

Embankments on Piles

Earthworks and Foundations

A63 Selby Bypass, North Yorkshire, UK Piled Embankment Reinforced using Fortrac® MP Geogrids



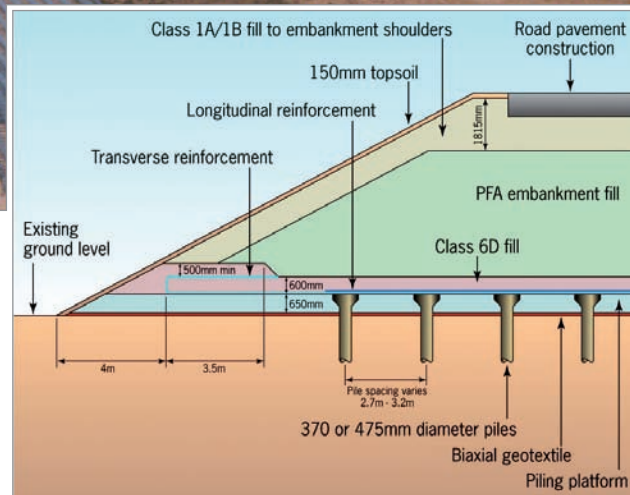
Picture 1: **Fortrac®** Reinforcement Rolls

Situation

The A63 Selby Bypass officially opened on 11th of June 2004. The scheme consists of 6.1 miles (9.8 km) of a single carriageway road bypassing the town of Selby. Prior to the bypass both the A19 and the A63 passed through the centre of Selby causing problems with congestion delays and safety through the town centre. The bypass scheme was proposed to reduce these delays, improve road safety by removing through traffic and enhance the environment in Selby town centre itself. The Highways Agency awarded this Design & Build Contract to Skanska in 2001 with High Point Rendel as their design consultants.

The project required embankments up to 9 m high to carry the bypass over the Selby Canal, the River Ouse and two railway lines. The ground conditions beneath the highest proposed embankments which cross the Ouse flood plain included highly variable recent alluvial deposits. These included 4m to 6m of soft and very soft, highly compressible peats, silts and clay soils with moisture contents 50% and 350% reported.

Strict performance criteria regarding vertical and differential settlements were stipulated in the client requirements. A variety of options were considered to support the road embankments in these locations, with a piled embankment incorporating HUESKER's high modulus **Fortrac® MP**



geogrid being deemed to provide the optimal solution providing both programme and cost certainties whilst satisfying the long term settlement criteria.

Solution

Driven, cast-in situ piles were chosen as the most suitable piling method. This technique allows for a 'mushroom head' pile cap to be formed as part of the individual pile construction, allowing for local variations in soil depth and minimising pile concrete wastage. The integral pile cap was reinforced to resist both wheel loading from construction vehicles prior to the embankment fill placement as well as the permanent loadings which would be imposed via the geosynthetic reinforcement spanning between the pile caps.

Embankments on Piles

Earthworks and Foundations



Picture 2: **Fortrac® MP** with installing aid



Picture 3: Preparing the regulating layer over pile heads



Picture 4: Installed measurement instruments

The piles essentially transfer the vertical and horizontal loads from the embankment fill on to the dense granular deposits of sand overlying the sandstone bedrock. Piles of 370mm and 425mm diameters were used for the foundations under the Basal Reinforced Platform, (BRP). The **Fortrac®** geosynthetic reinforcement was incorporated to bridge across the tops of pile caps, distributing the weight of the new embankment and maximizing the economic benefits of the piles.

The design of the piles was further optimised by the use of a lightweight embankment fill which allowed the pile spacing to be opened up. Furthermore the contractor installed measurement devices to monitor the geosynthetic strain development and lateral pile deformations.

The British Standard BS 8006:1995 was used to design the Basal Reinforced Platform (BRP).

The geogrids used for the BRP (The British Standard BS) were HUESKER's **Fortrac® MP** geogrid with an ultimate tensile strength 1200 to 1600 kN/m. **Fortrac® MP** is a high modulus low creep geosynthetic produced from Polyvinyl Alcohol (PVA). The **Fortrac® MP** range of geogrids was specified by the designers as they provided the optimal stress/strain characteristics of high strength and low strain.

The Advantages

- Immediate use of the embankment, without waiting for settlement to occur.
- Low Maintenance: Minimised deformation of the embankment after construction.
- Ability to use secondary recycled fill material for embankment construction.
- **Fortrac® MP** geogrids provided high strength and low strain reinforcement.
- Customised **Fortrac®** roll lengths minimised waste on site.
- Economic solution providing cost and program certainties.

Location: A63 Selby Bypass, North Yorkshire, England

Client: Highways Agency

Consultant: High Point Rendel

Construction: 2002/4

Contractor: Skanska

Products: **Fortrac® R 1200/30-30MP**
Fortrac® R 1600/50-30MP

HUESKER Synthetic GmbH

Fabrikstrasse 13-15, D-48712 Gescher
Phone: + 49 (0) 25 42 / 701 - 0
Fax: + 49 (0) 25 42 / 701 - 499
E-Mail: info@HUESKER.de
Internet: www.HUESKER.com

