

# Combigrid® Secugrid®

Geogrid-reinforced piling mat

Project name  
RHS Garden Bridgewater, Worsley,  
Greater Manchester, UK

Client  
RoC Consulting, UK

Supplier  
BAM Construction, UK

Product  
Combigrid® 40/40 Q1 GRK 4 C  
Secugrid® 40/40 Q1





At the historic site of the Royal Horticultural Society's fifth Garden at Worsley, Greater Manchester, Naue Geosynthetic's Combigrid® and Secugrid® products were used to create a layered geogrid-reinforced piling mat in preparation for construction of the new visitor centre or 'Welcome Building'.

Completed in 1845, Worsley New Hall was a notable residence of its era, and the estate's magnificent landscaped gardens developed over the following 50 years. Sloping ground to the south of the hall was worked into a formal terraced garden, with gravel paths and ornate fountains and, beyond the terraces, landscaped parkland extended to a large lake with an island accessed via a footbridge. There was an area of woodland towards the west of the hall, plus formal gardens, a croquet lawn and tennis court, as well as 11-acres of walled kitchen gardens.

During the First World War, however, the hall became a British Red Cross hospital and sadly, in the post-war period, the hall and gardens fell into decline. In the Second World War, parts of the hall were requisitioned by the War Office, and the gardens became training grounds for the Lancashire Fusiliers.

In 1943, however, the building was badly damaged by fire and by the end of the decade had been demolished. Subsequent years have seen parts of the grounds used as a rifle range, a Scout camp and a garden centre.

Reviving the gardens of the historic 156-acre Worsley New Hall estate to create RHS Garden Bridgewater represents one of the largest gardening projects in Europe at this time. Full planning permission for the £30m project was granted in June 2017 and the first phase of the garden will open to the public in 2020.

This will be the Society's fifth garden and the biggest project the charity has ever undertaken. As well as providing a spectacular visitor attraction the project will provide an invaluable educational and horticultural resource, and is expected to create more than 140 jobs in the garden and a further 180 in the local economy by 2029.

For design of onsite highways and drainage, as well as a new feature lake, the RHS appointed RoC Consulting's award-winning team of civil and structural engineers. RoC's Earth Sciences division, established in 2005 to provide geo-environmental and geotechnical advice on issues relating to ground risk and quality, carried out site investigations of the underlying sub-strata in order to inform foundation and pavement design.

The team's work involved developing practical and cost-effective solutions for ground improvement to address the soft, weak soils that underlie the site, and working with the Architectural team on designing the new Visitor Centre, which incorporates a timber glulam roof supported by freestanding concrete columns.

## Challenge

Ground conditions at the site of the new Visitor Centre were far from ideal, and the high levels of peat found in the sub-soil had pre-determined the need for a piled foundation. However, testing undertaken at the formation level had yielded CBR results as low as 0.2%, and provision of a solid piling mat platform for the rig to carry out operations was going to require significant stabilisation of the build site.

Structural design options for construction of a working platform both with and without geogrid reinforcement were investigated but, with no mechanical reinforcement, the depth of aggregate required was substantial, and the cost of installation prohibitive.

## Solution

Working with RoC Consulting and BAM Construction, Naues' engineers put forward a proposal to first install a layer of Combigrid® 40/40 Q1 GRK 4 C, directly to the peaty base layer, followed by a 200mm capping layer. It was calculated that this would achieve a minimum CBR rating of 1%, and provide the starting point to construct a stable piling mat, to BRE470 standards and guidelines, which would safely resist the loadings of the piling rig and the piling operations.

To meet these requirements, the capping layer was overlaid with a further geogrid layer – Naue's Secugrid® 40/40 Q1 – followed by a 560mm deep layer of well-graded, crushed aggregate. Despite poor weather conditions at the time of installation, the first stage of the geogrid-reinforced platform, with its Combigrid® base layer, facilitated construction plant movements around the site during completion of the second stage.

Combigrid® is a composite product of a Secugrid® geogrid, with a needle-punched Secutex® nonwoven geotextile firmly welded between the reinforcement bars to provide long term filter stability.

Combigrid® is ideal for application on weak sub-soils with low CBR values and where filter and separating properties are required. The monolithic flat polymer bars used in the manufacture of Combigrid® are extremely robust and resist service tensile force loading with very low elongation; allowing it to form an immediate interlock with the capping layer.

Secugrid® 40/40 Q1 is manufactured from extruded polypropylene bars, with welded rigid junctions, and has a tensile strength of 40kN/m in both directions. Both of these geogrids are supplied on 4.75m wide x 100m long rolls, and are quick and easy to install in all weather conditions; simply roll out on site, with basic overlaps, and trim with standard cutting tools