

# Waste Containment

High quality geosynthetic systems for
landfill engineering applications

# Contents





# Waste containment challenges

**The global population continues to grow with a trend towards urbanisation and larger cities around the World. This creates obvious ecological challenges and makes the efficient and safe control of our waste streams of paramount importance.**

Traditional approaches to landfill engineering are heavily reliant on finite crushed stone layers. The large volume of the materials required is heavy and expensive to extract, transport and install, incurring a heavy carbon footprint.

Deeper layers of aggregate drainage also reduce the volume of landfill storage space available, a key limiting factor considering the increase in global waste generated year on year.

The adequate drainage and leachate management of landfill sites in order to prevent groundwater pollution has historically been achieved using a combination of expensive and labour intensive lining and capping layers obtained from multiple suppliers, making installation and CQA tracking ever more challenging.

Multiple geomembrane liners are also typically heavy duty and difficult to manoeuvre into position around the site, with limited coverage rates per roll.

The efficient capture and control of landfill gas build-up is also a significant safety and environmental challenge facing today's waste containment facility engineers.

Finally the safe design of landfills to ensure slope stability and integrity in variable ground conditions and operating environments worldwide, demands a combination of many years of practical and theoretical geotechnical expertise and solution design.

# The advantages of geosynthetics for landfill engineering

**For more than 60 years, geosynthetics have been used extensively throughout the world to deliver innovative and cost-effective solutions that offer many advantages over legacy environmental management techniques and help to deliver sustainable alternatives.**

Geosynthetics and geocomposite products in particular, are used to combine multple functions in one layer. These light-weight components help to greatly reduce carbon footprint and speed up installation / coverage rates over large areas.

Solutions have been pioneered by ABG over the last 35 years, with a large wealth of project references and installed volumes on global landfill sites. Products are subject to rigorous testing and CE marking to meet the required legislative demands in this quality critical application. Key technical performance and testing criteria include shear box tests, compressive strength, in-plane flow capacity, permeability, CBR puncture resistance and chemical exposure testing.

Our products are subject to extensive SIM testing and as a result can be specified confidently at high loads for more than 100 years. All materials used in the lining system must be able to withstand prolonged contact with any pollutants and capable of withstanding long-term exposure to a wide range of chemical compounds. ABG can provide advice for specific chemicals and manufacture grades with enhanced performance to suit the project requirements.

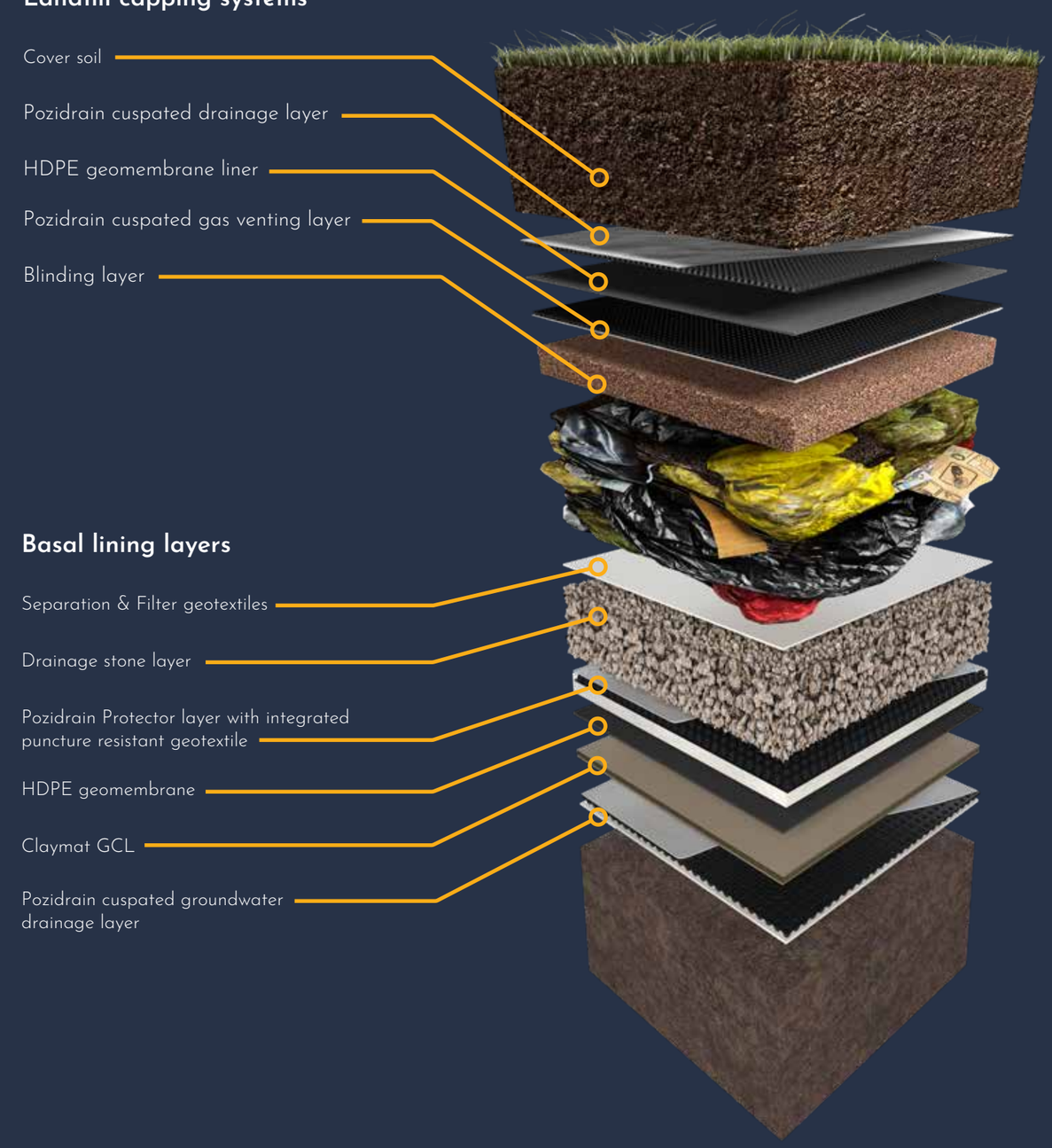
We specialise in providing value engineered alternatives to minimise shipping and installation costs, with reduced thickness designs that free up landfill capacity. Geocomposite designs also offer advanced performance for leachate and gas drainage / collection applications, with many times greater flow capacity (in multiple directions) compared to equivalent layers of drainage stone.

Our design department has over one hundred years' collective expertise, including CIWEM chartered engineers, backed up by geosynthetic manufacturing knowledge and calculation tools for slope stability, leachate / gas collection and capping drainage challenges.



GEOSYNTHETICS IN LANDFILL ENGINEERING

## Landfill capping systems




## Basal lining layers

# Geosynthetics Manufacturing

**ABG are specialist manufacturers of geosynthetics for use in civil engineering and environmental applications. Our waste containment solutions encompass:**

- The protection of water resources and land stabilisation
- Pozidrain® drainage geocomposites consisting of a combination of filter and protection geotextiles with integral cuspated core
- Anti-erosion capping products including Erosaweb® and other specialist geotextile and geomembrane components
- A comprehensive landfill lining product range, including Terrex nonwoven and woven geotextiles, GCLs and geomembranes for infrastructure projects
- Integrated technical support; from detailed design to project installation guidance

**Typical applications:**

- Landfill Capping
- New Landfill Cell Lining
- Storage Cell Rehabilitation
- Drainage & Waterproofing Layers
- Erosion Control on Slopes





# Waste Containment Solutions

**Our product range delivers the key functions required for landfill engineering:**

- Robustness to withstand installation and service life
- Superior drainage
- Stability and shear resistance solutions for steep slopes
- Excellent puncture resistance to protect linings from sharp objects
- Optimum strain characteristics to withstand point loading
- Chemical resistance for sustained contact with leachate
- UV resistance for the period before the product is covered by waste
- Revegetation of completed landfill cells

# Landfill Lining & Drainage Geosynthetics

**High performance lining, protection, filtration and drainage layers play a crucial role in ensuring the integrity and durability of landfill structures.**

Drainage geocomposites collect and drain leachate, whilst also protecting geomembrane liners from puncture. The integral geotextile filters also provide excellent resistance against clogging.

Geocomposites installed beneath the landfill basal geomembrane and/or geosynthetic clay liner act to manage groundwater ingress and provide protection to the lining system.

A single geomembrane or GCL will leak as a result of it's permeability. The liner permeability will be specified as 1x10-11m/s, which even though small, will result in a leakage of 10 -10,000 litres/hectare/day and is therefore not sufficient to achieve secure containment.

A composite system comprising an HDPE geomembrane and a GCL or clay barrier together will reduce the leakage rate by a factor of 10, but that still results in significant loss of contaminants into the ground below. The most secure system is to provide a competent leak drainage layer between the two barriers. This will reduce the leakage rate by a factor of 100.





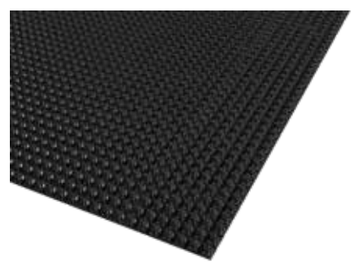
# Landfill Lining System Solutions

**Pozidrain® Protector** is developed specifically for use in landfill basal lining systems to collect and drain leachate, whilst providing protection to the geomembrane lining systems. It consists of Pozidrain bonded to a heavyweight, needle punched geotextile protector and offers a combination of drainage and geomembrane protection in a single product.

**Alphaline** geomembrane engineered to provide a liquid and / or gas barrier for landfill applications. Alphaline is manufactured from high quality virgin HDPE, allowing a quality assurance certificate to be provided for each roll.

**Claymat® GCL** (Geosynthetic Clay Liners) are used to provide a liquid and/or gas barrier for landfill lining. Claymat provides the barrier properties of bentonite in a convenient sandwich between two layers of geotextile, needle punched together.

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



**Terrex® SNW** provides a highly deformable, thick, puncture resistant needle-punched nonwoven geotextile for protection of the geomembrane liner.

# Landfill cell lining with Pozidrain® Protector

**Lean Quarry landfill site near Liskeard is an important facility for residential and commercial waste disposal in Cornwall. It is located in an environmentally sensitive area and therefore subject to close Environment Agency supervision.**

The requirement was to design a geosynthetic lining solution that would comprise of a double lining system (GCL and HDPE membranes) and a geocomposite drainage/protection layer on steep 1 in 2.5 basal side slopes with drainage stone on the cell base.

ABG's Pozidrain Protector 745 geocomposite drainage layer with enhanced protection and UV resistance was specified and installed on top of the 2mm HDPE textured geomembrane onto the steep side slopes. SIM tests confirmed that the compressive creep was less than 20% in 120 years.

Environment Agency cylinder test results for the Pozidrain Protector and stone material from this site indicated sufficient puncture resistance and protection performance, achieving the required factor of safety for the 45m deep installation and 1,200kPa pressure (2.5 times service loading).

**Product:**
Pozidrain® Protector

**Project:**
Lean Quarry landfill, Cornwall

**Quantity:**
10,000m$^2$

# Landfill Capping Geosynthetics

**ABG specialises in providing advanced geosynthetic and geocomposite systems for the effective drainage and reinforcement of permanent landfill capping designs:**

To guarantee effective cover, landfill caps should incorporate a drainage layer above and a gas collection layer below the lining system.

Pozidrain drainage geocomposite for landfill capping applications prevent the saturation of the cover soils by collecting and draining away rainwater. This ensures the capping soil remains stable and also acts as a protective layer for the capping geomembrane.

Pozidrain has the properties to provide these functions and offers improved performance at lower cost than using conventional crushed stone filter / drainage layers.

Pozidrain is designed to be compatible with all common lining systems and provides optimum performance over the whole-life of the cap. It enhances the performance of GCL or HDPE liners by providing an additional barrier that prevents the majority of the water or gas from reaching the liner.

Pozidrain geocomposite drainage layer has a proven track record in landfill capping and has been used on thousands of projects globally.

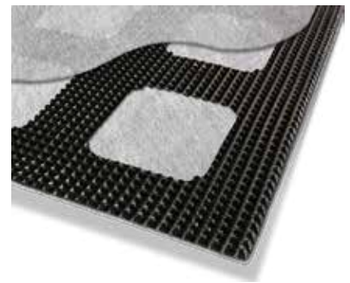




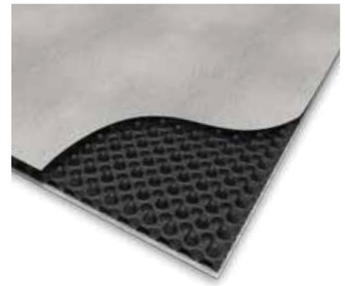
# Landfill Capping System Solution

**Pozidrain®** drainage geocomposite is a wide-width pre-formed drainage and gas venting solution, providing a sustainable, environmental alternative to traditional filter stone drainage layers. Pozidrain is used extensively for landfill and contaminated land drainage to remove water, liquids and gas quickly & efficiently.

**Pozidrain®** below a capping geomembrane forms the basis of a highly-efficient gas collection and dispersal system by creating a free draining void across the cap area. Installed with the flat face of the core against the liner and dimpled face against the waste, Pozidrain also affords a high level of protection to the lining system.



**Pozidrain® 7D** is a double-cuspated product laminated to non-woven geotextiles on both sides. It provides good long-term compressive strength whilst delivering high in-plane flow capacity in multiple directions, draining infiltration water from above and channeling away gases from below. The geotextiles allow water to freely enter the core, but prevent intrusion of the soils into the core.



# Landfill capping drainage with Pozidrain®

**Wollert Landfill is a Waste Management Association of Australia (WMAA) Gold Excellence Award winning landfill. Since its opening in 2000, Wollert Landfill has been providing the safe disposal of waste for households, as well as commercial, industrial and demolition businesses across the state of Victoria.**

The filled landfill cell needed to be safely capped with a permanent cover system which prevented the infiltration of water and the escape of gas which is converted to electricity.

The proposed final capping comprised a three layered geosynthetic, permanent capping treatment; with a geosynthetic clay liner (GCL), a 1.5 mm LLDPE liner and a geocomposite drainage layer.

Pozidrain 7S250/NW8 was chosen to meet the necessary water flow underneath the 1m non-descript crush rock (NDCR) overburden. In addition to the benefit of a more competent flow, the Pozidrain 7S250/NW8 option with one geotextile and a virtually impermeable core, provided a cost saving solution.

**Product:**
Pozidrain®
7S250/NW8

**Project:**
Wollert Landfill,
Victoria, Australia

**Quantity:**
51,000m$^2$

Pozidrain's unique drainage core also served to provide the lining system with an additional measure of protection to successfully pass the rigorous conformance testing.

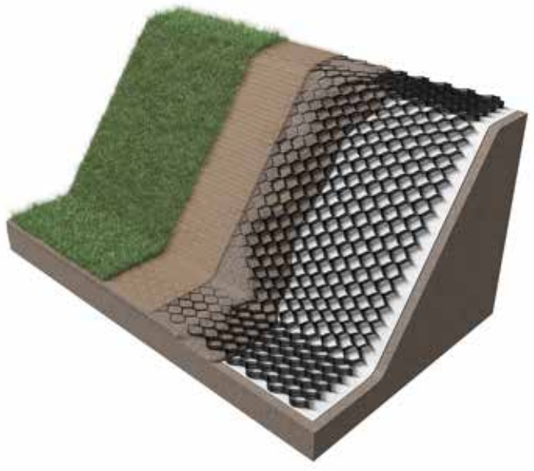


PROJECT STORY

# Landfill Capping Slope Stabilisation

**The ABG range includes a number of innovative products for the reinforcement and stabilisation of steep landfill slopes; including:**

- Value engineered geosynthetic solutions for erosion control and slope veneer stabilisation in the landfill sector.
- Erosaweb® and Erosamat erosion control options installed above the lining system and pinned to the slope to support the weight of the overlying soils and enable grass to establish and reducing the chances of slippage.








# Landfill Capping Slope Stabilisation

**Pozidrain® G** drainage geocomposite is a wide-width pre-formed drainage and gas venting solution, providing a sustainable, environmental alternative to traditional filter stone drainage layers. Pozidrain G drainage lattice provides additional interlocking and enhanced interface friction with cover soil material on steep slope installations.

**Erosaweb®** geocell is designed for the reinforcement of weak soils and has many applications, including retention of soils onto steep landfill slopes. The cells of the geocell retain the fill material, while allowing water to drain through.

**Erosamat Type 1 & 2** are biodegradable options to protect and enable grass roots to establish. Type 1 are low cost biodegradable erosion control mats made from woven jute. Type 2 is a heavy duty, long life coir biodegradable erosion mat, designed to prevent soil erosion and help establish new vegetation in situations of higher run-off / water velocity.

**Erosamat Type 3** is a range of permanent turf reinforcement matting for the protection of grass roots as they establish onto steep slopes and is suitable for installation above the ground cover layer. The sheet is made up of a thermally bonded matrix of polypropylene fibres that create a tough, flexible and long lasting erosion control mat.

# Landfill slope stabilisation

**Silent Valley, which runs up from the Welsh town of Ebbw Vale, is being restored and turned into a nature reserve managed by the Blaenau Gwent County Council and Gwent Wildlife Trust.**

With the finished landfill profiles incorporating 80m long x 1 in 2.5 slopes, the challenge was to achieve a stable cap without any reprofiling or use of geogrid reinforcement. The aim was to install a multi-layered synthetic cap comprising a 1mm LLDPE textured geomembrane with a drainage capability above the membrane and a gas venting capability below.

The unique Pozidrain G geocomposite was used to provide drainage, gas venting and membrane protection. Pozidrain G drainage lattice provides additional interlocking and enhanced interface friction with cover soil material on steep slope installations.

**Product:**
Pozidrain® G

**Project:**
Silent Valley Landfill, Ebbw Vale, UK

**Quantity:**
65,000m$^2$

It has sufficient flow capacity in both long and cross direction to drain cover material and ensure slope stability.

Shear box tests against site specific cover soil material and LLDPE geomembrane confirmed adequate Pozidrain G interface friction performance.



PROJECT STORY

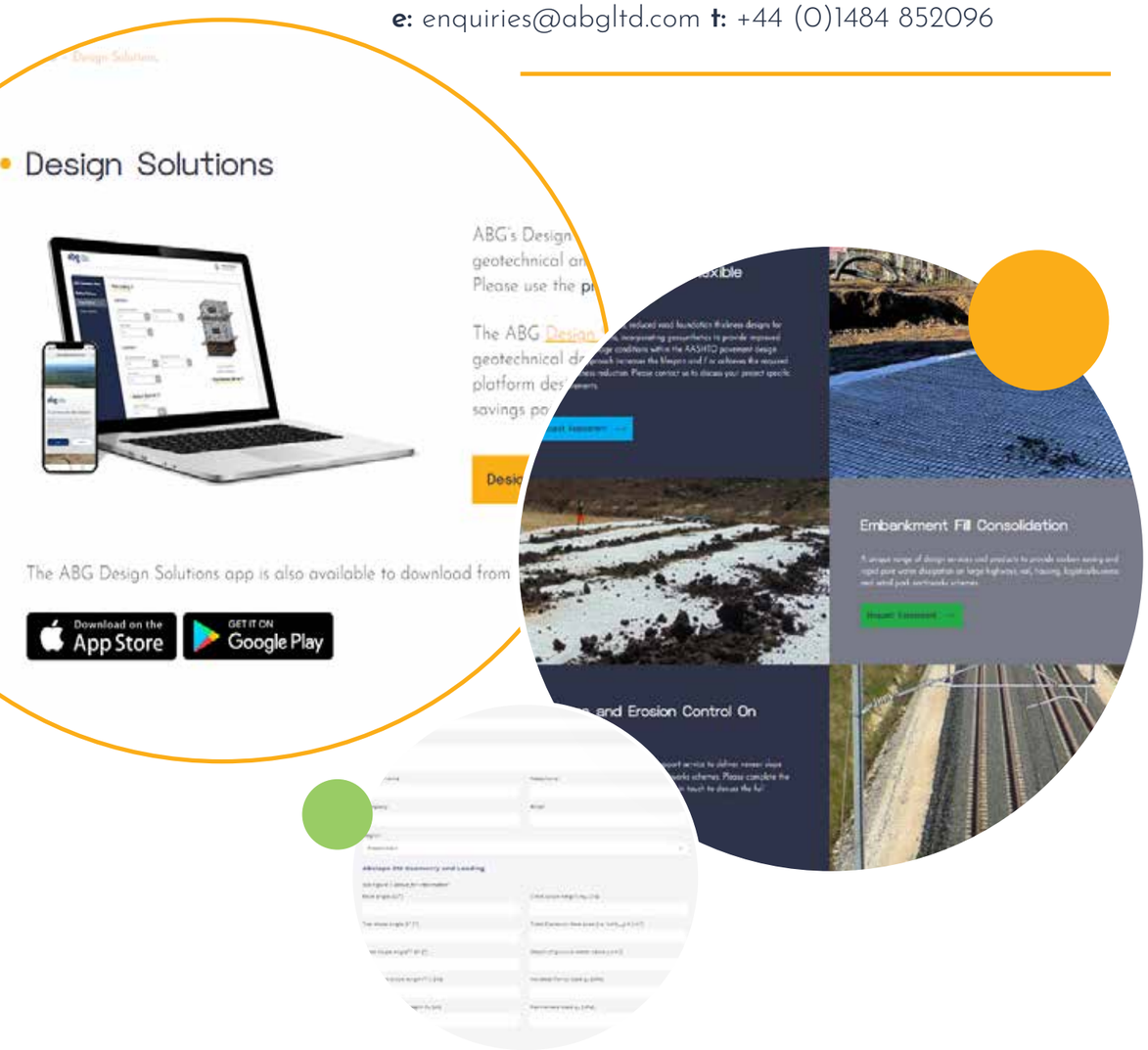
# Design Solutions

**Our experienced engineering department is on hand to assist with your waste containment 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 deisgn and application advice:

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








www.abgltd.com


**ABG Geosynthetics**
E7 Meltham Mills Road, Holmfirth, HD9 4DS
**T:** +44 (0)1484 852096 **E:** enquiries@abgltd.com **W:** www.abgltd.com

**a Bontexgeo Group company**