How to construct piezometers for monitoring groundwater on your farm

Key messages

- Piezometers are pipes installed in the ground to measure groundwater levels and collect groundwater samples.
- Piezometers need to be long enough to intercept the groundwater to be monitored.
- They are simply constructed using lengths of PVC pipe installed vertically in the ground, with a screen section at the bottom. The screen section can be drilled/sawed manually or purchased pre-slotted.

Introduction

Piezometers (also known as shallow groundwater monitoring bores) are PVC pipes used to measure groundwater levels and collect groundwater samples. Refer to "3**. How to monitor groundwater quality on your farm**" for further information.

Piezometers are installed vertically in sandy-loamy soils with relatively high infiltration rates and high hydraulic conductivity (where water easily moves through soil pores) to intercept groundwater. This fact sheet describes the construction of piezometers with a maximum length of 2.5-3.0 m.

A piezometer (Figure 1) comprises two main sections: the casing and the screen. The casing is the top section of PVC pipe. The bottom section is the screen, which is drilled/sawed/pre-slotted and enables groundwater to enter the pipe from several entry points. The end of the screen section must always be capped to keep the soil out.

The screen section can either be slotted manually (with a drill or a saw) or purchased pre-slotted from specialised shops. If the piezometer's screen section has large enough holes or slots for the soil to enter, the screen section should be wrapped with fabric.

Are piezometers expensive?

Piezometers are relatively cheap. They are simply lengths of PVC pipe that can be sourced from hardware suppliers.

Piezometers with manually drilled/slotted screens are relatively cheap (≈ $16/m), and the geofabric to cover the screen can be purchased from hardware stores. Alternatively, old socks or stockings can also be used to prevent soil and sediment from entering the screen.

Piezometers with pre-slotted screens are slightly more expensive (≈ $35/m). Pre-slotted screens are purchased from specialised suppliers dealing with bore installations.

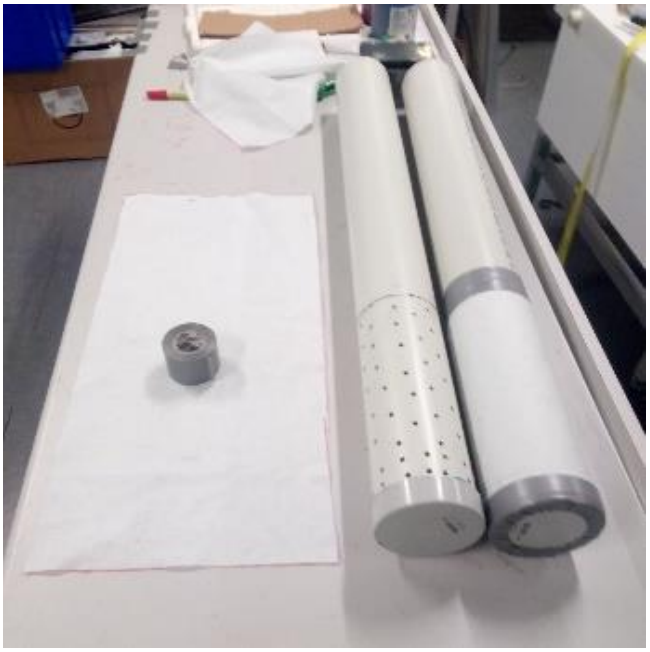

Figure 1: Piezometers are PVC pipes with a slotted/drilled section at the bottom (screen). The screen can be wrapped in fabric if needed.

What do I need to construct piezometers?

For piezometers with manually drilled/slotted screens:

- 50 mm PVC pipes
- 2 x 50 mm caps
- geofabric/old socks
- duct tape
- drill/saw/angle grinder for making holes or cuts in PVC
- suitable pipe primer and glue

For piezometers with pre-slotted screens:

- 50 mm class 12 PVC pipes
- pre-slotted screens
- 2 x 50 mm pressure caps
- 1 x 50 mm pressure socket
- suitable pipe primer and glue

How do I construct piezometers?

A piezometer's installation depth and the screen section's length depend on the groundwater depth from the ground surface. As a rule of thumb, the length of the screen can be 1/4 of the below-ground length of the piezometer (e.g., 0.25 m for a piezometer with a below-ground length of 1.0 m). Extending the top of the casing at least 0.2 m above the ground is recommended to prevent flooding and to signal the piezometer's presence. The description below is based on a piezometer installed at a depth of 1.0 m below ground.

For a piezometer with manually drilled/slotted screens:

1. Cut the 50 mm PVC pipe to the correct length, being the depth underground (1.0 m) plus extension above the ground (0.2 m) = 1.2 m total.
2. Glue a cap on one end of the PVC pipe.
3. After gluing the cap, drill holes (or cut slots) every 20 mm for a 0.25 m long section from the cap, ensuring that the integrity of the piezometer is maintained (Figure 1).
4. Cut a length of geofabric or use old socks to wrap the slots/holes in the piezometer.
5. Hold the geofabric wrap/old socks in position by sticking duct tape at the top and bottom of the geofabric (or the top of the old socks) (Figure 1).

Make four evenly spaced cuts on the 'wall' of the top cap to enable easy removal, as caps without cuts form a tighter seal (Figure 2).

For a piezometer with pre-slotted screens:

1. Cut 1.0 m of 50 mm class 12 PVC pipe.
2. Cut 0.25 m of pre-slotted screen (Figure 3).
3. Glue the PVC pipe and the pre-slotted screen using a 50 mm pressure socket.
4. Glue a 50 mm pressure cap at the bottom of the pre-slotted screen.
5. Cut four evenly spaced cuts on the 'wall' of the top cap to enable easy removal of the cap (Figure 2).

Refer to "**7. How to install piezometers on your farm**" for further information on installing the piezometers.

Figure 2: Cut four evenly spaced cuts on the 'wall' of the top cap to enable easy removal of the cap.

Figure 3: Section of a pre-slotted screen. Pre-slotted screens can be purchased from specialised suppliers dealing with bore installations.

These factsheets were developed as part of the Agriculture Water Treatment Project funded through the Queensland Government's Queensland Reef Water Quality Program and the Resilient Rivers 3 Project funded by Department of Environment, Science and Innovation.

September 2024