Reservoir renovation project - Grassholme Reservoir

Embankment stability works

- **Project name**
  Grassholme Reservoir, County Durham, UK
- **Client**
  Northumbrian Water Ltd, UK
- **Designer/Consultant**
  Esh Stantec, UK
- **Contractor/Installer**
  Groundwork Services Durham Ltd, UK
- **Products**
  Secugrid® 80/20 R6
  Carbofol® HDPE
  Secutex® R 501
  Secutex® HT 7

Grassholme Reservoir is an impounding reservoir situated in Lunedale, a side valley of the river Tees, just south of Middleton-in-Teesdale and immediately downstream of Selset Reservoir.

Owned by Northumbrian Water, Grassholme lies in picturesque rolling pasture land and supplies water for Teesdale and Teesside. In addition, with four miles of bank space and numerous inlets and bays, Grassholme Reservoir offers a wide variety of fishing and is renowned for being one of the best ‘any method’ fisheries in the country.

River versus dam - stabilisation of a dam required

At the foot of Grassholme Reservoir’s Northern Embankment, the meandering Carl Beck river had been eating away at the toe of the slope to such an extent that the stability and integrity of the embankment was becoming a cause for concern.

Northumbrian Water Ltd (NWL), working together with supply partner Esh Stantec, sought planning permission to reshape the land, in order to bolster the embankment, and to realign the course of the adjacent waterway to prevent a future repeat of the problem.

Some sections of stone walling will also be realigned, and the existing track along the back of the Northern Spillway tumble bay, which has been used as a construction access track, will be reinstated when the earthworks are completed, along with a geogrid-reinforced turning area.

Esh Stantec approved a range of Naue's geotextile products for installation during the 3-year project at Grassholme, where the essential maintenance and improvement works will ensure the reservoir’s future resilience to high water levels.

How to ensure the reservoir's future resilience to high water levels?

A quick and cost-effective geogrid solution was required to reinforce the 800mm deep backfill layers placed behind rows of interlocking precast concrete blocks. The material selected for the project was Naue’s Secugrid® 80/20 R6 - a uniaxial geogrid made from stretched, monolithic, textured polyester flat bars with welded junctions.

“Secugrid® is the ideal solution for embankment applications where locally available soils are being employed” explains Steven Airey, Naue’s Infrastructure Manager. “The material’s high tensile strength has the capacity to mitigate differential settlements in heterogeneous subsoils, and long-term stability is achievable, even on very steep inclines.” At Grassholme, screened materials from an adjacent borrow pit have been used as backfill on the embankment.

The realigned section of Carl Beck has been set around 25 metres north of its original course, in a wide arc, which directs flow away from the embankment. Civil engineering company, Groundwork Services, initially installed a layer of Secutex® HT 7 directly onto the newly-profiled bed to provide protection for a layer of Naue’s Carbofol® HDPE liner. To complete the installation, a final layer of Secutex® R 501 was placed above the Carbofol® membrane to protect the liner from accidental damage during placement of the 100cm deep layer of fill material taken from the borrow pit, along with materials reclaimed from the original watercourse.

The impermeable Carbofol® liner is 1.5mm thick, and has an embossed structured surface on both sides to guarantee a secure frictional interface with the Secutex® layers above and below. Carbofol® is manufactured in a range of thicknesses, with any combination of smooth or textured surfaces, and on rolls up to 7.5m wide. Naue supplied 5 of the widest rolls for the project, each 150m in length. In addition, Carbofol® has a High Melt Flow Index (MFI), which is ideal for welding at joins, but also makes Carbofol® geomembranes flexible and easy to handle during installation.

The remedial works undertaken on the northern embankment, adjacent to the dam wall, are just part of a £14.5m programme of upgrades which will bolster the reservoir’s resilience and expand facilities for leisure visitors at the site. As a result of the upgrades, the reservoir’s capacity and top water level will be permanently reduced to help protect the Victorian dam wall during extreme flooding.

00952