

Geotechnical – Subsidence, Dissolution and Slope Stability

Subsidence Investigations and Assessments

Subsidence is seen across the UK typically as cracks, sloping floors, sticking windows and doors in buildings of all kinds.

Subsidence is the variable settlement/heave of a building that can be caused by a variety of issues, including soils prone to shrink/swell, localised soft spots, moisture deficit caused by roots, variation within the natural underlying geology, dissolution and man-made factors, such as mining activity, local excavations and the washing out of fines from around soakaways, sited close to buildings.

From project inception at Ground & Water we can carry out detailed Phase 1 desk studies to identify any potential causes of settlement. This primarily focuses on the geology and hydrology

of underlying soils along with a review of on-site features that may be of interest. This is followed by a Phase 2 ground investigation which involves collecting samples of the underlying soils for further testing to obtain geotechnical parameters. The key parameters assessed include the presence of Made Ground, moisture content, volume change potential of the soils and moisture deficit. Should roots be encountered or suspected then samples will be taken for analysis.

An assessment of the existing foundations will also be carried out with localised trial pit exposures excavated around the building. This information will then be collated into a report and summarised with remediation recommendations.



Chalk Dissolution Risk Assessments

The presence of dissolution features on-site are problematic, as they often provide inconsistencies within the underlying geology. Often formed during glacial and periglacial conditions, the depth and width of these features can vary substantially often resulting in large variances in geological strength data.

Subsidence caused by dissolution features can cause structural damage. Properties affected by dissolution may experience a range of problems including:

- Cracking of walls
- Structural tilting or distortion with minor to major structural damage
- Partial collapse
- Damage to infrastructure such as roads, driveways, pipes and drains

If a dissolution feature is suspected, a geotechnical engineer and structural engineer should be contacted for suitable engineering designs, based on further works identifying and classifying the area the potential feature occupies.

Slope Stability Analyses

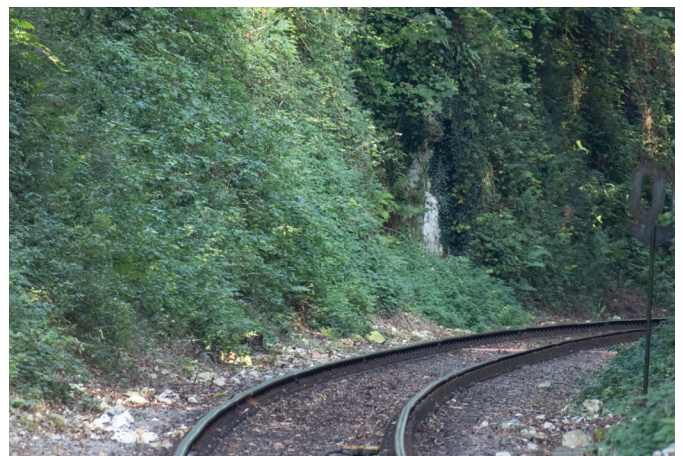
In accordance with Eurocode 7, Ground & Water undertakes slope stability assessments using Geostru software. Slope profiles are modelled from a variety of data, including topographic surveys, elevation drawings, section drawings and site walkovers.

Following site investigation, the encountered geology, geotechnical parameters and hydrogeological conditions can also be modelled. Loads, works of interventions (i.e. foundations, basements, retaining structures) and areas of different geology can also be modelled. Analyses can be undertaken for permeable or impermeable soils.

The risk assessment involves a number of stages:

- A Desk Study is undertaken reviewing all available sources of data to assign a risk rating to the site, ranging from negligible risk through to very high risk
- A Ground Investigation is undertaken to confirm the ground model formulated during the Desk Study
- Design, supervision and validation of an appropriate remedial strategy.

We are happy to discuss any concerns you may have over your developments.



A short-term analysis can be undertaken using undrained parameters, or a more conservative, long-term analysis can be undertaken using drained parameters. **Two analysis options are available:**

- **Janbu Simplified** - Slope failure plains are drawn freely within the slope, assessed and assigned a factor of safety (Figure 1)
- **Bishops** - A grid is drawn above/away from the slope. Each grid square will then be assessed and resulting failure loci will be drawn for each square. A factor of safety is given for each failure loci, with the lowest factor of safety highlighted (Figure 2).

An acceptable factor of safety is considered to be 1.30 (ratio of restoring moment to the disturbing moment).

After the analyses is undertaken, remedial measures could be suggested and analysed using a sensitivity analysis approach, where remedial measures (i.e. reprofiling a slope, deepening a retaining wall or moving a load) are changed and the factor of safety is reassessed. Conclusions and recommendations can then be made.

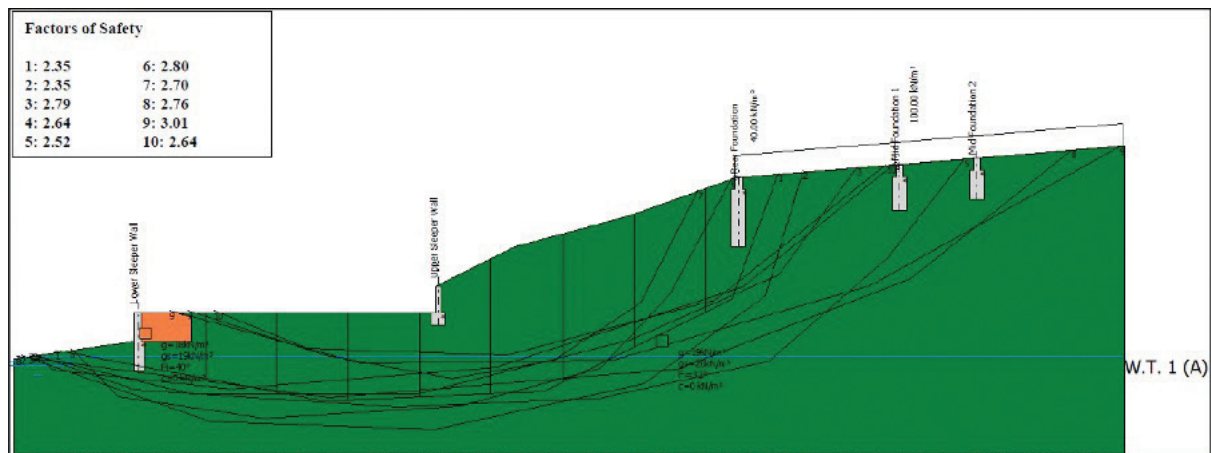


Figure 1: An example of the Janbu simplified method

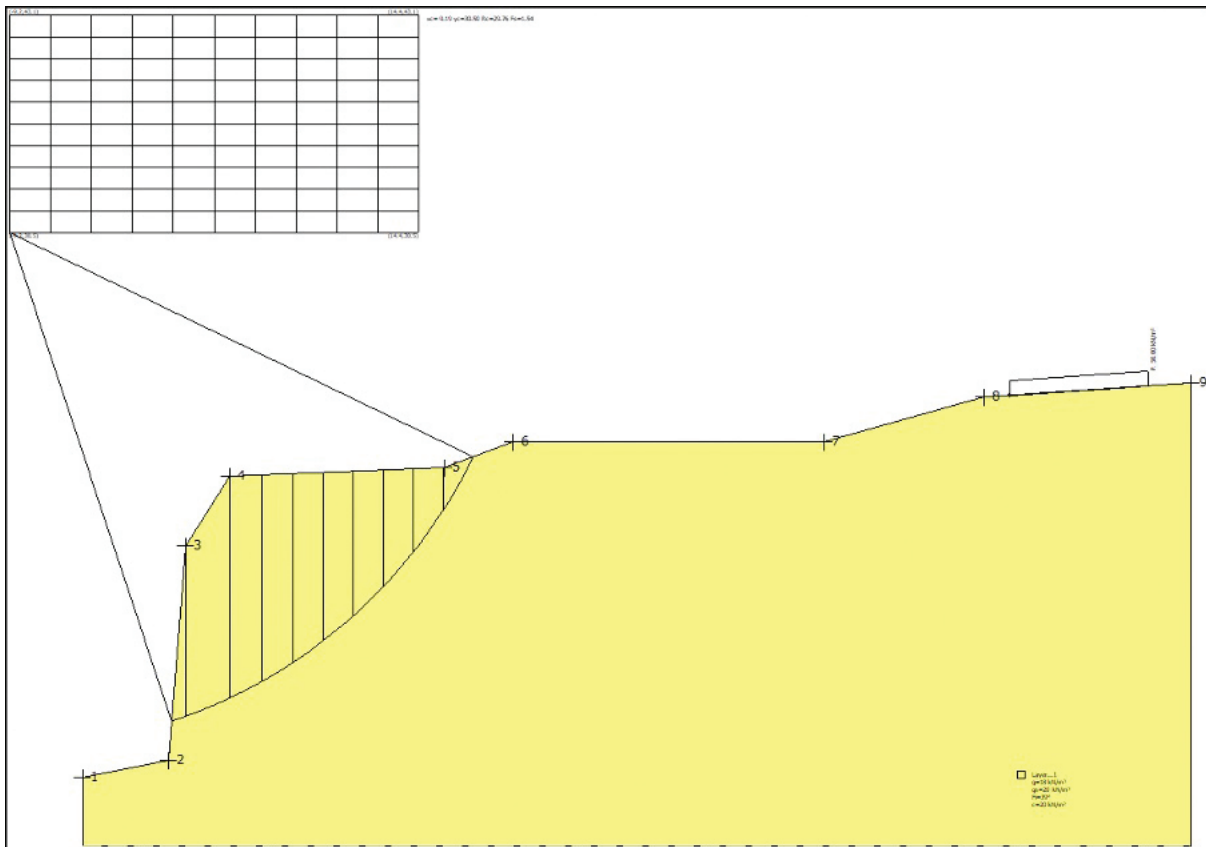


Figure 2: An example of the Bishop's method

If you require any of the services described above, please email: enquiries@groundandwater.co.uk or call us on 0333 600 1221