

NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD

MONITORING WELL

(No.)  
Code 353



**DEFINITION**

A well designed and installed to obtain representative in-situ ground water quality samples and hydrogeologic information from an aquifer.

**PURPOSE**

To provide controlled access for sampling ground water near an agricultural waste storage or treatment facility in order to detect seepage and monitor the effects of contaminants in seepage on ground water quality.

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies to the design, installation, and development of monitoring wells where

- contamination of ground water from an agricultural waste storage or treatment facility is a concern; and
- the facility is a component of an agricultural waste management system.

This practice does **not** apply to:

- methodologies for the collection and analysis of ground water samples or ground water information from the well;
- monitoring of subsurface waters in the vadose zone;
- the installation of wells for any other purpose;
- temporary exploratory drill holes or borings; and
- the decommissioning of monitoring wells.

**CRITERIA**

**Laws and regulations.** Plan, design, construct, operate, and maintain the monitoring wells in a manner that meets all applicable local, state and Federal laws and regulations.

Monitoring wells are regulated under Florida Department of Environmental Protection, Chapter 62-532, "Water Well Permitting and Construction Requirements", Florida Administrative Code (FAC).

Evaluate and avoid or minimize impact to cultural resources, wetlands and Federal and state protected species to the extent practicable during planning, design and implementation of this conservation practice in accordance with established National and Florida policy, General Manual (GM) Title 420-Part 401; Title 450-Part 401, Title 190-Parts 410.22 and 410.26, National Planning Procedures Handbook (NPPH) Florida Supplements to Parts 600.1 and 600.6, National Cultural Resources Procedures Handbook (NCRPH), National Food Security Act Manual (NFSAM), and the National Environmental Compliance Handbook (NECH).

Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

**Hydrogeologic investigation.** Prior to the design of a monitoring well, conduct a surface and subsurface investigation to develop a conceptual hydrogeologic model of the site, identify potential ground water flow paths, and determine the location of the target monitoring zone(s).

Include in the hydrogeologic investigation the mapping, identification and description of soil and rock masses that affect the movement and transport of ground water occurring within at least 100 feet of the perimeter of the facility of interest.

For the identification of soil and rock masses, follow ASTM Standards D2487 "Standard Classification of Soils of Engineering Purposes (Unified Soil Classification System)", D2488 "Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)", and D653 "Standard Terminology Relating to Soil, Rock, and Contained Fluids." Use the standard Rock-Color Chart when describing rock and cutting samples.

For the hydrogeologic investigation, identify and describe all characteristics and properties of geologic units that can influence subsurface water flow paths or produce preferred flow paths such as karst development, joint sets, fracture systems, faults, lineaments, and other similar discontinuities. Draw these characteristics to scale on a geologic evaluation site map.

For the hydrogeologic investigation, identify and describe any tile lines, surface and subsurface drains, irrigation ditches, irrigation wells, water supply wells, septic drain fields, infiltration strips, subsurface quarries, mines, or other water control/management related features that may have the potential to alter the native ground water flow paths. Draw such features to scale on a geologic evaluation site map.

Complete the hydrogeologic investigation with sufficient detail to map the potentiometric surface to a one-foot contour interval. Use the map of the potentiometric surface to determine the hydraulic gradient and direction of ground water flow within the target monitoring zone(s).

Identify and describe in the hydrogeologic investigation any seasonal changes in the potentiometric surface and direction of ground water flow paths.

Identify and describe in the hydrogeologic investigation other features that influence

ground water flow such as hard pans, sand boils, animal burrows, seasonal desiccation, high shrink/swell soils, and dense till.

**Layout.** Locate monitoring wells both up gradient and down gradient of the waste storage facility and at a distance and depth based on the results of the hydrogeologic investigation of the site.

Base the placement of monitoring wells in fractured-rock and karst aquifers on the location of zones of high-permeability even if they are located offsite.

A minimum of one monitoring well shall be placed on the up gradient side of the waste storage facility and a minimum of three monitoring wells shall be placed down gradient.

When seasonal changes in the direction of subsurface water flow are possible, place monitoring wells in such a manner as to capture both up gradient and down gradient flow during any time of year.

Base the layout of the monitoring wells on the conceptual hydrogeologic model to intercept representative ground water flow path(s) of the target monitoring zone(s).

**Design.** Design all components of the monitoring well to conform to ASTM D5092 "Standard Practice for Design and Installation of Ground Water Monitoring Wells in Aquifers" for granular aquifers or to ASTM D5717 "Standard Guide for Design of Ground-Water Monitoring Systems in Karst and Fractured-Rock Aquifers" for karst or fractured-rock aquifers.

**Materials.** Specify materials used for the construction of monitoring wells to be non-reactive with subsurface water and shall not leach substances into the ground water.

Ensure materials to be free of contaminants prior to installation.

Ensure well screens to be fabricated by machine.

Ensure all joints to be threaded. Do not use glued or solvent welded joints.

Ensure materials to have adequate strength to withstand the forces of installation and development.

**Installation.** Select installation methods based on site-specific conditions.

Ensure installation methods to be in conformance with ASTM D5092 for granular aquifers, and ASTM D5717 for karst and fractured rock aquifers.

Ensure the equipment used be capable of creating a stable, open, vertical borehole for installation of the monitoring well.

**Well Protection.** Ensure Installation of measures to protect the monitoring well from damage from hazards such as surface drainage, animal or equipment traffic, and lack of visibility conform to ASTM D5092.

Establish positive surface drainage away from the well heads.

Provide protection from natural or human caused damage in conformance with ASTM D5787 "Standard Practice for Monitoring Well Protection".

Establish a buffer zone with a minimum radius of 30 feet around each well head. Fence the buffer zone or otherwise protect it from access by motor vehicles and livestock.

Ensure no storage, handling, mixing, or application of fertilizers, pesticides or other agricultural chemicals or cleaning of equipment used in the handling or application of such items within the buffer zone.

**Development.** Develop the monitoring well to improve the hydraulic communication between the target hydrogeologic unit and the well screen, to minimize the interference of sediment with water quality samples, and to restore the ground-water properties disturbed by the drilling process. Upon well completion, ensure that only the targeted hydrogeologic unit contributes to the monitoring well and that the annular space is sealed to prevent cross contamination from other water sources.

Select the well development method from alternatives provided in ASTM D5092. Base the selection of the method on the physical characteristics of the target hydrogeologic unit and the drilling method used.

For granular aquifers, conform well completion to ASTM D5521 "Standard Guide for Development of Ground Water Monitoring Wells in Granular Aquifers."

For fractured-rock and karst aquifers, ensure well completion conform to ASTM D5717.

**Record Keeping.** Conform record keeping to:

- ASTM D5254 "Standard Practice for Minimum Set of Data Elements to identify Ground-Water Site";
- ASTM D5408 "Standard Guide for Set of Data Elements to Describe a Ground-Water Site: Part One – Additional Identification Descriptors"; and
- ASTM D5409 "Standard Guide for Set of Data Elements to Describe a Ground-Water Site: Part Two – Physical Descriptors".

Report installation of monitoring wells as required by local or state laws and regulations.

### CONSIDERATIONS

Consider using geophysical tools in conjunction with penetrative exploratory techniques to improve and refine the mapping of the location, shape, orientation and extent of subsurface hydrogeologic units.

Consider effects of geomorphic processes, geologic structures, regional stratigraphy, and soil and rock properties on subsurface flow patterns when developing a conceptual hydrogeologic model.

Consider the physical properties and methods of movement in the environment of the solutes and pollutants of interest when designing monitoring wells.

Consider installing additional monitoring wells at other points as dictated by the results of the hydrogeologic investigation to adequately monitor the location and direction of movement of any potential contaminant plume.

Consider evaluating alternative drilling methods for installing monitoring wells provided in ASTM D6286 "Standard Guide for Selection of Drilling Methods for Environmental Site Characterization".

Where frost heave is a concern, consider monitoring well design alternatives that reduce the potential for frost heave damage.

### PLANS AND SPECIFICATIONS

Prepare plans and specifications for constructing, installing, developing and completing monitoring wells in keeping with this standard. Include in the plans and specifications description of the requirements for applying the practice to achieve its intended purpose.

Include as a minimum in the plans and specifications the following:

A to scale geologic evaluation site map showing all features that may have the potential to alter the native ground water flow paths.

- Location of monitoring well(s).
- Number of monitoring wells.
- Well design including diameter, depth, surface sealing, wellhead protection.
- Materials including casing, type, gage, and diameter.
- Location of utilities and notification requirements.

#### **OPERATION AND MAINTENANCE**

Provisions shall be made for operation and maintenance requirements in keeping with the purpose of this standard. As a minimum, include the following in the O&M Plan:

- Schedule of sampling and contaminants to be sampled.
- Verify well has not be disturbed by livestock, equipment, or humans.
- Verify casing has not rusted, cracked, etc.

#### **REFERENCES**

ASTM Specifications

D653, D2487, D2488, D5092, D5254,  
D5409,

D5408, D5521, D5717, D5787, D6286

Chapter 62-532,FAC, "Water Well Permitting  
and Construction Requirements"

General Manual (GM)

Title 420-Part 401

Title 450-Part 401

Title 190-Parts 410.22 and 410.26

National Cultural Resources Procedures Handbook

National Environmental Compliance Handbook

National Food Security Act Manual

National Planning Procedures Handbook

Florida Supplements to Parts 600.1 and

600.6