of the user of this guide to establish appropriate safety and health practices and determine the applicability of regulatory limitations before its use.*

1.5 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 services 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*:<sup>2</sup>

- D653 Terminology Relating to Soil, Rock, and Contained Fluids
- D5092 Practice for Design and Installation of Groundwater Monitoring Wells
- D5299 Guide for Decommissioning of Groundwater Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities

### 3. Terminology

3.1 *Definitions*—For definitions of common technical terms in this standard, refer to Terminology D653.

### 4. Significance and Use

4.1 Millions of oil and gas wells, water supply wells, and wells installed for environmental monitoring and remediation purposes, have been abandoned. The need to determine the locations of these abandoned wells is based on safety and

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<sup>2</sup> 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.

threats to the environment. Improperly constructed or abandoned wells may pose a safety threat to humans and animals, may be sources of brines and other undesirable fluids coming to the surface, may be conduits for transport of contamination from the surface to the substrate, or may cross-contaminate water-bearing zones in the subsurface. All states do not require documentation of the abandonment of wells and may not have specific requirements for abandonment procedures.

## **5. Methods for Locating Abandoned Wells Whose Locations Have Been Recorded, Observed, or Marked at the Surface**

**5.1 Records Search**—Information regarding the potential location, type, age, method of abandonment, and other pertinent information about wells often can be determined by a thorough review of local, state, or federal records. Many governmental agencies have reporting requirements for both the installation and abandonment of all types of wells. Typically, oil and gas wells are controlled by separate agencies from water and environmental wells. With the recent proliferation of environmental studies, the number of agencies that may maintain these records has increased.

**5.2 Local Agencies**—Local (city and county) agencies typically retain records of oil and gas leasing agreements, tax records, plat maps, property ownership maps, and other related information. Information on municipal wells often is retained in local courthouses.

**5.3 State or Regional Agencies**—Most states or regions have several agencies that maintain records of drilled wells. Some maintain sophisticated computer databases, others maintain paper records. Location information also varies by jurisdiction and can be by township, range and section, state plane coordinate system, UTM coordinates, or latitude and longitude. Drilling logs, installation diagrams, production records, mechanical integrity testing reports, and other information often are available. Injection wells information typically also is available.

**5.3.1** A starting place for well record information is a Geological Survey agency. If they do not maintain well records, they typically can provide direction to the proper agency.

**5.3.2** Water well records are required in most jurisdictions. The sophistication of record keeping and location detail is variable. Health agencies often maintain records for public water supply wells.

**5.3.3** Within the areas that produce oil and gas, a specific agency usually has been given the responsibility for maintaining well information.

**5.4** Environmental monitoring wells have become more prolific within the last decade. Agencies typically require documentation of the installation of these wells.

**5.4.1** Refer to Practice **D5092** as it lists the minimum amount of information required for documentation of each installation. Guide **D5299** lists information required to document the abandonment of wells.

**5.5 Interviews**—Conversations or interviews with local property owners, longtime residents, and drilling contractors often provide information about the locations of abandoned wells. Property owners often can identify specific well locations. Drilling contractors often maintain internal records of well locations. A careful explanation of the need for locating certain wells is necessary sometimes to obtain access to these proprietary data. The initial purpose for conducting the interview should dictate the type and format of interview documentation.

**5.6 Reconnaissance**—Actual site visits may identify the locations of abandoned wells whose surface locations have been marked or whose installation or abandonment have left soil disturbances that are identifiable as well-related.

## **6. Airborne and Space-Based Photographic and Other Methods for Locating Abandoned Wells Whose Locations Are Unknown**

**6.1 Aerial Photographs**—Aerial photographs may be used to detect the surface disturbance associated with well drilling activities or the actual surface equipment. Historical photographs may document the actual drilling of now-abandoned wells. Aerial photographs may be available at many different scales and from many different sources.

**6.1.1** The larger the scale of the aerial photograph, the easier it is to identify features. Photographs usually are available at a low cost. Photographs, however, may not be available for a given area or may not be at an appropriate scale. Interpretation of the photographs should be performed by trained personnel.

**6.1.2 Sources of Aerial and Satellite Photographs**—Many local and state or regional governmental agencies have archives of aerial photographs of their area of jurisdiction. In addition, a review of the local telephone directory listing of companies that provide aerial photographic services may provide sources of aerial and satellite photographs.

**6.2 Other Remotely Sensed Data**—Surface disturbances, associated either with the original well installation or with leaking fluids from an improperly abandoned well, may be detectable using various remotely sensed data. These data include, but are not limited to spectral, radar, and color infrared data acquired by satellite or aircraft. Spectral imagery may be used to detect vegetative stress resulting from either drilling activities or from the presence of saline or contaminated water leaking from an abandoned well. Thermal infrared imagery may be used to detect temperature anomalies resulting from the presence of metal casing. Spectral, color infrared, and radar imagery also may be used in textural analysis to deduce surface disturbances that may have resulted from drilling and well installation activities.

**6.2.1** Most of these data are available only in digital format. Appropriate computer hardware and software, as well as personnel trained in image processing, may be necessary to use these data. Relative costs per unit aerial coverage for data acquisition and processing may be high for small search areas but low for large search areas. Ground verification of wells is necessary.