Direct-Push Wells Prove Effective for Long-Term Ground Water Monitoring

Study results to date suggest that direct-push wells can provide a cost-effective alternative to drilled wells for use in long-term ground water contaminant monitoring.

By Mark Kram, Dale Lorenzana, Joel Michelsen, William Major, Louise Parker, Chris Anwort, and Tim McIlhale

**DIRECT-PUSH MONITORING WELLS ARE TYPICALLY considered “temporary” monitoring points, because detailed comparisons with conventional drilled shallow stem auger monitoring wells have not previously been conducted.**

However, we have recently found that when working in unconsolidated fine- to medium-grained sand, direct-push installed monitoring wells can be good-cost-effective alternatives to drilled wells for characterizing ground water chemical distribution.

**What Are the Pros and Cons of Direct-Push Wells?**

For relatively shallow screens (20 feet or less), direct-push wells can be installed at rates up to 10 times as fast as conventional drilled wells. At one of our sites, 42 direct-push wells were installed to depths of approximately 25 feet in two days.

Here are several advantages and limitations of direct-push monitoring wells:

**Advantages**
- Minimal cutting waste
- Fewer development wastes
- Rapid installation
- Less worker exposure to contaminants
- Representative chemistry
- Very discreet screen depth ranges possible
- Inexpensive to replace if plugged
- Well installation step can be integrated into a comprehensive dynamic monitoring plan using chemical and hydrologic sensors within a single deployment.

**Limitations**
- Not applicable when cobbles or consolidated materials are present
- Not accepted for long-term monitoring in most states
- Debate remains regarding hydrogeologic characterization capabilities
- Boring log not generated during installation (but can use soil classification samples and even collect samples if so desired)
- Seal above screen is sometimes difficult to achieve (however, several exceptional sealing options exist)
- Many practitioners still use screens without filter packs, which could increase turbidity and compromise results.

The main regulatory concerns regarding the use of direct-push wells for long-term ground water monitoring include:

1. Filter pack materials (for preventing sediment entry) are either not used or are generally not based on grain-size distribution of the formation in contact with the well screen section.
2. Minimum annular sealing and annular size requirements are based on drilled well specifications and replacement logistics (e.g., test well versus gravity feed).
3. Annular testing may not be complete for pre-packaged (or “pre-packed”) well screen devices and tampered filter pack applications under some geologic conditions.

Because the design theory of sand pack gradation is based on mechanical retention of the formation particles, a filter pack provides an excellent barrier to the migration of fine-grained materials, including radionuclides. Therefore, the use of this barrier is critical to the success of any study that attempts to determine long-term changes in the ground water environment.

**Figure 1.** ¾-inch pre-pump direct-push well screen design. The mesh and sand pack cover the screened zone. The frame keeps grout materials from entering the screened zone.