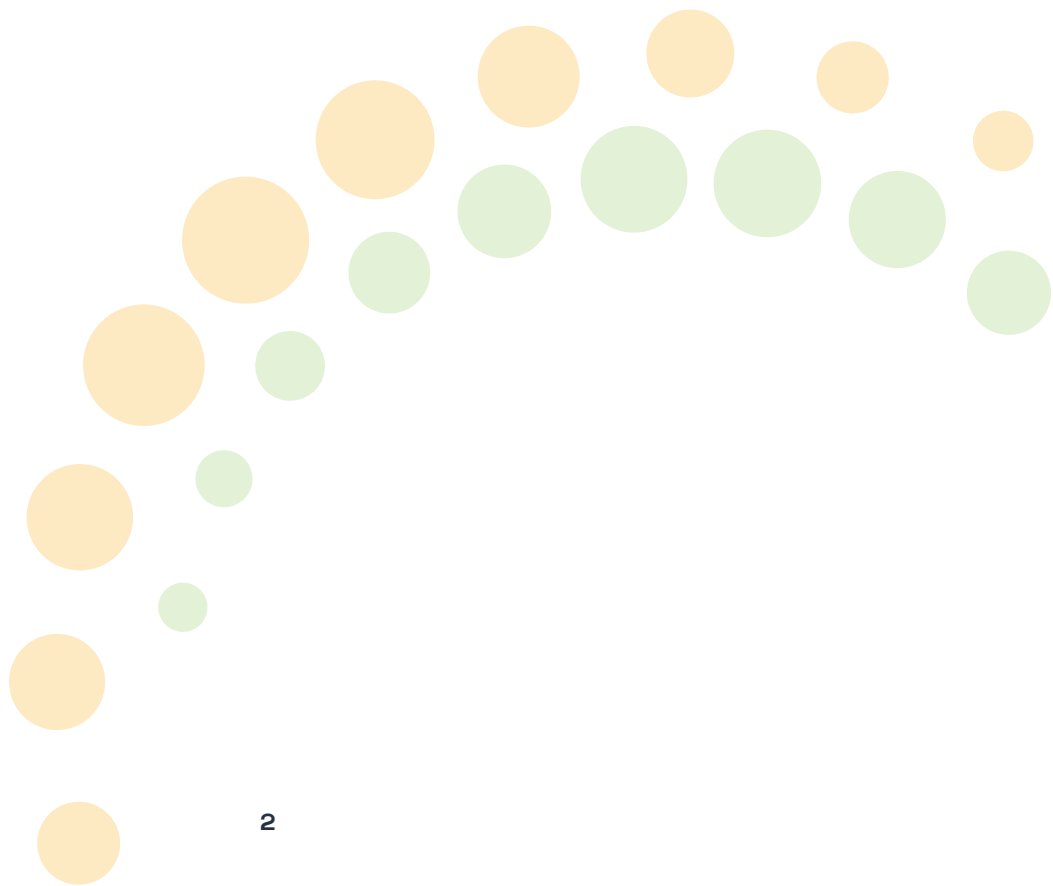




Mining

High quality geosynthetic systems
for mining applications



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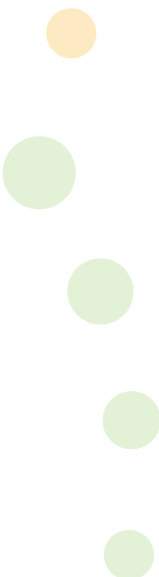
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- **Challenges in mine engineering**

Mining facilities, such as gold, silver, iron and copper ore extraction locations, store their slurry in earthen tailings dams constructed from the mine's waste materials.

With the advent of heavier and more extreme rainfall events in mining regions across the world, tailings dams, especially those constructed using upstream raises, are particularly prone to collapse as the tailings become saturated and the water level behind the structure rises.

This poses a serious threat to downstream communities, with many high profile catastrophes occurring in recent years following the collapse of unstable mine waste storage dams.

Geotechnical engineers and mine operators are specifically being questioned on the suitability of the drainage and erosion control systems when looking at potential signs of weakness.

This has led to geosynthetic based methods being sought to provide more consistent and controlled drainage of mine tailings to prevent future failures.

Better recovery and a reduction of the volume of water consumed during mining operations in arid regions is also a key challenge facing today's operators.

• The advantages of geosynthetics in mining applications

To create safer, more stable mining facilities with improved process water conservation, geosynthetic drainage and capping layers are specified.

Many sites are restricted by their topography, with limited space for tailings storage that require an efficient solution to rapidly dewater tailings.

ABG's high performance geocomposites provide an all-in-one drainage and membrane layer. The geocomposites are utilised for basin lining, slope drainage and capping system applications to deliver a cost-effective design that speeds up the dewatering and consolidation time of tailings and serves as an impermeable barrier.

The high-flow and consistent drainage capacity facilitates the greater recovery of water for reuse in the mineral separation process. This is a key consideration in arid regions and provides additional safety and storage volume for managing tailings with higher fluid content.

The Pozidrain solution and range of integrated geotextiles are specified to provide the required flow capacity and specific filtration characteristics to match the tailings content.

As a tailings dam drainage and lining solution it provides a defined and high flow capacity in both directions with an impermeable HDPE underside and flat seldedge for joining and overlapping. The result is a safer and more stable tailings stack, with less pressure on dam walls and a decreased risk of tailings liquefaction.

Pozidrain is manufactured from virgin polymer to ensure long-term compressive strength reliability and to reduce the variability of creep performance that is a limiting factor with products made from recycled plastics.

Our high-quality nonwoven geotextiles, geogrids and HDPE geomembranes complete the range of options for tailings storage management and ground stabilisation applications in the mining sector.



Geocomposite solutions

High-flow drainage geocomposites for accelerated mine tailings consolidation

Geomembrane liners

Impermeable HDPE geomembranes for basal lining applications

Geotextile layers

Nonwoven filtration, separation and protection layers to control the settlement of different material thicknesses and protect liners against damage.



• Geosynthetics Manufacturing

ABG are specialist manufacturers of geosynthetics for use in civil engineering and geotechnical applications. Our mining sector solutions encompass:

- Geocomposite lining layers consisting of a combination of filter and protection geotextiles with integral cusped drainage core
- Innovative reinforced earth retaining wall systems
- Erosion control products including Erosaweb® and many other specialist geotextile and geomembrane components
- Working platforms and haul road design
- Solutions to improve the recovery of water resources and tailings stabilisation
- Integrated technical support; from detailed design to project installation guidance

Typical applications:

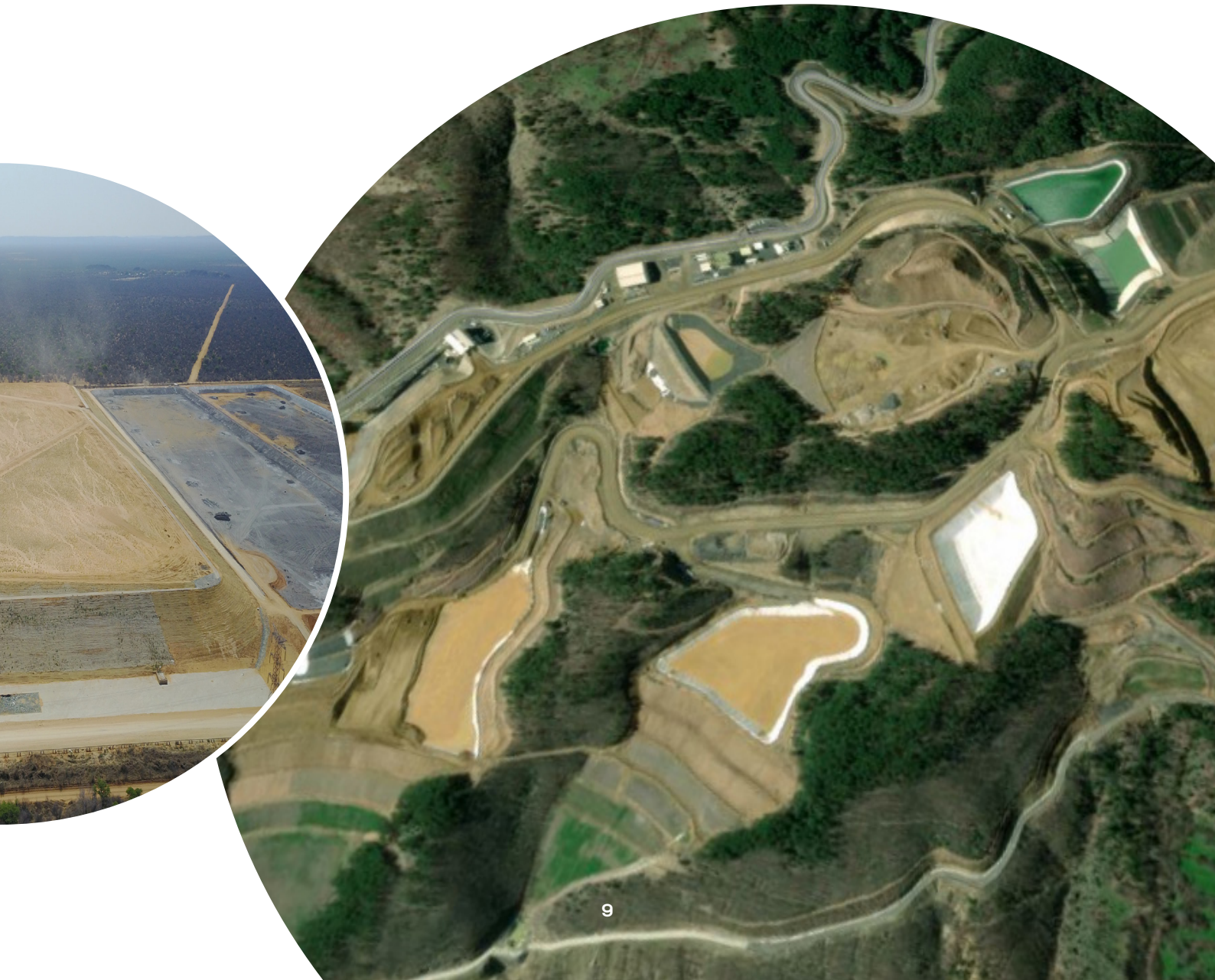
- Tailings Drainage & Stabilisation
- Basal & Slope Lining Systems
- Filtration, Separation & Protection Layers
- Erosion Control
- Legacy Mine Remediation
- Haul / Access Road Stabilisation



● Mining Solutions

Our product range delivers the key functions required for mining applications:

- Robustness to withstand installation and service life
- Superior drainage
- Stability and shear resistance solutions for steep slopes
- Accelerated consolidation rates
- Carbon footprint saving materials and construction techniques
- Geogrid, geocomposite, geomembrane and geotextile based design solutions



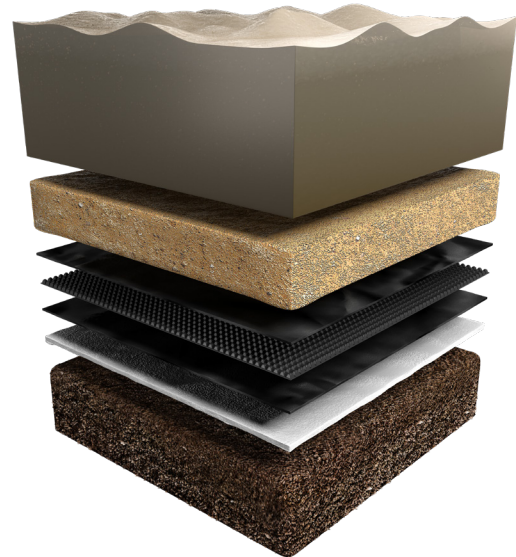
● Mine tailings consolidation

Drainage is a critical consideration in mine waste treatment applications and effective drainage of the tailings dam and leach pads plays a key part in the safety and success of the overall mining operation.

At ABG we are specialists in the design, manufacture and supply of geosynthetic drainage systems for civil engineering projects, including a range of advanced geocomposites specially designed for mining applications.

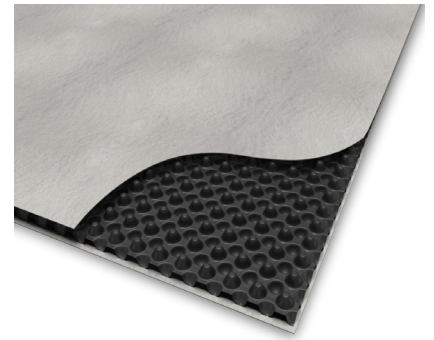
Our experience also includes a long track record of project experience in delivering accelerated fill consolidation, leak detection and containment systems for the mineral processing and coal production industries.

When used in place of traditional drainage stone, geocomposite products deliver a significant reduction in the environmental impact, as well as reducing costs and installation times.

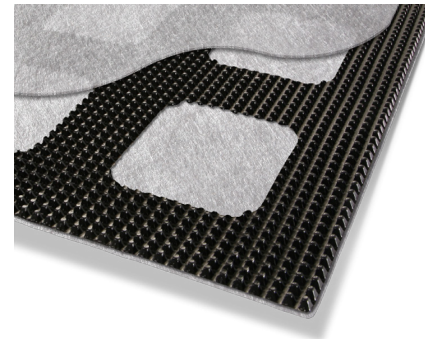


● Mine tailings consolidation solutions

Pozidrain® sub-surface drainage using a horizontal layer of geocomposite to replace the need for granular drainage layers, as well as relieving pore pressure and accelerating consolidation. Available bonded to a range of geotextiles to suit the ground conditions and the site specific application.



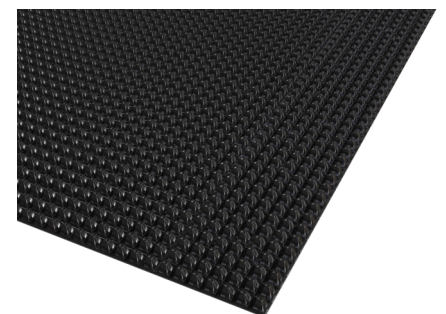
Pozidrain® G geocomposite has a lattice structure core which offers superior interface friction performance for drainage applications on steep slopes. A primary application for mining projects is for the rapid consolidation and settlement of new dam process structures.



Pozidrain® K all-in-one geocomposite system comprises an impermeable back HDPE cusped drainage core and a geotextile bonded on one or both sides. This version of Pozidrain delivers excellent performance for capping and long-term creep resistance for deep loading applications. The addition of a flat selvedge down one edge of the Pozidrain rolls enables a pressure seal between adjacent rolls for leakage prevention.



Leakdrain® drainage composite is designed for use as a leak detection layer between multiple linings within basal containment systems. Leakdrain is available in three core thicknesses of 3mm, 5mm and 6mm and in four strength grades; Standard, Super, Hyper and Ultra for long-term loadings up to 250kPa, 500kPa, 1,000kPa and 1,300kPa respectively.



- **Mine tailings drainage with Pozidrain®**

The El Soldado copper mine is located in the Nogales district of central Chile, 125km northwest of Santiago. It is the largest of the known copper deposits in central Chile and operations first started at the site in 1980. It has been majority owned by Anglo American since 2002 and produces approximately 42,000 tonnes of copper each year.

ABG's high performance Pozidrain geocomposite was specified to provide an all-in-one drainage and membrane lining layer for the tailings storage facility. The solution delivers a cost effective design that provides factory consistent drainage capacity and serves as an impermeable barrier.

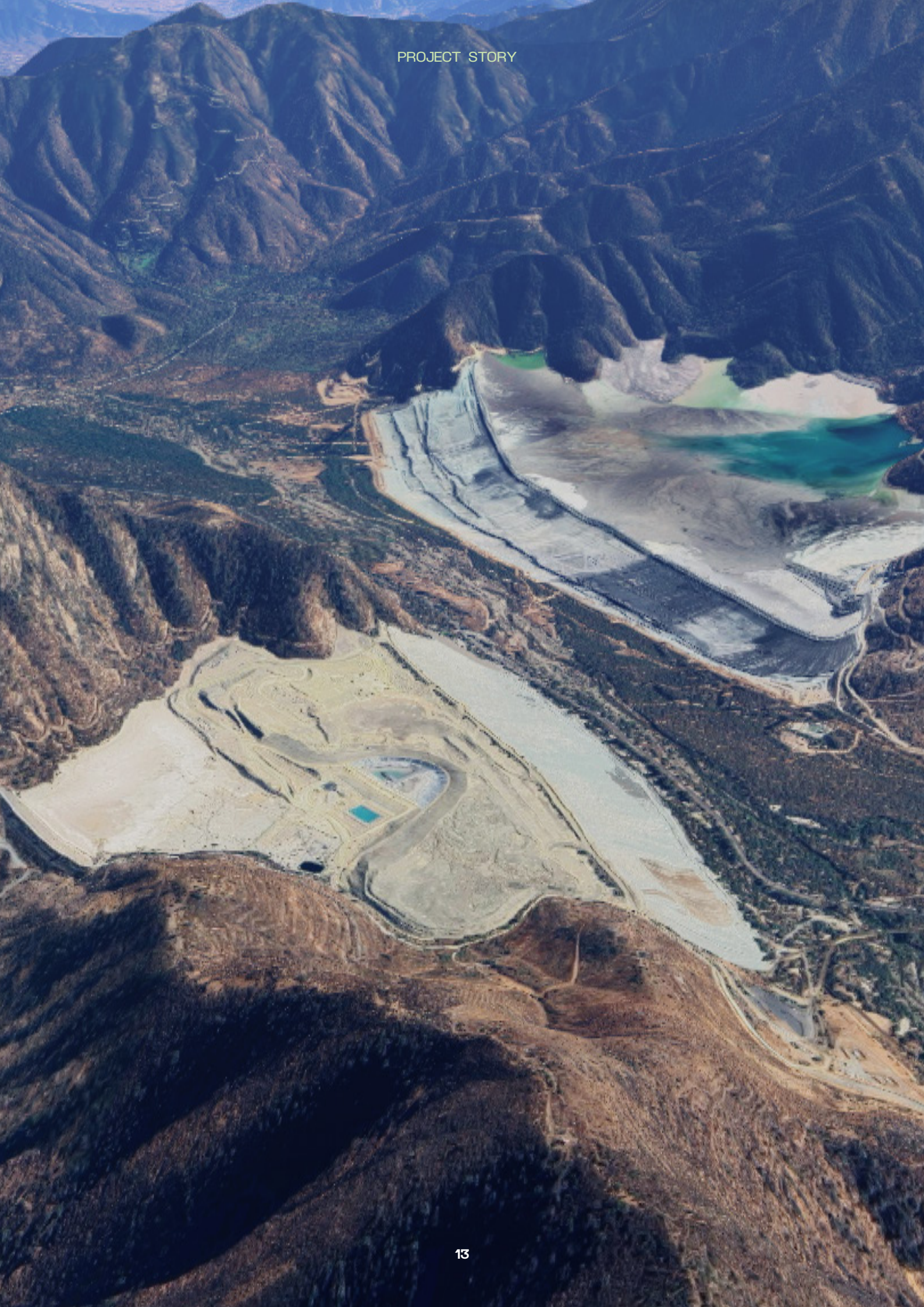
The all-in-one geocomposite design greatly reduces the installation time and cost associated with installing separate geotextile, geomembrane and drainage layers.

Product:
Pozidrain® K

Project:
El Soldado Copper Mine,
Chile

Quantity:
47,500m²





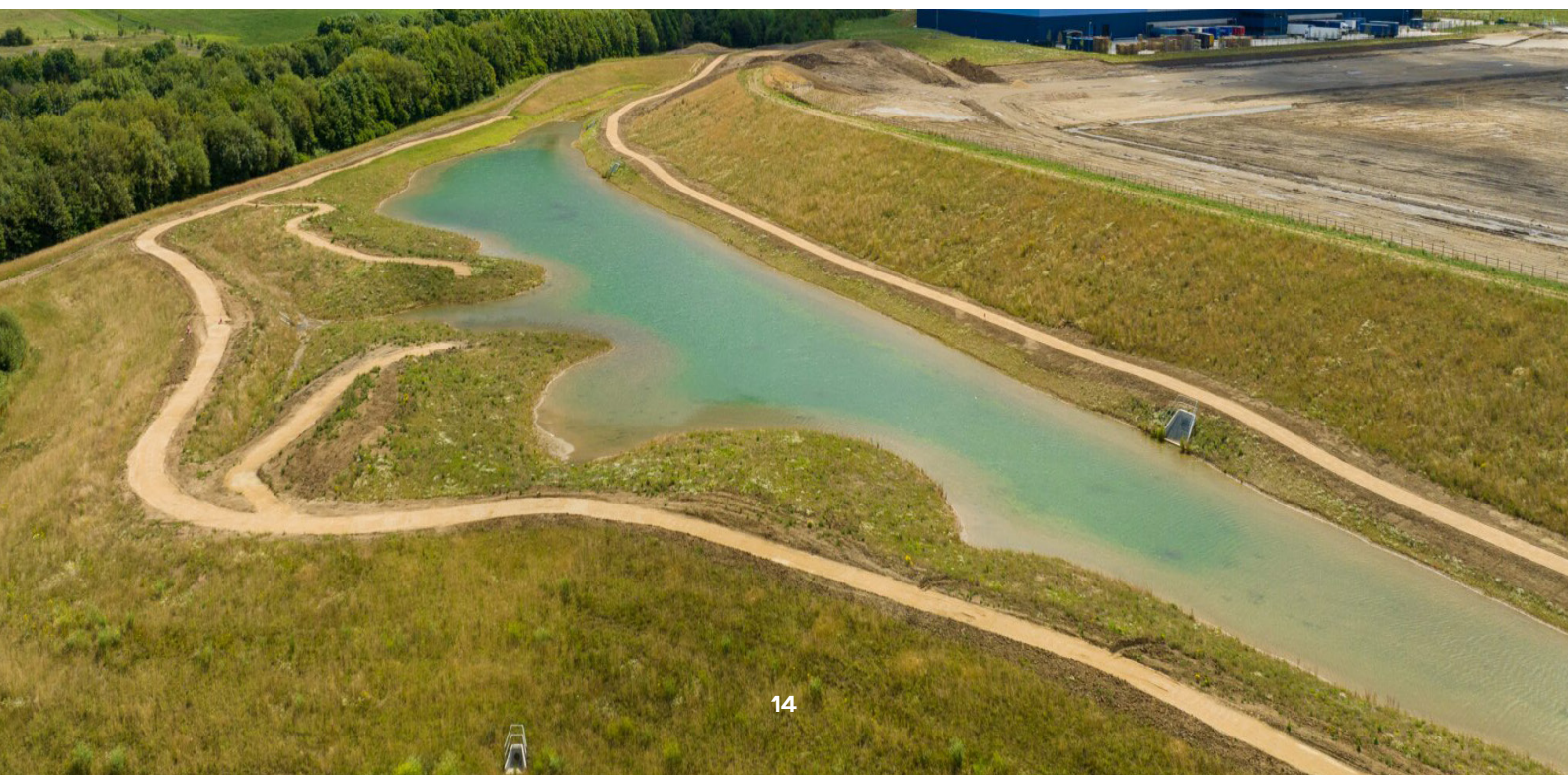
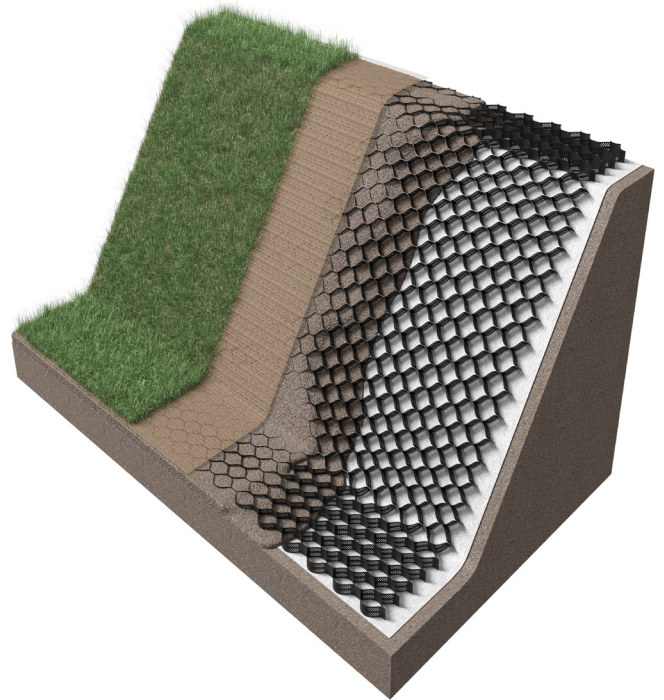
● Legacy mine slope remediation

ABG's range of Reinforced Earth Retaining systems include green / vegetated surfacing options to suit the desired aesthetics of the mine remediation project. Face angles ranging from 26° to 70° can be achieved and a design life from 60 years up to 120 years.

ABG's green slope solutions include the Erosaweb, Abslope SM and Abslope EM systems, with designs adapted to suit our client's budget and site specific requirements.

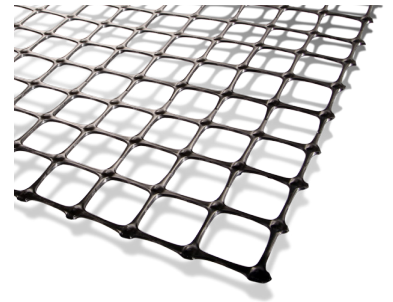
ABG's involvement in the design and construction of reinforced slopes and earth retaining walls extends to over 25 years, from when we first developed and launched our own range of ground engineering solutions.

These systems include a comprehensive range of geogrids and geotextiles for earth reinforcement and as a sustainable and cost saving alternative to gabions and crib wall constructions.

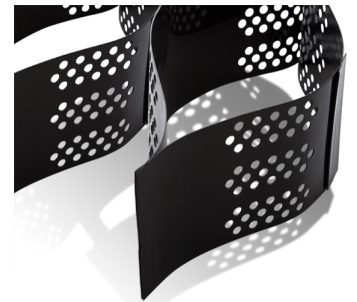


● Green Slopes & Earth Retaining Walls

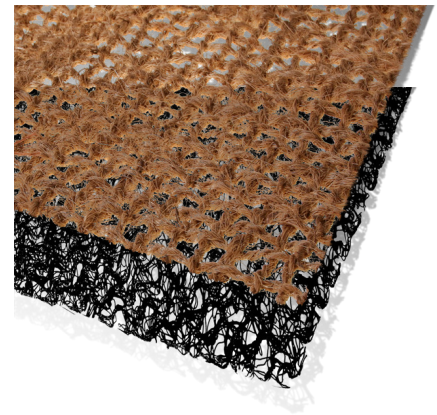
ABG Geogrids solve a range of geotechnical design challenges for retaining walls and steep-sided soil embankments. Options include biaxial, triaxial and fibre reinforced grids.



Erosaweb geocellular panels for slope reinforcement and ground stabilisation applications. The panels are perforated to allow drainage through the geocell pockets.

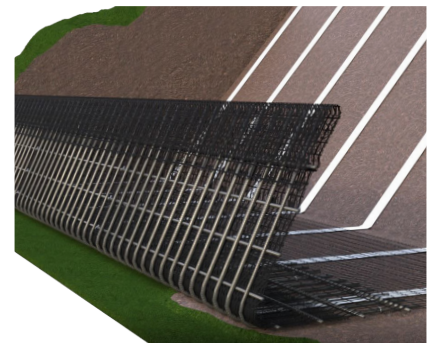


Erosamat is a range of biodegradable and permanent turf reinforcement matting. Jute and coir options consist of a dense mesh of fibres to absorb the impact of rainfall and reduce run-off velocity. Erosamat Type 3 is made up of a thermally bonded matrix of polypropylene fibres that create a tough, flexible and long lasting erosion control mat.



Abslope SM is a geogrid-reinforced steep soil slope system with steel mesh face to create grassed slopes between 60° to 70°.

Abslope EM is a geogrid-reinforced soil slope for embankments up to 45° with a vegetation liner on the face to support a naturally vegetated surface.



● Slope & tailings capping

The former Barneycrag lead mine at Carrshield operated primarily between c.1760-1920, and the mine tailings were deposited along the east bank of the River West Allen during that time. The site was prioritised for remedial action as part of Defra's Water and Abandoned Metal Mines programme, in partnership with the Coal Authority and the Environment Agency.

As part of the action plan for the site, the tailings storage facility required a permanent capping solution to prevent rainwater infiltration into the tailings.

By using the all-in-one Pozidrain 4SKL geocomposite drainage capping solution, the contractor saved significant material costs compared to purchasing separate layers, as well as reducing the programme time for the installation works.

Erosaweb GWX geocell was used on the 1:2.5 slopes to reinforce the soil veneer and promote grass growth.

Product:
Pozidrain®
Erosaweb®

Project:
Carrshield Mine Works,
Northumberland, UK

Quantity:
9,000m²





● Coal ash containment

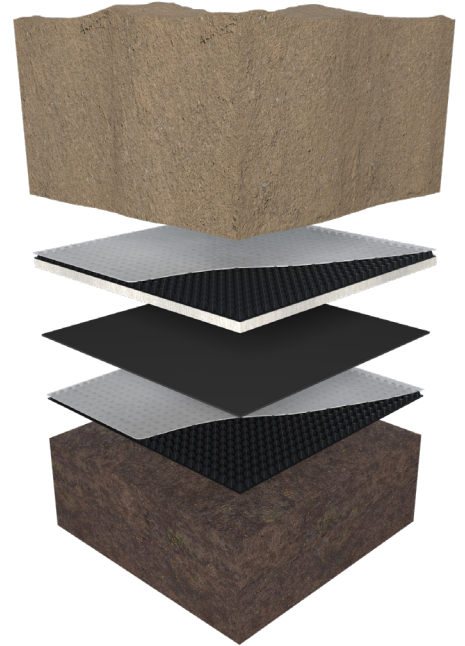
A condition of coal production operations is that a fully lined containment area is constructed for storage of the coal combustion residues (CCR) on site.

The design of containment areas typically comprises a main storage areas plus a waste water treatment lagoon.

A completely sealed and protected geomembrane is installed under the storage areas and the leachate needs draining effectively from beneath the CCR for collection and treatment.

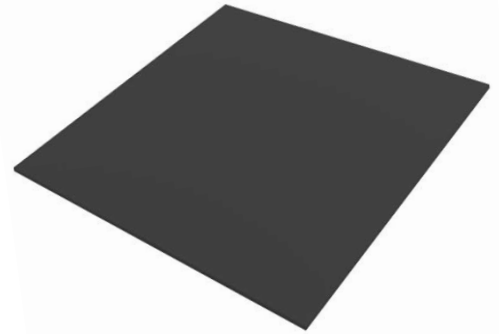
The traditional method would be to import selected stone from a distant quarry at a great environmental cost.

Geosynthetic basal containment options comprising Terrex protective geotextiles, 2mm HDPE geomembrane lining and a Pozidrain drainage layer in contact with the coal combustion waste can be utilised as a high-performance and long-lasting alternative, with the geotextiles specifically designed to filter the very fine CCR material.

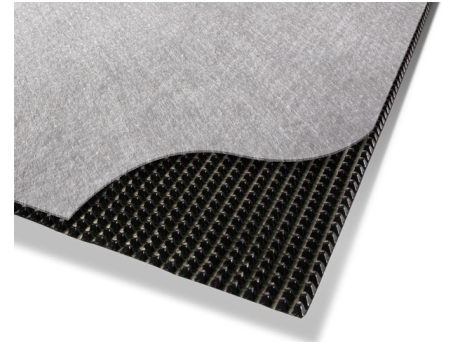


● Leachate containment solutions

HDPE (high density polyethylene) geomembranes to provide excellent chemical resistance for lining applications and a completely liquid and gas tight seal. Flexible and easy to seam (tape or weld) with good tensile strength & puncture resistance.



Pozidrain offers a wide-width preformed drainage and gas venting solution, used extensively for contaminated land drainage on slopes and basal areas to remove water, liquids and gas quickly & efficiently.



Terrex is a range of high performance, thermally bonded needle-punched non-woven geotextiles manufactured from UV-stabilised polypropylene. Terrex SNW are installed to provide a thicker layer to protect geomembrane liners.



● Haul road stabilisation

ABG's Design Engineers are experts in stabilisation and reinforcement applications for mine access roads and working platform construction.

Geosynthetic based designs provide a reliable base for operation and manoeuvre of heavy plant to enable:

- reduced thickness of required granular fill by up to 60% and construction over soft foundation soils
- reduction in construction waste and off-site removal of material and the associated carbon costs
- improved site accessibility and health and safety speeds up construction programme and reduces vehicle emissions

The ABG range of geosynthetics typically used to construct haul road designs are Terrex geotextiles and a range of geogrids.

Geotextiles are primarily used as a protective separation layer to prevent the loss of fines and contamination of the roading layers and to provide a secondary degree of reinforcement / stabilisation.

Geogrids are specifically required to provide reinforcement and stabilisation of the granular fill, providing a lateral restraint via friction and interlock / confinement.

As a rule of thumb, a layer of geogrid is equivalent in cost to 100mm of granular fill and it is generally safe and economically justifiable to incorporate a grid when the road build-up depth can be reduced by 100mm or more.





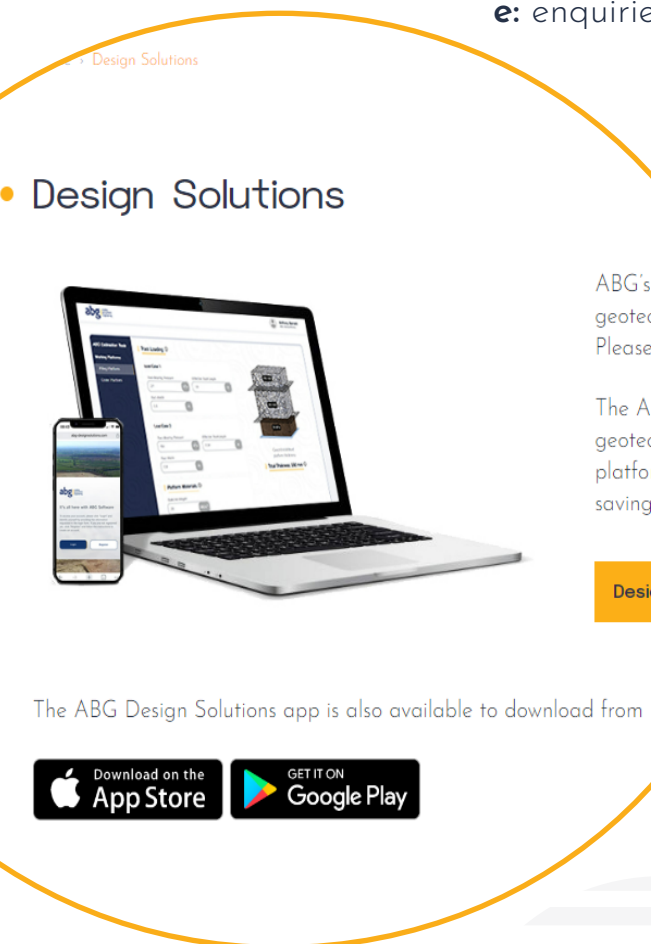
• Design Solutions

Our experienced engineering department is on hand to assist with your mining sector project requirements.

A range of project assessment forms are now also available on our website to assist with your project design @ www.abg-geosynthetics.com/design-solutions

Contact the ABG engineering team for design and application advice:

e: enquiries@abgltd.com **t:** +44 (0)1484 852096



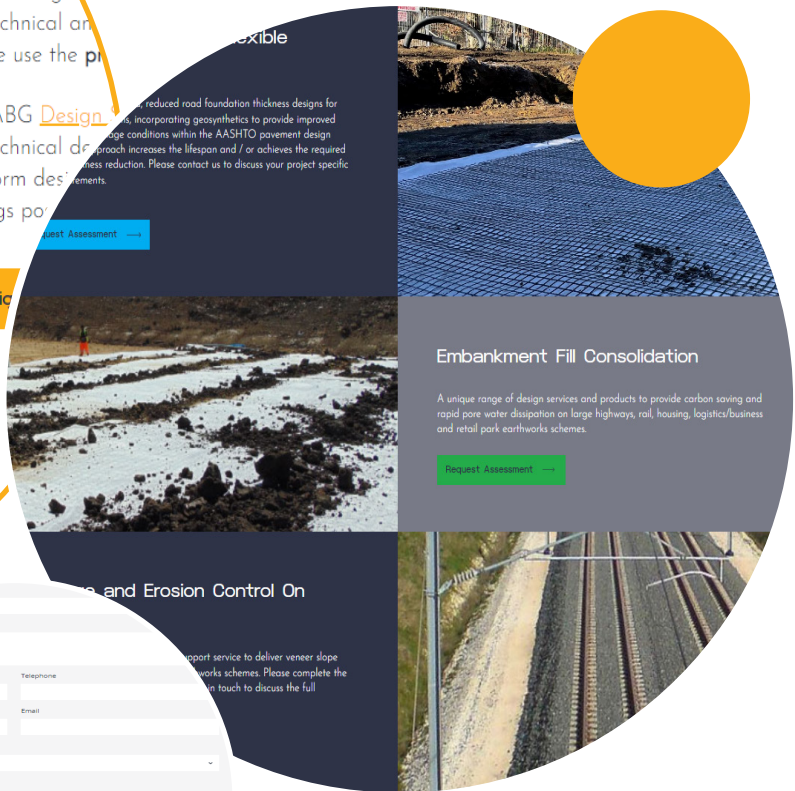
• Design Solutions

ABG's Design Solutions provides geotechnical and geosynthetic design solutions. Please use the product selection tool to find the most suitable solution for your project.

The ABG Design Solutions platform provides geotechnical design solutions for road, rail, housing, logistics/business and retail park earthworks schemes. It offers reduced road foundation thickness designs for improved road conditions within the AASHTO pavement design approach, increased lifespan and/or achieves the required mass reduction. Please contact us to discuss your project specific requirements.

[Request Assessment](#)

Design



Embankment Fill Consolidation

A unique range of design services and products to provide carbon saving and rapid pore water dissipation on large highways, rail, housing, logistics/business and retail park earthworks schemes.

[Request Assessment](#)

Design and Erosion Control On

Our design support service to deliver veneer slope earthworks schemes. Please complete the form below to request a design touch to discuss the full details of your project.

name Telephone

company Email

region

Please select

Abstope SM Geometry and Loading

See Figure 1 above for information

Face angle α [°]	Crest slope height H_{cs} [m]
Toe slope angle β' [°]	Total Elevation face area (i.e. LH_{total}) A [m ²]
1st slope angle ⁽¹⁾ β'' [°]	Depth of ground water table y [m]
2nd slope length ⁽²⁾ L [m]	Variable/Temp load q_v [kPa]
Height H_2 [m]	Permanent load q_p [kPa]



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