

NAUE's Bentofix® GCL for new M8 motorway junction

The village of Bishopton, in north east Renfrewshire, Scotland, is bounded by the M8 motorway to the east and the A8 on its western side. Just a mile south of the River Clyde, and around 12 miles to the north west of Glasgow, Bishopton enjoys easy access to Glasgow International Airport, and the area has seen a significant growth in the volume of residential property over recent years, especially with the adjacent development of Dargavel Village on the former Royal Ordnance Factory site.

Although Bishopton sits alongside the M8, access to the motorway network has always been via junction 30, near Erskine, or junction 29 near Paisley but, in January 2017, construction work commenced on the motorway's new junction 29A, where it intersects with the A8, close to Bishopton.

CASE STUDY

Project Name:	M8 – Bishopton Link Road
Date:	June 2017
Contractor:	Morgan Sindall
Installer:	D Morgan plc
Consultant:	Dougall Baillie Associates
Product:	Bentofix® NSP4900

Specification of NAUE's Bentofix® NSP4900 Geosynthetic Clay Liner, for civil engineering works at a new junction on the M8 motorway, has provided the impermeable water barrier required following installation of band drains for the new Bishopton Link carriageway, and also for associated SUDS construction.





This £14 million three-year project is the single largest road infrastructure investment Renfrewshire has seen, and will provide commuters and local residents with direct access eastbound and an exit off the M8 westbound; greatly enhancing Bishopton's connectivity to the wider region. The work is being undertaken in stages by construction and infrastructure company Morgan Sindall and, as well as realignment of the A8, the project will involve the creation of two new roundabouts, large embankments for slip roads, plus associated infrastructure such as cycle paths, pedestrian areas, street lighting and drainage.

In consultation with Renfrewshire Council, SEPA, Transport Scotland and BAA (Glasgow Airport), Dougall Baillie Associates, one of the region's largest consultancy firms, prepared a comprehensive Flood Risk Assessment & Surface Water Management Scheme for this strategic infrastructure project.

The scheme, designed to comply with Water Environment (Controlled Activities) (Scotland) Regulations 2005, and to meet Adopting Authority requirements, included specialist designs to mitigate existing water pollution arising from landfill leachate as well as watercourse diversions and restorations, bridging structures and SUDS attenuation and treatment wetlands.

During construction, the contractors are expected to lay more than 27,000m² of surface drains and install more than 43 miles

of vertical drains, and designs for drainage at the site also include the formation of three attenuation ponds.

Due to the nature of the underlying geology, the site has been subjected to a preloading consolidation process to remove excess pore water pressures. A preloading programme can be designed to induce settlement in an accelerated time frame and minimise long term residual settlements – following preloading at the Bishopton site, engineers determined that a period of 404 days must elapse prior to the continuation of highway construction work.

To prevent any pore water from rising to the surface after band drains were installed, and after pre-loading, a layer of NAUE's Bentofix[®] NSP4900 geosynthetic clay liner (GCL) was laid over a 500mm deep starter drainage layer of Class 6C aggregate. Bentofix[®] NSP4900 is a multi-directional shear strength transmitting GCL, comprising a uniform layer of 100% natural sodium bentonite, encapsulated between two layers of needle-punched geotextile material; one layer woven and the other non-woven. Additional bentonite powder is impregnated into a 500mm overlap area on both longitudinal sides of one layer and, once hydrated, the natural sodium bentonite immediately expands; safely self-sealing overlaps, as well as any unexpected mechanical damage incurred during the installation, to form a water resistant lining, with virtually unlimited lifespan. To facilitate drainage of any water from the upper face of the Bentofix[®] liner, a geocomposite drainage layer was installed directly above the Bentofix layer, followed by further layers of aggregate and landscape fill.

The proposed SUDS ponds will provide attenuation and natural, robust filtration treatment of run-off water from the roundabouts and slip roads being constructed at the new interchange and, in addition, designs for the ponds will take into account the proximity of Glasgow Airport – discouraging large birds from roosting and feeding at the ponds will help to mitigate the risk of bird-strike to aircraft. Initially, just one pond is being constructed and the other two ponds will be completed over the subsequent two year period. A series of existing ponds, immediately to the west of the M8, are also being retained and will continue to provide important treatment of surface water run-offs from the historic landfill site.

NAUE's Bentofix[®] NSP4900 has also been employed in creation of the first attenuation pond; providing a cost-effective alternative to a traditional compacted clay barrier. Lining the excavation with Bentofix[®] NSP4900 creates an impermeable barrier to prevent any pollutants entering the pond, and ensuring the integrity of the water quality reaching downstream watercourses.

From the new junction, all drainage will ultimately run to existing outfalls and watercourses – the most significant of which is the Linn Burn, a tributary of the River Gryffe. The new junction is expected to be open to the public in early 2020, but the new drainage ponds will also improve biodiversity and provide positive benefits for flora and fauna in the area.

To date, NAUE have supplied a total of 25,000m² of Bentofix[®] for the project. Just 6mm thick, and supplied on 50m long, 5m wide rolls, the liner is simply rolled out across the prepared site, with the robust geotextile layers ensuring protection for the sodium bentonite layer; guaranteeing its long-term performance.