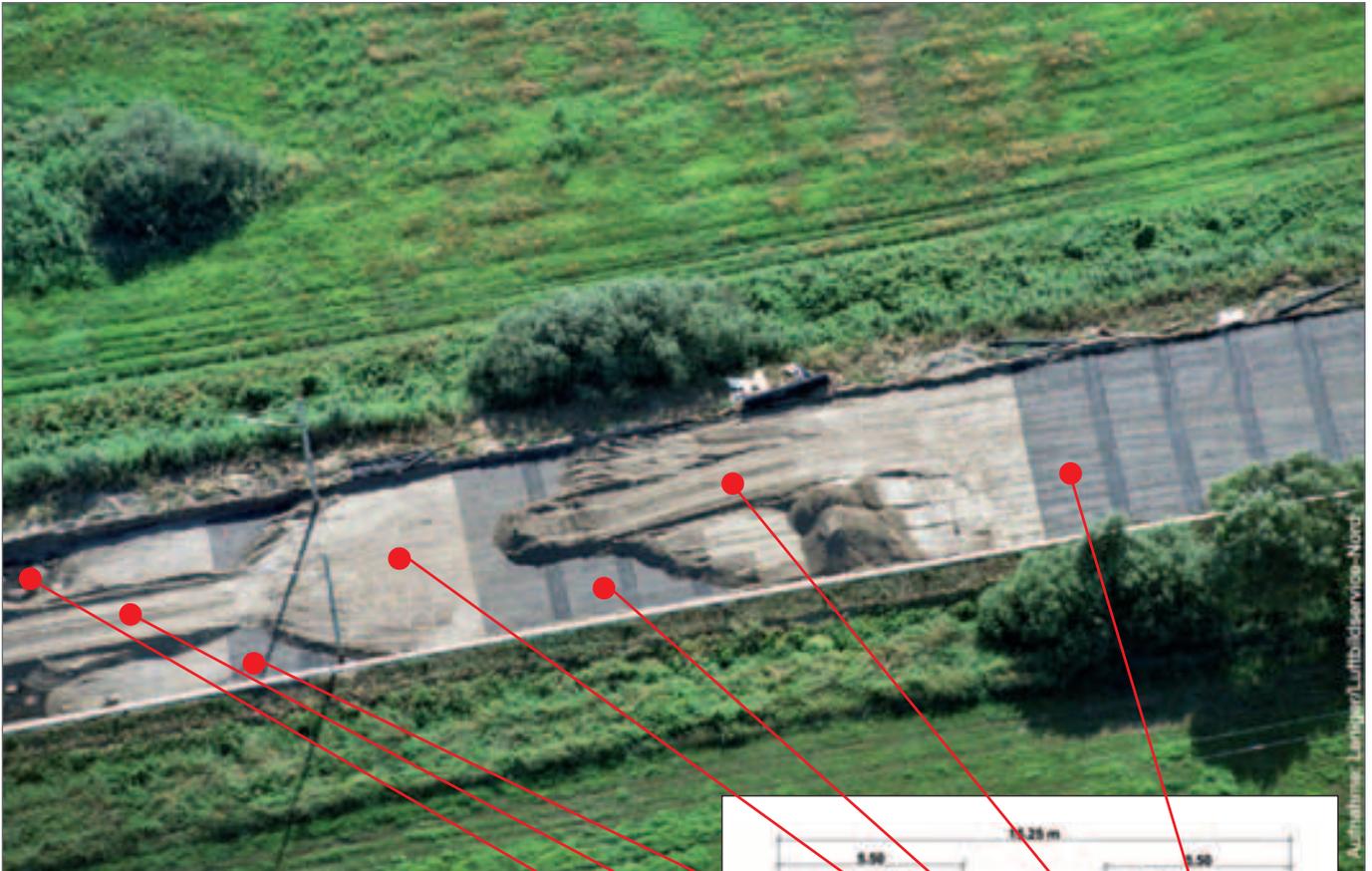
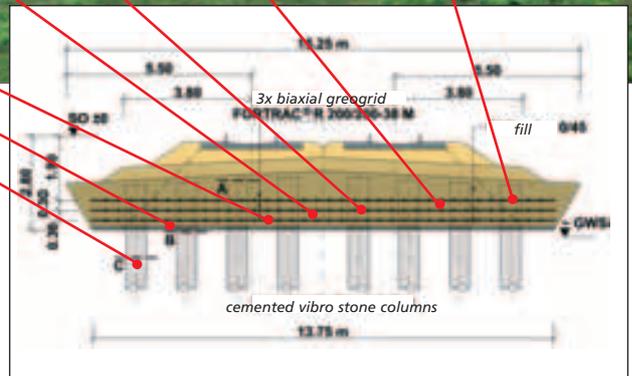


**ICE rail link Hamburg-Berlin, Germany;
Paulinenaue Section
Reinforcement of rail embankment constructed
on piles using Fortrac® geogrids**



Aerial photograph: Paulinenaue Section



Embankment – typical cross section

The situation:

After the high-speed magnetic rail link between Hamburg and Berlin was abandoned, the German Rail company, Deutsche Bahn AG, decided in favour of a second stage improvement of the existing track. This section of line had already been upgraded to a speed of 160 km/h in the 1990s.

The second upgrading allows top speeds of 230 km/h and reduces the journey time from Hamburg (Main Station) to Berlin (Zoo) to around 100 minutes.

The greatest challenge is the 14.5 km length between Paulinenaue-Friesack, which forms part of the Spandau-Neustadt section. The boggy foundation soils there are capable of taking very little load.

The solution:

During the planning phase, DB ProjektBau GmbH was at first in favour of a partial closure with single track operation, as it had been the case in other

sections. After consultation with the joint venture partners, a limited period (76 days) of full closure was adopted, along with a three-shift, 7-day working week.

Work on the section started simultaneously at several sites. At first the existing track bed with the subconstruction was completely removed. The original boggy ground was then replaced to the level of the groundwater table.

The partially injected vibro columns forming the piled foundations were cut off to existing ground level and improved good where necessary. The new embankment was then constructed on this foundation.

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Cut off vibro columns in piled foundation and incorporation of mixed aggregate layer



Rolling out and cutting the geogrid



Placing three layers of Fortrac® geogrid

Three layers of **Fortrac®** PVA geogrid type R 200/200-30 M were placed with a vertical distance of 30 cm over a 20 cm layer of mixed aggregate.

The rolls of geogrid were placed transversely to the track and overlapped by one metre over a 14-metre embankment width. The geogrid was custom-made in 210-metre long rolls so that waste was reduced to a minimum.

The shortened journey times made possible by the completion of this construction project will be incorporated into the new timetable at the end of 2004.

Due to the excellent cooperation between all parties the project was finished within the extremely short period of 76 days.

Project/

Location: ICE rail link Hamburg-Berlin;
Paulinenaue Section

Client: DB ProjektBau GmbH

Contractor: Joint Venture ABS
Hamburg-Berlin, PRA 1
Wittfeld, Wiebe, v.d. Wettern,
Freitag and Matthäi

Constructed: Summer 2003

Product: **Fortrac®** geogrid, type R 200/200-30 M



Embankment fill

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