

# Site Investigation

## Monitoring Services

Every ground investigation has different monitoring needs. From groundwater pressure and flow to ground movement and settlement to slope instability, all can affect the performance of engineering structures and the final cost of construction. You may also need to investigate the concentration and emission rates of ground gases or monitor the movement of contaminants through the ground, which is why every installation undertaken by Soil Mechanics benefits from thorough pre-planning in order to coordinate the best resources and produce an end result of recognised quality.

### Groundwater

Soil Mechanics can provide a range of monitoring techniques to determine the groundwater regime and provide the engineering parameters you need for design associated with:

- Slope stability/instability
- Settlement control
- Contamination pathways
- Seepage/soakage rates
- Pore water pressure
- Tidal effects.

### Standpipe Piezometers

We have a range of piezometer tips which are well-suited to near ground level and down hole conditions. Piezometric pressures at the tip indicated by the head of water which develops inside the standpipe tubing are monitored using a probe lowered from ground level or by using retrievable sensor/data loggers that can be installed for long term monitoring. When artesian pressures are present, these can be measured by using a gauge fixed to the standpipe head.

### Vibrating Wire/Pneumatic/Hydraulic Piezometers

Vibrating wire piezometers are high precision electronic instruments designed to measure porewater pressures in low permeability ground. They are particularly applicable where access to the borehole is difficult, e.g. railway, highway and airport locations, or where the borehole is covered by subsequent construction such as building or embankment. An array of many piezometers can be collected together and connected to a data logger at a single remote monitoring point. The advantages are long lead lengths, fast response times to changes in pore water pressures and automation for long term data logging. Pneumatic and hydraulic



piezometers offer a similar performance at remote installations where data logging is not required. A variety of sensors are available to meet variable ground conditions.

### **Multilevel Groundwater Monitoring**

Multi level monitoring using systems such as Waterloo and Westbay offer significant advantages including:

- Detailed data
- Data integrity
- Reduced purging and sampling times
- Fewer drilled holes
- Reduced site disturbance.

### **Gas Concentration and Flow**

Where gas could originate from natural ground such as coal measures, made ground or land fill areas, Soil Mechanics can install instrumentation to determine the levels and emission rates of methane, carbon dioxide, carbon monoxide, hydrogen sulphide and oxygen. Standpipes are installed in boreholes, sealed into the ground, and fitted with single or twin tap valves so that gas levels and flow rates can be monitored at a frequency and time scale to suit the sensitivity of the development and gas generation potential of the site.

### **Ground Movement**

For the accurate measurement of horizontal and vertical ground movements Soil Mechanics has extensive experience of installing monitoring instrumentation in:

- Embankments
- Land slip areas to detect shear planes
- Tunnels
- Excavations
- Shafts
- Piles and retaining walls
- Foundations.

### **Inclinometers**

A wide range of inclinometers can be installed to measure horizontal ground movement relative to a stable datum usually at the base of a borehole.

### **Extensometers**

Single and multi-rod grouted and/or anchored extensometers for measuring vertical ground deformation and for the provision of deep datum can be installed. Where large settlements are anticipated multiple magnet open access tubing extensometers with telescopic casing are also available.

