

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
MONITORING WELL**

(No.)

CODE 353

DEFINITION

A well designed and installed to obtain representative groundwater samples and hydrogeologic information.

PURPOSE

To provide controlled access for sampling groundwater near an agricultural waste storage facility, waste treatment facility or other area of concern to detect the occurrence of seepage and to monitor groundwater quality through time.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to the design, installation, and development of monitoring wells near components of an agricultural waste management system.

This practice does not apply to:

- Methods for developing a ground water monitoring plan
- Methods for collection of ground water samples
- Analysis or interpretation of laboratory test results
- Monitoring of subsurface waters in the vadose (unsaturated) zone
- Installation of wells for any other purpose
- Temporary exploratory drill holes.

CRITERIA

Laws and Regulations. Ensure the investigation, design, and installation of the monitoring well satisfy all applicable governmental regulations, laws, permits, licenses, and registrations.

The landowner is responsible for obtaining all necessary permits for the work prior to construction. The landowner and/or contractor are responsible for locating all buried utilities in the project area, including drainage tile and other structural measures.

Hydrogeologic Site Characterization. Use guidance provided in ASTM D 5092, "Standard Practice for Design and Installation of Groundwater Monitoring Wells", to conduct surface and subsurface investigations within the area of concern prior to the design of a monitoring well to develop a conceptual hydrogeologic model of the site, identify probable groundwater flow paths, and determine the target monitoring zone(s).

Use National Engineering Handbook (NEH), Part 631, Geology, for methodologies in identifying, field-testing, and interpretation of geologic material and mass factors that affect movement and flow direction of groundwater within the area of concern.

Planning. Locate and describe any tile lines, subsurface drains, surface drains, irrigation ditches, irrigation wells, water supply wells, septic drain fields, infiltration strips, quarries, mines, and other water control/management features that influence the flow of local subsurface and surface water.

Conservation Practice Standards are reviewed periodically and updated if needed. To obtain the current version of this standard, download it from the electronic Field Office Technical Guide, or contact the NRCS State Office or the Wisconsin Land and Water Conservation Association Office at (608) 441-2677

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Identify and describe other relevant features that influence subsurface water flow, such as hard pans, sand boils, animal burrows, seasonal desiccation, high shrink/swell soils, dense till, depth of frost line, or permafrost.

Estimate the vertical and lateral seasonal variability in the water table using guidance provided in NEH Part 651, Agricultural Waste Management Field Handbook, Chapter 7.

Write a report of the hydrogeologic investigation and include a geologic evaluation map or sketches of all identified features and interpretations.

Layout. Use the hydrogeologic investigation report to determine the optimum location(s) of monitoring wells, both up-gradient and down-gradient of the waste storage facility or in the area of concern.

In highly fractured-rock and in karst aquifers, locate the monitoring wells in the zones of highest permeability, even if locations are offsite.

Design. The design of all components of the monitoring well must conform to criteria provided in ASTM D 5092.

Materials. Materials used for the construction of monitoring wells must not chemically react with subsurface water and must not leach substances into subsurface water. Avoid quick-setting cements containing additives that may leach from the cement and influence the chemistry of water samples collected from the monitoring well.

For conventionally screened and filter-packed groundwater monitoring wells located in sand and gravel aquifers and other granular materials, ensure the grain size distribution contains less than 50 % finer than the 200 sieve and less than 20 % clay sized material.

Ensure all materials used in construction, development, and sealing are free of contaminants prior to installation.

Use only commercial well screens or slotted pipe.

Use only threaded jointed pipe or casing. Do not use glued or solvent-welded joints.

Use only materials of adequate strength to withstand the forces of installation and well development.

Installation. Select the design protocol and installation method according to site-specific conditions identified during the hydrogeologic investigation.

Use only drilling or digging equipment capable of creating a stable, open, vertical hole for proper installation of the monitoring well.

Installation methods must conform to ASTM D 5092, and ASTM D 5787, "Standard Practice for Monitoring Well Protection".

Direct push methods for installation are allowable provided they are consistent with guidance provided in ASTM D 6724, "Guide for Installation of Direct Push Groundwater Monitoring Wells", and ASTM D 6725, "Practice for Direct Push Installation of Prepacked Screen Monitoring Wells in Unconsolidated Aquifers".

Well Protection. Provide protection of the monitoring well from damage from hazards such as frost action, surface drainage, animal or equipment traffic, and lack of visibility.

Establish positive surface drainage away from the wellhead.

Establish a buffer zone with a minimum radius of 30 feet around the wellhead of the monitoring well. Use fencing or other types of protection that exclude motorized vehicle access and livestock intrusion.

Ensure that 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 occur within the buffer zone at any time.

Development. Well development procedures must target the most productive hydrogeologic zones penetrated by the monitoring well. Seal the annular spaces adjacent to non-productive zones to prevent cross contamination and comingling of chemically or biologically different zones of underground or surface waters. Refer to ASTM D 5521, "Standard Guide for Development of Groundwater Monitoring Wells in Granular Aquifers" for a description of the various development methods. Conduct the development process only after completion of well installation, fill and sealing operations, and wellhead protection measures.

RECORD KEEPING

When writing records to describe a ground-water site, refer use guidance provided in ASTM D 5408 "Standard Guide for Set of Data Elements to Describe a Ground-Water Site: Part One – Additional Identification Descriptors", and ASTM D 5409 "Standard Guide for Set of Data Elements to Describe a Ground-Water Site: Part Two – Physical Descriptors".

CONSIDERATIONS

In developing the conceptual hydrogeologic model, consider effects of geomorphic processes, geologic structures, regional stratigraphy, and soil and rock properties on subsurface flow patterns, location of groundwater recharge, and pollution potential. Consider the physical properties and methods of movement in the environment of solutes and pollutants of interest and potential impact of relevant soil properties (clay content, organic matter) when designing and locating the physical position and depth of a monitoring well. Also, consider inherent physical and conductive properties of relevant soil horizons (particle size, structure, kSAT).

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 installing additional monitoring wells at other locations and at appropriate depths to ensure identification of the location and direction of movement of any potential contaminant plume.

Consider alternative drilling or digging methods for installing monitoring wells as provided in ASTM D 6286 "Standard Guide for Selection of Drilling Methods for Environmental Site Characterization."

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

PLANS AND SPECIFICATIONS

Ensure plans and specifications for constructing, installing, completing, and developing monitoring wells comply with this standard and describe the requirements for applying the practice to achieve its intended purpose.

OPERATION AND MAINTENANCE

Operation and maintenance requirements must comply with the purpose of this standard.

Maintenance and rehabilitation procedures must comply with criteria in ASTM D 5978 "Guide Maintenance and Rehabilitation of Ground for water Monitoring Wells", to ensure acquisition of groundwater samples free of artificial turbidity, eliminate siltation of wells between sampling events, and permit acquisition of accurate ground water levels and hydraulic conductivity test data from the zone screened by the well.

When no longer needed, close the well according to NRCS WI Conservation Practice Standard *Water Well Decommissioning (Code 351)*.

REFERENCES

American Society for Testing and Materials, ASTM D5092 "Standard Practice for Design and Installation of Groundwater Monitoring Wells": ASTM-International, 100 Barr Harbour Dr. P.O. Box C-700 West Conshohocken, PA.

American Society for Testing and Materials. "ASTM D5408, Standard Guide for Set of Data Elements to Describe a Ground-Water Site: Part One – Additional Identification Descriptors": ASTM-International, 100 Barr Harbour Dr. P.O. Box C-700 West Conshohocken, PA.

American Society for Testing and Materials. "ASTM D5409, Standard Guide for Set of Data Elements to Describe a Ground-Water Site: Part Two – Physical Descriptors": ASTM-International, 100 Barr Harbour Dr. P.O. Box C-700 West Conshohocken, PA.

American Society for Testing and Materials. "ASTM D5521, Standard Guide for Development of Groundwater Monitoring Wells in Granular Aquifers": ASTM-International, 100 Barr Harbour Dr. P.O. Box C-700 West Conshohocken, PA.

American Society for Testing and Materials. "ASTM D5787, Standard Practice for Monitoring Well Protection": ASTM-International, 100 Barr Harbour Dr. P.O. Box C-700 West Conshohocken, PA.

American Society for Testing and Materials.
“ASTM D5978, Guide for Maintenance and
Rehabilitation of Groundwater Monitoring Wells”:
ASTM-International, 100 Barr Harbour Dr. P.O.
Box C-700 West Conshohocken, PA.

American Society for Testing and Materials.
“ASTM D6286, Standard Guide for Selection of
Drilling Methods for Environmental Site
Characterization”: ASTM-International, 100 Barr
Harbour Dr. P.O. Box C-700 West
Conshohocken, PA.

American Society for Testing and Materials.
ASTM D6724, “Guide for Installation of Direct
Push Groundwater Monitoring Wells”, ASTM-
International, 100 Barr Harbour Dr. P.O. Box C-
700 West Conshohocken, PA.

American Society for Testing and Materials.
ASTM D6725, “Practice for Direct Push
Installation of Prepacked Screen Monitoring
Wells in Unconsolidated Aquifers, ASTM-
International, hydrogeologic information. 100
Barr Harbour Dr. P.O. Box C-700 West
Conshohocken, PA.

USDA, NRCS, 2012. National Engineering
Handbook Part 631, Geology.

USDA, NRCS, 2010. NEH 651, Agricultural
Waste Management Field Handbook, Chapter 7,
Geology and Groundwater Considerations.

Wisconsin Administrative Code, Chapter NR141,
Ground water Monitoring Well Requirements.