highways england

A417 fact sheet

Geotechnical surveys

What are geotechnical surveys?

Geotechnical surveys, more commonly known as ground investigation surveys (GI surveys), are carried out to understand the geological and groundwater conditions of the ground along the route of any proposed road construction scheme.

What's involved?

We'll be drilling a number of boreholes, which involve digging shallow trial pits at various locations along the proposed route for the new scheme and alongside the existing A417.

Before starting any work, we'll be carrying out careful archaeological and ecological surveys at each location to ensure we avoid any risk of damage. There are two types of investigation techniques; trial pits and boreholes.

Trial pits: are shallow (up to 5m depth below ground level) holes in the ground which are excavated by a mechanical digger to gather materials and other samples from the ground. Once collected, an engineering geologist will inspect the removed material and use this data to make an assessment of the ground conditions.

Boreholes: are holes drilled into the ground, either as a vertical or angled narrow shafts. They can be drilled singly or in clusters. For the A417 we'll be drilling boreholes to collect samples and to monitor groundwater levels. This information, once collected, allows an engineering geologist to make an assessment of the ground and groundwater conditions.

What will happen on site?

Trial pits: we'll need an area of approximately 5m x 10m (allowing us to create a safe working zone and have sufficient space to place the excavated soils). It generally takes between 30 minutes to an hour to excavate a trial pit, and we'll carry out inspections during excavation.

Trial pits with soakaway tests: at some trial pit locations, we'll need to dig the pit to a depth of around 2m. We'll then fill the pits with clean water brought to the site using a mobile water tank. We'll monitor the rate the water level decreases in the pit as the water discharges into the ground. Each test will take us no longer than a day to complete and we'll need to repeat the test three times to obtain a reliable result.

Boreholes: we'll need an area of approximately 15m x 10m (allowing us to create a safe working zone and have sufficient space to store equipment and samples temporarily). It takes about three days to drill each borehole. In the soft overlying soils we'll need to use a percussive drilling technique. In solid bedrock we'll use a rotary drilling method to recover core samples. Both techniques of drilling can be undertaken by one type of drill rig, along with associated support equipment and plant machinery. Once ready, each borehole will have a raised cap (100 to 300mm high) concreted at the surface and protected by a small 1 x 1m rail and post, wooden fence.

Boreholes fitted with piezometers: we'll install standpipe piezometers inside nominated boreholes to monitor the groundwater level. We'll need pedestrian access so that we can collect regular data readings. We estimate that these readings will take place about every two weeks, taking about half an hour to complete.
The piezometers will remain in place throughout the construction of the scheme to gather important groundwater data on an ongoing basis.

Once we've completed the excavation and testing, we'll backfill the trial pits/boreholes with excavated materials and the original top soil left until last. We'll leave the ground surface slightly mounded to allow for settlement.

The cone penetration or cone penetrometer test (CPT): this is an in-situ method that we use to determine the engineering properties of the soil strata. The test method consists of pushing a series of steel rods vertically into the ground, utilising hydraulic rams mounted onto either tracked or wheeled trucks.

The tip of a cone attached to the end of the steel rods is instrumented allowing a series of readings to be undertaken in real time. Data is collected to determine a variety of engineering properties such as shear strength, which we'll use in our geotechnical design. The process creates no vibration, is quiet and creates minimal soil disturbance.

Why are we doing them now?

These types of survey are one of the most invasive that we do, but they are vital because the information collected will inform engineering design decisions such as the design of earthworks (slope angles, depth of construction, assessment of materials for re-use as fill and pavements) as well as the design of foundations for any structures and drainage.

We've already conducted surveys over the past couple of years which has helped us draw up the preliminary design of the scheme.

To ensure we can start construction on schedule (if the scheme gets the go-ahead) we need to start looking for a main works contractor. As part of this tender process, we need to gather more in-depth information about the ground and groundwater conditions so that construction companies have a complete picture when they bid to design and build the scheme. We'll also use the information to inform our final detailed design.