

Boring and Monitoring Well Decommissioning

FSOP 1.9 (March 19, 2018)

Ohio EPA Division of Environmental Response and Revitalization

1.0 Scope and Applicability

- 1.1 Borings that are drilled for sampling or subsurface exploratory purposes or monitoring wells that are no longer needed for site assessment purposes must be decommissioned [Ohio Administrative Code (OAC) 3701-28-07, 3745-9-03 and 3745-9-10]. Ohio EPA's Technical Guidance Manual (TGM) for Hydrogeologic Investigations and Ground Water Monitoring (current version) provides appropriate guidance for boring and monitoring well decommissioning (Chapter 9, Sealing Abandoned Monitoring Wells and Boreholes).
- 1.2 The process of decommissioning a boring or monitoring well includes the following:
 - Verifying that the boring or monitoring well is no longer needed for site assessment or remediation purposes. Generally, soil borings not converted to monitoring wells are decommissioned upon completion of the boring.
 - Permanently sealing the boring or well with a low-permeability material
 - Documenting the decommissioning activities
 - For monitoring wells or borings used to characterize or assess ground water, submitting a completed Ohio Division of Natural Resources (ODNR) Division of Water "Well Sealing Report" [Ohio Revised Code 1521.05(c), Form DNR 7810.12]. Refer to FSOP 1.8, ODNR Well Construction Log and Well Sealing Report Filing Requirements
- 1.3 Soil borings greater than six feet deep or that intersect the water table must be sealed with a low permeability sealing material upon completion. Bentonite granules or chips are typically used as a sealing material. Under some circumstances (e.g., a boring that intersects multiple saturated zones), the boring may need to be sealed using positive displacement grouting, *i.e.*, installing bentonite grout slurry using a tremie pipe.
- 1.4 Soil borings 6 feet deep or less and that do not intersect the water table may be backfilled with the soil cuttings, topsoil, or other clean fill materials (e.g., sand or gravel) rather than bentonite provided that:
 - The DERR Site Coordinator or the Ohio EPA client division representative approves of using a clean soil or fill material.
 - The soil boring does not encounter any hazardous waste, solid waste, or construction and demolition debris (C&DD) materials.
 - The soil cuttings or other materials used for backfill are not known to contain contaminants exceeding any federal or state regulatory concentration levels.
 - The soil cuttings or other materials used for backfill do not contain any solid waste or C&DD.
 - The soil cuttings or other materials used for backfill will likely exhibit a hydraulic conductivity equal to or less than the soil encountered in the boring.

- 1.5 Monitoring wells must be sealed when no longer needed and may be decommissioned by:
 - 1.5.1 Physically removing the well materials (casing and screen) and sealing the boring with a low-permeability material using positive displacement grouting, *i.e.*, installing bentonite grout slurry using a tremie pipe)
 - 1.5.2 Decommissioning the monitoring well in-place by filling the screen and well casing with bentonite or filling the monitoring well with clean sand to approximately two feet above the top of the screen and filling the well casing with bentonite, removing the protective casing, removing the upper 1 to 3 feet of well casing if possible and filling the upper 1 to 3 feet of the borehole with soil or other clean fill materials
- 1.6 Under some circumstances, DERR's LOE contractor may be needed to decommission borings or monitoring wells. Such situations may include, but are not necessarily limited to, borings or monitoring wells that are greater than 2 inches in diameter, are installed in bedrock, or are installed within the paved area of a highway. These situations may require the use of drilling rigs and other equipment not available to Ohio EPA staff. Decommissioning procedures to be followed by the LOE contractor will vary with site conditions and will be approved through a site-specific work plan (SSWP).
- 1.7 Monitoring wells that are installed below the base of the uppermost saturated zone (*see Section 2.0, Definitions*) and intersect multiple saturated zones generally should be decommissioned by removing the screen and casing, which will require services of DERR's LOE contractor. Removing the screen and casing may not be possible due to the well location and work/equipment obstructions. Under such circumstances, abandoning the well in place may be acceptable.

2.0 Definitions

- 2.1 Bentonite Chips (or Coarse Grade Bentonite): crushed sodium bentonite shale particles sized from $\frac{3}{8}$ - to $\frac{3}{4}$ -inch diameter that are intended to fall through a water column in a boring or well without bridging (also referred to as crushed or chip bentonite)
- 2.2 Bridging: the creation of a void within a decommissioned boring or monitoring well when bentonite chips, pellets or granules are either poured into the boring or well too quickly or prematurely hydrate and fail to form a continuous seal
- 2.3 Granular Bentonite: processed sodium bentonite with a particle size range of 2.4 to 0.8 mm (#8 to #20 mesh), typically used for bentonite grout slurries, but may also be used in dry form to seal borings under certain circumstances
- 2.4 Neat Cement: a mixture of Portland cement and fresh water (5 to 6 gallons of water per 94-pound sack of cement)
- 2.5 Tremie Grouting: pumping a grout slurry through a conductor pipe or tube that extends nearly to the bottom of a boring or monitoring well to positively displace (lift)

ground water out of the boring or well as the denser grout is emplaced; this method prevents dilution of the grout, which could inhibit formation of a proper grout seal

- 2.6 Uppermost Saturated Zone: the first (shallowest) zone of saturation present at a given location. The uppermost saturated zone extends from the first ground water encountered to the base of the unit where saturated conditions are not present. For example, the uppermost saturated zone would be from 10 to 20 feet below ground surface (bgs) for a surficial 20-foot thick sand layer saturated from 10 to 20 feet bgs and underlain by low-permeability clay. A monitoring well installed anywhere within 10 to 20-foot bgs would be considered an uppermost saturated zone well. A well installed deeper than that, *i.e.*, below the confining clay layer in lower (second) saturated sand would not be considered an uppermost saturated zone well. Uppermost saturated zones may include perched ground water zones.

3.0 Health and Safety Considerations

- 3.1 Wear appropriate personal protective equipment (PPE) when working near a drilling rig or grout pump. At a minimum, PPE should include protective eyewear, footwear, and hearing protection.
- 3.2 Use hand protection to help prevent injuries when performing boring or monitoring well decommissioning activities that require the use of mechanical or manual equipment.
- 3.3 To avoid direct contact with chemical contaminants and prevent skin irritation, wear chemical-resistant or other protective gloves when handling grouting materials or soil from decommissioning activities. Wash your hands after completing boring or well decommissioning activities.
- 3.4 Well sealing materials, including but not limited to bentonite, cement and sand may present a silica dust hazard. Appropriate health and safety precautions should be implemented to prevent exposure to respirable silica, *e.g.*, engineering controls and/or respirators with the appropriate filter cartridges.
- 3.5 Dress appropriately for anticipated weather conditions, and always have ample drinking water available when working in hot weather. Insect repellent may be needed for protection from ticks, mosquitoes, and other biting insects in heavily wooded areas.

4.0 Procedure Cautions

- 4.1 When decommissioning a boring or monitoring well by pouring bentonite granules or chips into it, use a weighted tape or drilling rods to ensure that the bentonite does not bridge above the bottom of the boring.
- 4.2 Bring the bentonite to within approximately 1 to 3 feet of the ground surface and fill the remainder of the boring with appropriate clean fill materials (*e.g.*, topsoil in a residential lawn area, sand or gravel and asphalt mix in a paved area). If bentonite is brought nearer to the ground surface, it may expand out of the boring

onto the ground. Decommissioned borings containing bentonite that has expanded to the ground surface are aesthetically unattractive and present a slip/fall hazard.

- 4.3 Ground water exhibiting elevated hardness (> 500 ppm) or chloride concentrations (> 1,500 ppm) can suppress the hydration of bentonite grouts. Ground water near solid waste landfill leachate plumes or salt piles may contain high concentrations of chlorides. Under such circumstances use of neat cement grout slurry or an alternative grouting material may be required.

5.0 Personnel Qualifications

Ohio EPA personnel working at sites that fall under the scope of OSHA's hazardous waste operations and emergency response standard (29 CFR 1910.120) must meet the training requirements described in that standard.

6.0 Equipment and Supplies

- 6.1 Bentonite chips or granules
- 6.2 Topsoil, concrete mix, asphalt mix, sand and/or gravel
- 6.3 Potable water
- 6.4 Water level indicator
- 6.5 Weighted measuring tape or drilling rods
- 6.6 Shovel
- 6.7 Pry bar
- 6.8 Sledgehammer
- 6.9 PVC pipe cutter
- 6.10 Photoionization detector (PID)
- 6.11 PPE
- 6.12 Large heavy-duty trash bags
- 6.13 Decontamination equipment and supplies
- 6.14 Field book or decommissioning log form

7.0 Procedures

- 7.1 Decommissioning soil borings 6 feet deep or less that do not intersect the water table:
 - 7.1.1 If the soil boring does not encounter any hazardous waste, solid wastes, or C&DD materials, then decommission the boring by backfilling it with soil cuttings, topsoil, or other clean fill materials (e.g., sand or gravel). The soil cuttings or other materials used for backfilling must be known to not contain contaminants exceeding any federal or state regulatory concentration levels or any hazardous waste, solid waste or C&DD materials. If the soil boring is located within a paved area, complete the decommissioning in a manner that prevents pavement settling and fill the upper 4 to 6 inches (or pavement thickness) of boring space with concrete or asphalt mix, whichever is appropriate.

7.1.2 If the soil boring encounters hazardous waste, solid waste, or C&DD materials, then decommission the boring by backfilling it with bentonite chips or granules unless otherwise directed by the SSWP, DERR Site Coordinator or Ohio EPA client division. Use potable water to hydrate the granules or chips after installation.

7.2 Decommissioning soil borings deeper than 6 feet but less than the depth to the base of the uppermost saturated zone or any boring that intersects the water table:

7.2.1 Depending on the subsurface conditions encountered, decommission soil borings by backfilling with bentonite chips or granules.

7.2.2 Use a weighted tape or drilling rods to ensure that the bentonite does not bridge in the boring and form a void. The dry bentonite should be hydrated by adding potable water as needed.

7.3 Decommissioning monitoring wells installed in the uppermost saturated zone (in-place decommissioning technique)

7.3.1 Before decommissioning the monitoring well, record final static water level and total depth measurements.

7.3.2 Fill the monitoring well screen and casing with granular bentonite or chips. Use a weighted tape or drilling rods to ensure that the bentonite does not bridge in the boring and form a void. Clean sand may be substituted for bentonite from the bottom of the well to approximately two feet above the top of the screen.

7.3.3 The dry bentonite should be hydrated in lifts by adding potable water as needed.

7.3.4 Remove the protective surface casing and concrete seal and cut the well casing between one and three feet below the ground surface.

7.3.5 Fill the remaining void with topsoil or other clean fill materials appropriate for the use of the area in which the boring is located. For example, if the boring is in a lawn area, topsoil may be used. If the boring is in a paved area, use sand or gravel topped with a 4- to 6-inch thick layer of asphalt mix or concrete.

7.4 Decommissioning monitoring wells installed below the base of the uppermost saturated zone

7.4.1 Monitoring wells installed below the base of the uppermost saturated zone generally should not be decommissioned in place, *i.e.*, the casing and screen generally should be removed. However, removing the screen and casing may sometimes not be possible due to the well location and

work/equipment obstructions. Under such circumstances, abandoning the well in place may be acceptable.

- 7.4.2 DERR's LOE contractor should be mobilized to decommission monitoring wells installed below the base of the uppermost saturated zone if the casing and screen are to be removed.

8.0 Data and Records Management

- 8.1 Document soil boring and well decommissioning procedures, materials and observations on a field decommissioning log form or project field book. Refer to FSOP 1.3, Field Documentation.
- 8.2 For all wells and soil borings used to assess ground water quality or quantity, an ODNR water well sealing report must be filed. Refer to FSOP 1.8, ODNR Well Construction Log and Well Sealing Report Filing Requirements.

9.0 Quality Assurance and Quality Control

Not applicable

10.0 Attachments

Not applicable

11.0 References

FSOP 1.1, Initial Site Entry

FSOP 1.3, Field Documentation

FSOP 1.8, ODNR Well Construction Log and Well Sealing Report Filing Requirements

Ohio EPA Technical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring (February 2009): Chapter 9, Sealing Abandoned Monitoring Wells and Boreholes

Ohio Administrative Code (OAC) 3701-28-07, 3745-9-03 and 3745-9-10

Ohio Revised Code (ORC) 1521.05(c)

State of Ohio Technical Guidance for Sealing Unused Wells: State Coordinating Committee on Ground Water (1996)