

Embankment Stabilisation

South Milford Embankment

NORTH YORKSHIRE



Continuous Flight Auger piled retaining wall for failed railway embankment

Introduction

There was a history of embankment instability close to South Milford, Railtrack's strategic freight and East Coast Main Line diversionary route, in North Yorkshire. This culminated in a major failure in February 1995, closing one of the two lines. The closure of even one line was a very serious problem and a solution was urgently required. Bachy Soletanche was approached to assess the slope failure, design a solution and carry out all the remedial works as main contractor.

Ground Conditions

The embankment consisted of ash and stone layers overlaying clay fill. The supporting natural ground was a firm, thinly laminated silty clay with laminae of sandy silt and micaceous sand, over a medium dense sand with bedrock at approximately 14m depth. A previous slip in 1967 had been stabilised at the time with a berm.

Design

The design process initially assessed the conditions in 1967 using archive drawings provided by Railtrack giving the geometry of the original slope and an indication of the probable zone.



Site of major slip failure prior to commencement of remedial work

CLIENT:	Railtrack London N.E.
MAIN CONTRACTOR:	Bachy Soletanche Limited
DURATION OF WORKS:	12 weeks

WORKS QUANTITIES

70m of embankment

84 no. 750mm CFA piles @ 850mm centres to a depth of 14m

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Reinstatement of track onto stabilisation area

Having obtained soil parameters from the back analysis the most recent failure was modelled and remedial measures designed.

An additional soils investigation was undertaken specifically to confirm these soil parameters, with laboratory testing focused on the critical parameters.

At the same time, in advance of the results of the laboratory testing, the construction progressed on the basis of the designed solution.

In particular, the piling platform temporary works were utilised as a temporary berm to provide immediate support and arrest the slope movement in the short term which allowed the line to be reopened more quickly.

Solution

A piled retaining wall was installed through the slip plane using continuous flight auger techniques to provide an adequate factor of safety against failure.

750mm diameter piles were installed at 850mm centres to a depth of 14m over a 70m length at a distance of 9m from the nearest track. The piles were reinforced over their full length.

Additional regrading of the embankment behind the wall was undertaken in conjunction with a permanent berm in front of the wall.

Contract

The design and build contract was carried out by Bachy Soletanche and included the



Contiguous bored pile wall construction

complete process from negotiating access for the piling equipment over the neighbouring farm land, to construction of the capping beam and associated landscaping.

Finally, Bachy Soletanche themselves relayed the track under the supervision of Railtrack's Permanent Way Engineer.

The swift response to both the design and the construction works, and the fact that Bachy Soletanche was able to carry out all associated management for Railtrack as the main contractor ensured that the delay to the traffic on the line was minimised.

Safety Management

As main contractor, Bachy Soletanche took the lead role in determining safe methods of working and in ensuring that all relevant staff were suitably trained and certificated for working in the railway environment, both during the possessions and whilst trains were passing the active work site.