How to install piezometers on your farm

Key messages

- A piezometer can be installed manually or mechanically by drilling a borehole to intercept shallow groundwater (usually up to 2.5-3.0 m below ground level).
- Piezometers are installed at the bottom of the borehole, ideally on top of a clay layer (if present).

Introduction

Piezometers are PVC pipes used to measure groundwater levels and collect groundwater samples. Refer to "**6. How to construct piezometers for monitoring groundwater on your farm**" and "**3. How to monitor groundwater quality on your farm**" for further information on piezometer construction and groundwater monitoring.

Piezometers need to be installed in pre-drilled boreholes. These can be excavated manually with an auger or mechanically with a drill rig mounted on an excavator or a bobcat. This fact sheet describes the installation of piezometers at the bottom of boreholes with a maximum depth of 2.5-3.0 m. Although piezometers can be installed deeper, a licenced bore driller should undertake deeper installations. Drilling should occur during the dry season to prevent the borehole from collapsing due to the presence of groundwater.

The borehole section surrounding the piezometer screen is backfilled with fine gravel or coarse sand to allow groundwater to flow into the piezometer and be sampled. The borehole section surrounding the remainder of the piezometer (the casing) is backfilled with excavated soil up to the surface. Bentonite or concrete (optional) can be used to seal the top of the borehole to prevent surface water from entering the piezometer.

Is piezometer installation expensive?

There are two ways to install piezometers: manually and mechanically. Manual installation can be cheap when using manual excavation tools, but it can also be time-consuming.

Mechanical installation requires a drill rig to dig the borehole. Drill rigs can be installed on different types of machinery. Hiring a contractor might be necessary, which can be quick but relatively costly. Therefore, installing piezometers over an extensive area could significantly impact the installation costs.

What equipment do I need?

- Manual excavation tools (e.g., auger) or mechanical excavation machinery (e.g., drill rig)
- tape measure
- 50 mm diameter PVC-constructed piezometer
- fine gravel/coarse sand
- bentonite or concrete (optional)
- star pickets or flagging tape to signal the piezometer (optional)
- permanent marker pen
- GPS (smartphone)

How do I install piezometers?

1. Pre-drill a borehole manually or mechanically (Figure 1).
2. Observe the soil profile to determine if a low permeability layer (e.g., clay) is present. If a low permeability layer is encountered, stop drilling and measure its depth from the surface. If there is no low permeability layer, measure the depth of the borehole.
3. Measure the whole length of the uncapped piezometer.
4. Install the piezometer at the bottom of the borehole or on top of the clay layer (if present) (Figure 2).
5. Cap the top of the piezometer to prevent any backfilling material from falling into it.
6. Start backfilling the bottom of the borehole with fine gravel or coarse sand around the screen, up to 0.1-0.2 m above the top of the screen (Figure 3).
7. Backfill with soil up to the surface (Figure 4) or use bentonite to seal the top 0.2-0.3 m of the borehole (recommended if the install location experiences flooding or surface water flow).
8. Place a star picket 0.2-0.3 m from the piezometer to signal it (optional).
9. Inside the top cap, write the number of the piezometer for identification.

10. Measure the length of the top of the casing above ground level.
11. Take the GPS coordinates (smartphone) of the piezometer's location.
12. Record the piezometer information in Table 1.

Figure 1: An auger and bobcat can be used to drill a hole quickly.

Figure 2: Install the piezometer in the hole.

Figure 3: First, backfill the hole with fine gravel or coarse sand to 0.1-0.2m above the screen section of the piezometer.

Figure 4: Backfill the rest of the hole with soil and compact it.

Table 1

Piezometer name/code	Installation date	Whole length of the uncapped piezometer (m)	Bore depth (m)	Top of casing length (m)	Latitude	Longitude	Notes (clay layer etc.)

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