

Construction alongside HS2 route in Warwickshire - UK

Lining of a balancing pond

- **Project name**
HS2 Attenuation Pond, Long Itchington Wood, Warwickshire, UK
- **Client**
High Speed Two Ltd (HS2), UK
- **Design consultant**
Ramboll UK Ltd
- **Contractor/Installer**
LM JV (Laing O'Rourke / J. Murphy & Sons)
- **Product**
Bentofix® X2 NSP4900



Photograph ©2020 Richard Clifford



The planning and construction of HS2 is a colossal undertaking on a scale not seen in the UK for decades and is currently the largest live infrastructure project in Europe. The works to deliver this high-speed railway are complex and, for Phase One from London to Birmingham, early works are being carried out by LM – a joint venture between Laing O'Rourke and J. Murphy & Sons.

In Warwickshire, just north of Long Itchington Wood, these preparatory operations include the development of a main compound area with office space and welfare facilities, plus storage areas for materials and equipment, and the tunnel being constructed at Long Itchington will enable HS2 trains to pass directly beneath one of the county's largest areas of ancient woodland. The area is protected under the Wildlife and Countryside Act, and measures to avoid loss of the woodland were developed in consultation with Natural England.

HS2 run-off management through the construction of an equalisation basin

The balancing pond is situated alongside an embankment to the east side of the track - just south of the new Longhole Viaduct crossing the Grand Union Canal, and just north of the cutting at the north portal to Long Itchington Wood Tunnel.

In the short term, the attenuation pond at Long Itchington will be used to manage run-off from the construction compound, which could potentially carry hydrocarbon pollutants from equipment and activities within the compound. In the long term, however, once the compound area is returned to its natural state and trains are brought into service, the pond will be employed to manage run-off from the HS2 line; again, with the prospect of run-off water, including particulate contaminants, such as heavy metals and hydrocarbons, emanating from passing trains.

Bentofix® instead of clay - saving costs and minimising CO₂ emissions

Draft design specifications for the pond construction proposed the use of puddle clay as a basal lining material. However, with no local source of clay available, it would have required transportation to site involving hundreds of goods vehicle movements on and off the site.

In comparison, by employing Naue Bentofix® X2 NSP 4900 GCL, just two deliveries to the site were required; a highly cost-effective solution which would also deliver significant reductions in carbon emissions.

For Phase One civil assets, such as tunnels, viaducts and cuttings, HS2 Ltd is working to PAS 2080 – the global standard for reducing carbon in infrastructure – and a target of 50% carbon reduction on construction baselines has been set. The PAS 2080 framework assesses the whole construction process and aims to reduce carbon and cost through intelligent design, construction and use. Before any aspect of the new high-speed railway is designed or built, HS2 considers whether it can be 'built clever', and the use of low-carbon solutions is explored in order to minimise resource consumption during construction and operation.

Naue Bentofix® X2 NSP 4900 is a needle-punched, reinforced composite geotextile, incorporating a uniform core of high-swelling natural sodium bentonite powder sandwiched between 2 durable geotextile layers; an upper-facing woven layer and a nonwoven bottom layer. In addition, a 0.2mm polyethylene coating is extruded onto the woven side during manufacture.

The result is a uniform, multi-directional, shear-resistant hydraulic barrier with self-sealing and re-healing characteristics. The polyethylene extrusion-coated GCL provides an immediate barrier to moisture and gases, and the polymer coating is resistant to delamination. Naue Bentofix® X2 was the material of choice for this project not only for its proven sealing capabilities, but also because the PE coating provides a secure barrier to ensure that any pollutants in the collected run-off water are contained and unable to leach into the subsoils.

With a depth of 1.2m, 1:3 sloping sides, and a base area of 6750m², the pond is designed to accommodate a 1 in 100-year flood event, with a maximum containment volume of up to 8,745m³. The design also includes a rock-filled gabion basket dam; creating a sediment forebay to provide filtration and to restrict the speed at which water is discharged into local watercourses.

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