Southern Testing
Environmental & Geotechnical

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Slope Investigation - Tonbridge Castle, Kent

We were employed by Tonbridge and Malling Council to investigation a portion of the curtain wall embankment around Tonbridge Castle, where evidence of landslip had been observed.

The movement was noted on the eastern limb of the outer keep, which comprises a 6 to 9m high embankment topped to the south by the remains of the outer castle wall. A tarmac footpath runs along the crest to the north, but steps down alongside the outer wall as it approaches the river to the south.

The embankment slopes stand at about 40°, but slip scars were visible just below the footpath and stretched about 30m along the crest of the embankment. Downslope there are several lengths (up to 12m) of toe bulging, with slumping and sloughing of materials, which had result in localised steeper slopes of over 50°.

Ground Investigation

We designed and undertook a detailed ground investigation, which included several restricted access boreholes, installation of slip indicators and a series of DPL dynamic penetration tests along the crest of the embankment. Soil conditions encountered comprised made ground of sands and clays, with natural soil at depth. No groundwater was encountered. Field monitoring results indicated that the slope was experiencing quite shallow landslip, but no significant movement had been recorded at lower depths.

Stability Analysis

A detailed slope stability model was developed based on soil parameters derived from laboratory test results, groundwater monitoring and field test data. The model was verified by back analysis of the failed slope.

Remedial Design

The analysis indicated that without remedial works the slope would continue to fail, principally centred around the path at the top of the embankment. Given the historical importance of the site, the remedial design would need to be managed carefully to avoid any damage to the existing foundations of the castle walls. Various remedial measures were proposed to achieve both the local and overall long-term slope stability. These included soil nailing or regrading the existing slopes together with soil reinforcement by use of gabion walls under the footpath.

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