



Enviroflow Systems

- Lightweight
- Versatile
- Cost effective
- Easy to install

email: environmental@naylor.co.uk web: www.naylor.co.uk







NAYLOR ENVIRONMENTAL

Enviroflow System

ENVIROFLOW is a macro-porous/ micro-porous matrix, unique drainage product manufactured solely from 100% waste plastics. It drains water very

quickly but also retains essential water reserves. Most importantly, Enviroflow will not clog and can be incorporated into a wide range of existing systems and applications; offering an exceptional yet simple sustainable solution. It provides unparalleled drainage whilst having lower costs, quicker installation times and more structural



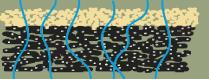
stability than conventional drainage. It is environmentally friendly and carbon positive - providing sustainability without compromise.

What makes Enviroflow perform so well?

Effective drainage must offer a high open pore space for excess water to flow. Traditional sand over gravel permits an acceptable drainage flow rate... ...until settlement allows migration of the particles, causing separation of the fines from the sand. This causes clogging and prevents efficient drainage flow. When Enviroflow is used there is a small degree of initial migration, but then Enviroflow cannot be infiltrated further and efficient drainage is maintained.







Enviroflow properties

Made with 100% recycled thermoplastics, Enviroflow creates permanent solutions that do not clog, are easy to install and handle, require little to no maintenance, are high strength and long lasting. Whether you are looking for a more efficient solution for drainage, water treatment, ground stabilisation, retention/detention, or permeable paving, Enviroflow has a solution for you!

Enviroflow Planks are a permanent solution superior to traditional drainage, stabilisation, and green infrastructure systems for a wide range of industries. The product's high-void structure allows for a drainage capacity and structural stability greater than stone or pipe and are quick and easy to install.

PHYSICAL:		
Size:	1m (L) x 220mm (W) x 45mm (D)	
Weight:	6kg/ plank (75% lighter than aggregate)	
Attenuation Effect:	8.2 l/m2	
Permeable Surface Area:	50% (perforated pipe is 5%)	
Effect of Compression:	Drains freely under 1,000 T/m2	
TECHNICAL:		
Porosity:	35 – 45%	
Percolation Rate:	18,500mm/hr (Sand 1,200-2,000mm/hr)	
Permeability (No Load):	33.0 l/s/m2	
Permeability (Load):	30.0 l/s/m2	
Longitudinal Flow:	0.33 l/s (equivalent to 73mm ID pipe)	
Pore size:	21 - 28µ	
Compressive strength:	1,028 tonnes/m2	
Push through force:	8,997kN	
Water Quality (Leaching):	Pass (Compliance with WRA)	
Freeze Thaw:	Pass (expansion is internal)	
Environmental:	200mts saves 2 tonnes of Co2	

Agricultural benefits

Whether used on large farm with hundreds of acres of land or even a backyard garden, Enviroflow provide a more efficient, environmentally friendly approach to field drainage and soil moisture control. Enviroflow can serve as a medium for hydroponic agriculture – all that is required is Enviroflow material, a dusting of top soil, seed, and occasional watering. Once plants have grown and been harvested, simply pull out the roots, hose off the material, and start all over again.

Enviroflow have been proven to not only control evaporation and water migrations in farming, but also can reduce water consumption. Likewise, Enviroflow can be used as tiling in between rows of crops. Simply pour water from one end, and capillary action will allow it to migrate to the other end, helping the crop to grow with regular moisture.

Typical uses of Enviroflow

ENVIROFLOW has been subjected to extensive testing over the years to confirm its use in the following situations:

School Sports field & General drainage

Keep facilities maintenance costs down and school grounds looking green using Enviroflow Planks for playground and sports field drainage; reduced disruption during installation and lower long term maintenance upkeep.

Commercial Sports & practice grounds

Simple and economic to install and prevents settlement, compaction, migration and drying out of the top surface.

Permeable Block Paving bases

Replaces thousands of tonnes of aggregate under permeable parking areas, driveways etc and provides a stable porous base that doesn't clog and needs no geotextile to protect it.

Golf - Fairways, Bunkers

Ideal for bunker drainage and the treatment of wet spots on the fairway and doesn't dry out like french drains to leave barren grass strips.

Residential Drainage

Enviroflow provides a stable and simple fully porous base for driveways beneath permeable paving in accordance with the latest Government advice and is a very cost effective method of draining waterlogged gardens.

Equestrian Surfacing for Stables and Arenas

When Enviroflow is used as a base for stables, ménages and arenas it provides a comfortable base to protect joints and allowing fluids to flow through and provide insulation from concrete floors. It can also be used to drain entire fields with a layout similar to a land drain.

French drains

Although Enviroflow is an economic and superior alternative to french drains it can also be used as a silt control layer to dramatically reduce maintenance for existing systems.

Green Roofs & Roof Gardens

Lightweight & easy to install Enviroflow saves on construction costs and provides a controlled growth environment. It can also be trafficked during construction thus minimising delay to build schedules.



Driveways Enviroflow can provide a

structural drainage layer to

surfaces allowing filtered water from above to be directed horizontally, to be collected by vertical units at the edge of the area.

Embankment stabilisation

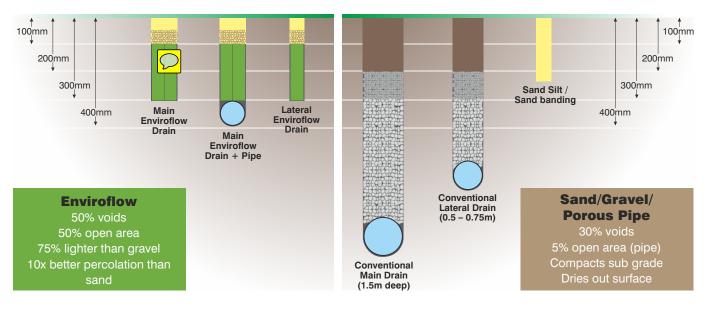
Enviroflow is a high void high strength solution for draining and de-watering embankments to prevent land slip.

Retaining wall dewatering

Structures, bridges, basements etc can use a single layer of Enviroflow to collect and move water away from vulnerable areas.

Go Green with Enviroflow

It is not only Enviroflow's composition of recycled materials that make the product environmentally friendly – Enviroflow can serve as a substrate in green building. When used to create green roofs and walls, Enviroflow provide a simple and efficient means of drainage, while promoting vegetation growth and structure sustainability.



Enviroflow vs Trench Drains



Manufactured from 100% recycled materials Enviroflow sports

emissions per pitch, Enviroflow offers an immediate and direct

refurbishment the Enviroflow system is fast, effective and low

equipment, sports pitches can be fully refurbished and back in

Dependant on the intended use, sports pitch design can vary

significantly: A cricket pitch is rarely used during rainstorms

but needs to have effective drainage to allow immediate use once the rain has cleared, whereas a Football or Rugby pitch

is used throughout a rainstorm and needs to drain quickly and

Looking at a "typical" pitch size of 90m x 60m, the Enviroflow

dependant on gradients. A final double connection is then

made from the laterals to a silt trap outfall before connection to

would be installed at 2-5m centres across the pitch, dependant on soil type and intended use. These transverse runs are abutted to two lateral double runs of Enviroflow that transfer the water to either one end or both ends of the pitch

impact and, up to 20% cheaper than conventional drainage

pitch drainage system helps combat the cause and effect of

climate change. Typically saving over 40 tonnes of CO2

environmental benefit. Whether it's a new construction or

systems. Installed using fast, clean & precise trenching

Sports pitch design using Enviroflow

use in record time.

effectively during this time.

the complete pitch drainage can be

finished in record time.

Enviroflow for Sports fields & pitch drainage



Enviroflow is the ideal permanent, efficient drainage solution for sports grounds - from the recreational level and school, to college and professional leagues. It offers exceptional Sports pitch drainage together with major environmental benefits.

Enviroflow combats the major problems of conventional drainage and is equivalent to a 73mm pipe

Settlement, compaction of the ground, clogging of traditional drains, migration of sand and drying out of the surface.

Enviroflow offers significant benefits

Reduced overall cost, fast installation, rapid reinstatement of the surface, reduced "trench drop" and topping required, 40% less material transported to site, 50% less excavation, undamaged by trafficking, simple installation reduces site traffic, reduces long term maintenance costs.

The unique way that Enviroflow drains and maintains water flow within the upper surface of the playing surface means that aeration by deep tining is not necessary.

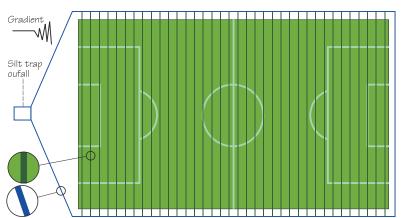
European Turfgrass Laboratory Testing Results

Material	Flow Rate (mm/hr)
Enviroflow	21,000mm/hr
Medium Course Sand	2,089mm/hr
Medium Fine Sand	1,222mm/hr

Conclusion

Enviroflow significantly increases the transport of water by up to 355%.





Lateral drains should be installed at between 2m - 5m centres depending on the soil type and site conditions.

Enviroflow double vertical trench - Lap joint Enviroflow panel size (mm): 220 (D) x 45 (W) x 1000 (L) Recommended back fill depth 100mm specified free draining back fill sand, sand/soil blend or topsoil Gravel is not required.

Enviroflow single vertical trench - Butt joint

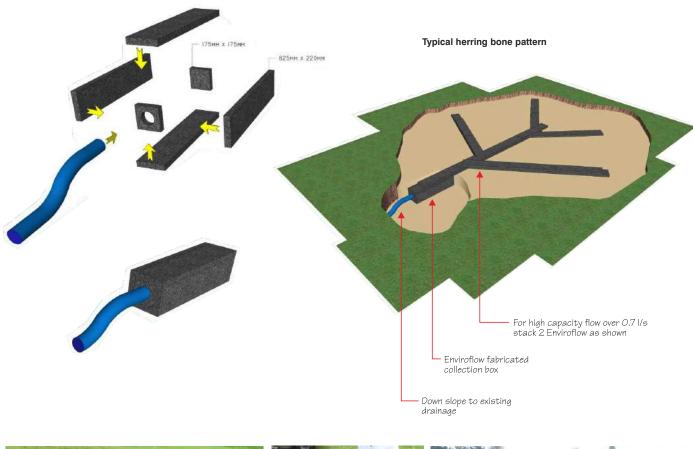
Enviroflow panel size (mm): 220 (D) x 45 (W) x 1000 (L) Recommended back fill depth 100mm specified free draining back fill sand, sand/soil blend or topsoil Gravel is not required.

*100mm

<text>

eliminate contamination of the bunker sand with efficient sand trap drainage capabilities. Plus, when installed for fairway drainage, Enviroflow are sturdy enough to withstand aeration and prevent drying out of the overlying grass. The product can also be used as an effective drainage solution for buggy paths and culverts.

To install Enviroflow in bunkers, cut shallow drainage trenches into the stable sub-base of the bunker using lateral/herringbone branches and direct drainage to the low point of the bunker.



Bunker Drainage details



Marking out installation (10.00 am)

Testing of Enviroflow (1.00 pm)

Finished project (3.00 pm)



Enviroflow for Porous paving structural bases



Enviroflow is a superior totally porous structural sub-base that replaces expensive aggregate and dirt substrate under driveways, carriageways and railways. It is easy to transport, handle and install and Enviroflow promotes efficient road drainage, prevents cracking, and reduces costs associated with recurring maintenance.

Due to its porous, high void composition, Enviroflow material is proven to become stronger with added weight loading and can withstand heavy trafficking. When used as a sub-base beneath railways, rather than compacted sub-grade, Enviroflow moves water away from the tracks to prevent pulsing.

Enviroflow is suitable as a porous structural base:

Beneath permeable blockBeneath any porous surfacingIn supermarket entrancespaving drivewayssuitable for vehiclesto reduce build up

Driveway construction (permeable paving)

Dependant on the strength of the sub soil the 45mm deep Enviroflow replaces 100-150mm of Type 1 sub-base. The area is excavated down to the sub soil layer and compacted. A 10-20mm of 6mm grit is then installed and compacted to even out any irregularities.

The Enviroflow is then installed on top with edges butted up against each other to ensure water transference. The Enviroflow can be trimmed to size with a standard wood saw. At the lowest point a vertical unit can be installed to both retain the paving and direct the flow to a suitable drain or soakaway.

Once installed to a level finish the Enviroflow then has a 30mm compacted 6mm grit installed to receive the permeable block paving which is installed in a conventional manner.

The total installation depth can be as little as 125mm reducing excavation and ensuring driveways can be installed without covering DPC's.



Supermarket entrances The requirement to minimise construction depth whilst still providing a drainable area that is level enough to accommodate trolleys is a feature of supermarket entrances. With a layer of Enviroflow beneath a permeable entrance, water can be directed to a suitable outlet without excessive excavation and without significant

gradients



Enviroflow for Multi use stadiums

The Enviroflow system lends itself well to sports stadiums which are used to host other events such as concerts, where the weight of thousands of concert goers would destroy the drainage capability of the turf and root zone.

As an edging unit to carry water

away from the sub surface

The Millennium stadium had Enviroflow modules $(1m \times 1.2m)$ bonded to a strong and durable base installed for such a use. The Enviroflow module sits on top of the asphalt base, on top of that, 30cm of fibre sand, and on top of that the turf.

The Enviroflow modules allow a large and even interface between the root zone and the atmosphere below the module. This makes for very effective use of sub air systems, which circulate warm air underneath the pitch, encouraging turf to grow out of season so that it puts down roots making the pitch more stable.

As well as heating the pitch, you can also

atomise water and circulate this under the pitch too, which is a far more efficient way of irrigating and also encourages root growth. In the stadium trial shown, a number of rugby matches were played on the surface without any tearing or ripping of the

grass surface.

The Enviroflow modular system is very light weight - a forklift can move a number of modules and its possible to pick each one up individually to put them in place with two men. They are also very strong and its possible to run heavy plant machinery over them.

Although modular systems are still in their infancy, in a world where stadiums have to stay busy and are used for multiple purposes, they are the future.

Enviroflow for Construction & Silt control



Enviroflow's unique properties regarding both the transfer of water and its ability to filter our silts above 30 microns makes it ideally suited for use on construction sites as an economic alternative to traditional solutions.

The M25 Junction 30 project is a case in point

The volume of waste water and silts generated during the course of the works was substantial, as was the costs of this process because of the need to transport waste off site to a contaminated land fill.

The designers (Balfour Beatty/Skanska) worked with Naylor Environmental to create a filtration system using Enviroflow to drastically reduce silts from the many road sweepings and also introduced Naylor's Smart Sponge[®] technology to extract and permanently capture the hydrocarbons within the various run offs.

Overview of the proposal

- Waste material would be tipped into a forebay and allowed to travel down a slope to the first layer of Enviroflow filtration
- The waste would then flow through a second layer of Enviroflow filtration
- The final water would discharge into a Smart Sponge[®] Ultra Urban Filter



For French Drains ground level soil soil ground level soil ground level below suface 150mm x 600 mm deep trench 25mm washed gravel fill 100mm dia perforated drain pipe

Enviroflow - prevents silt build up, stabilises the gravel to prevent rutting when over-run by HGV's.

Standard roadside drain filter cleaning *due to silt build up* - **This involves**: Excavation of the gravel fill, segregation and cleaning of the filter material and the return of the graded and cleaned material to the drain it came from. The drain is cleaned down to 600mm and a width of 600mm & creates 8-10 tons of spoil and accumulated silt for every 100m of drain.

M25 Junction 30 Construction & Operation

The decision to go ahead with the scheme was made based on economics and the fact that once complete the whole project could be broken down and used elsewhere.





The completed Enviroflow filtration scheme showing all 3 stages of treatment

0

The final discharge through a Smart Sponge[®] Ultra Urban Filter was tested by the EA.

M25 Junction 30 - The results

Following the completion of the scheme an analysis was done on the effectiveness and financial viability:

- Final Discharge was approved locally by the EA for the receiving water course without a permit.
- 28,000litres of waste water was treated and re-used on site in April 2016 with no external trips to land fill required.
- Savings of over £110k per annum were calculated for this site alone. Total construction costs were £11k.

Following this scheme several other similar schemes are now in various stages of construction.

Enviroflow

Filtration

Enviroflow is the ideal drainage layer within railway ballast and beneath carriageways. Even when loaded to 1,000 tonnes /m² it maintains its porosity and prevents silts from "pumping" to the surface without clogging.





Enviroflow for Equestrian & Livestock use



Stables and livestock areas

Enviroflow provides a warm and dry stable floor that is nonslip and offers enhanced comfort levels for horse stabling and many other types of livestock flooring.

Installed as a single layer over an existing concrete floor it is a completely porous non clogging structural surface that allows water and other fluids to drain through leaving a drier bedding layer that can be periodically washed down without a problem. The 100% recycled Enviroflow can also be deployed as a

removable flooring layer for temporary stables saving time and effort. With the reduction

in wet bedding combined with the "flexibility" associated with the recycled Enviroflow flooring this also has additional health benefits for the animals reducing swelling, helping with arthritis etc.



Arenas & Ménages

Adequate drainage is an essential element of a successful arena or ménage. With an efficient drainage system you can ride whatever the weather. Enviroflow is the ideal cost effective way to drain an arena and can be done simply and effectively without costly equipment. A typical novice arena can be drained using the basic layout principles shown for other sports stadia and would use around 480 Enviroflow units that can be installed and finished within a day using a small trenching machine. Installed correctly, your arena should never flood.

The Enviroflow layer is installed above the geotextile base to the riding surface ensuring the water is in direct contact. Delivery of the Enviroflow is on $1m \times 1m$ pallets (152/pallet) which can be stored elsewhere and brought to the arena as required.

Enviroflow

for Solar Fields use

Adequate drainage is an essential element of a successful Solar Park installation, ensuring that standing water adjacent to

panels producing electricity is prevented and Enviroflow is an ideal solution for both new installations and carrying out remediation to existing problem fields.

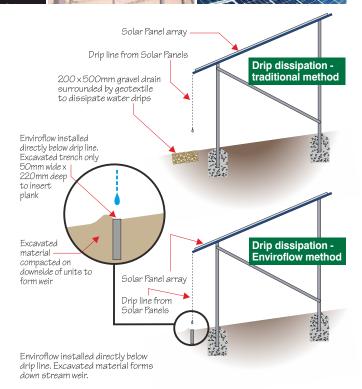
The installation of solar panels can have a negative effect on existing land drainage which can result in large volumes of water building up at ground level. The installation of Enviroflow can have immediate positive results eradicating standing water.



The units are also just as effective in preventing the drying out of the ground around the solar panels which can be just as devastating for the effectiveness of the scheme.

Enviroflow

- 75% lighter than gravel & no gravel or sand is required
- · Fast & easy to install with no geotextile and no fittings
- Capillary action transports water without clogging
- Product will not crush or settle during use



Enviroflow for Effective drainage



Retaining Walls & Structures

Water pressure build-up behind retaining structures creates a thrust on the wall that can be devastating if not dealt with. Weep holes can be introduced but these small diameter pipes

clog too easily, even when the wall is backed by a gravel trench to promote drainage and filter fabric is used to keep dirt out of the gravel.

Enviroflow is the ideal solution – It filters the water without the need for geotextiles retaining silts on the earth side of the structure. Water is taken by advanced capillary action along the Enviroflow until a discharge point is reached. Fast effective dewatering for structures.





Embankment Stabilisation

Enviroflow type systems have been proven in the field to successfully intercept ground water from hillsides and cut profiles, while preventing erosion along hillsides. Traditional systems of drainage for the oil and gas industry require massive amounts of aggregate, which are often transported down steep hills – a cumbersome, time-consuming process.

Enviroflow are easily transported to the site in pallets and are

simple to install by hand, either horizontally or vertically and should be spaced at around 2-4m centres to intercept rainwater with the transverse runs discharging to each side.

Enviroflow can provide a viable simple method of transporting storm water away from building foundations that is both easy to install, highly efficient and permanent. Simply affix Enviroflow, side-by-side, next to the foundation, and place a perpendicular plank every



2.5 - 3m. Enviroflow will now capture storm water that would typically run into the foundation, and direct the water away from the structure via the perpendicular planks without clogging. As a result, foundations are more stable and basements are kept dry.

Residential Drainage

Enviroflow is a far superior replacement to traditional French drains in residential construction to eliminate soggy front and back gardens. Not only are they cost-effective and easy to install, they have been proven both in the field and in the laboratory not to clog over time. Traditional French drains incorporate aggregate, geotextiles, and perforated pipe – which silt-up in 2-7 years.

Minimally disruptive to the property, Enviroflow can be installed in a 50mm wide trench at 3-5m centres with a small piece of equipment and the units installed by hand. They can even be used to create

planters that also control irrigation effectively.

The Enviroflow can even be used as path edging that can be concreted into place but still allow effective drainage to a pathway or driveway by transporting water along their length by capillary action to a suitable outlet point.







Living Structures

Enviroflow can be used to create green facades (vertical surfaces) using the unique ability of Enviroflow to provide vertical hydration to pitched or vertical surfaces to support plant growth through hydroponics. The capillary structure of the Enviroflow draws water across the surface supporting planting structures and bringing them to life.

Enviroflow benefits:

Thermal/energy saving, air filtration, reduced pollution, minimises urban heat islands effect, rainwater harvesting, SuDs (reduced water discharge) ecological, biodiversity, social/environmental

Concrete Deck or similar

improvements, aesthetics. Lightweight, strong and structurally stable. Units can be trafficked immediately without damage to the product or an underlying membrane.



°⊡°7

PAVING: Timber decking, turf or planting Enviroflow — Drainage Panel

Impermeable -geomembrane Concrete Decking or similar Enviroflow Drainage Panels lining base and sides of planter (1000x225x45mm)

Tiles or slabs

Impermeable aeomembrane



Enviroflow for Green Roofs



Green Roofs

The Enviroflow panels are manufactured entirely from recycled plastic and feature a unique advanced capillary action to transport water, enabling green roofs and facades to be created. The Enviroflow panel acts as a wick, as well as a water store and diffuser, primarily to assist with storm attenuation drainage. These unique properties enable plants to be grown, fed and irrigated, the soil-less structure creating herbaceous growth without the risk of soil slippage. The surface can be covered with dense, evergreen, self-seeding, non-invasive plant varieties with creeping root structures such as birds' foot trefoil or rupturewort ground cover which would require little more than an annual inspection.

The Enviroflow has been tested to confirm it saves approximately 1 tonne of CO2 per 100m2, it is also extremely lightweight, even when saturated. Such lightweight green roof structures can remain green all year round with irrigation but if preferred, traditional sedums can be used without irrigation, the retained water being taken from the roof deck to the roots by capillary action.



Green Roof construction - Hydroponic (Rainwater Harvesting) Depth - 45mm Saturated Weight - 35.5kg/m2 Rain harvesting Tank - Surface or sub surface Water circulation - Photovoltaic or mains Plant varieties - various

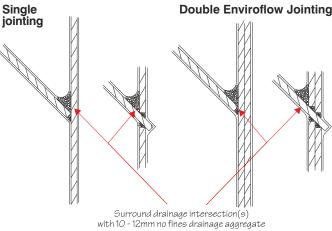


Enviroflow Standard construction details

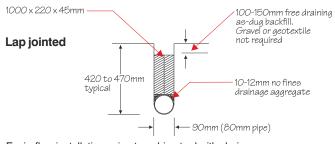




Enviroflow Jointing

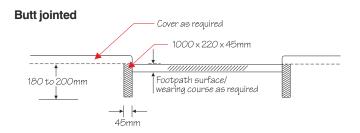


Double vertical Enviroflow & Pipe Installation



Enviroflow installation using trenching tool with chain or wheel trencher

Single vertical Enviroflow

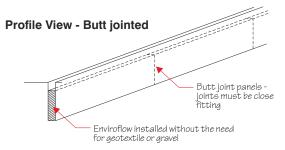




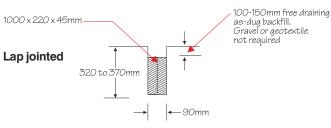
Single Enviroflow Installation

100-150mm free draining 1000 x 220 x 45mm as-dug backfill. Gravel or geotextile not required **Butt jointed** 320 to 370mm -50mm

Enviroflow installation using trenching tool with chain or wheel trencher

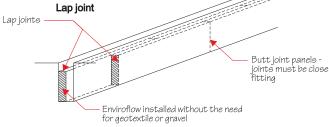


Double Enviroflow Installation



Enviroflow installation using trenching tool with chain or wheel trencher

Profile View - Lap jointed



Enviroflow

Product Physical Properties & Performance Test Results

Test	Result
European Turfgrass Laboratories Percolation Rate (ASTM F1815-06)	18,500mm/hr
BTTG High Performance Materials) – not loaded Average Permeability (0.00812m/s)	33 litres/second/m2
BTTG High Performance Materials) – compression 30kN/0.0043m2) Average Permeability (0.02469l/s)	30 litres/second/m2
Freeze/Thaw Cycling (Ref. ASTM D5312-04, modified)	0.017% Weight Loss
Expansion/Contraction (Product expands within its own dimensions)	230 x 10-6 Contraction (per deg. C.)
Compressive Strength (Ref. ASTM 1621-00, modified)	1,028 tonnes/m2 (10,080kN/m2)
Shear Strength (Geospec)	8,997 N (unsupported push through force)
Water Quality (Leachate) prEN 12457 & pr EN14429 BS6920 Pt 1	Below thresholds & complies with WRAS
Environmental (Life Cycle Inventory: Newcastle University)	2 tons of Co2 (Greenhouse Gas) saved per 200m2

Product Dimensions & Weight

Standard Size: 1m x 220mm x 45mm Pallet Quantity: 152pcs (33.5m2) Weight: Pallet Dims: 1m x 1m x 190cm (900kg) 5.9 kg

Typical Uses of 100% recycled Enviroflow:

Sports Surface Drainage - Golf, Football, Cricket, Rugby both commercially and in Schools and colleges Highways Drainage - Beneath block paving, concrete & asphalt surfaces as a superior sub base, stabilising French Drains Railways - Preventing sub grade water pulsing, stabilising embankments

Residential - As a French Drain or land drain substitute

Foundations - As a de-watering structure to protect basements

Oil & Gas Industries - Slope stabilisation for cuttings positioned in a herring bone pattern

Fracking - Providing stable drainage under well pads

Agriculture - As land drainage & moisture control, or as a growing medium for hydroponics

Green Roofs - Lightweight, easy to handle, and simple to install, faster vegetation growth, but also requires less water

Advantages of 100% recycled Enviroflow:

- ♦ 75% lighter than aggregate draining medium.
- Lightweight, easy to handle and transport.
- Fast and simple installation, minimally disruptive to the property.
- ♦ 50% reduced excavation & rapid reinstatement of surface.
- Reduced construction costs and less manpower.
- Environmentally friendly, made of 100-percent recycled materials.
- Prevent hillside erosion.
- Cost-effective, permanent drainage solution.
- Does not clog or accumulate silt, no settlement or migration.
- Durable enough to withstand heavy equipment & still maintain flow.
- Requires no additional materials such as sand, stone or geotextiles.
- Creates a controlled growth environment for hydroponics.

Information contained herein is subject to change without notice. Customers should check with Naylor Environmental to ensure that they have the latest details. Liability in respect of any statements, conditions, warranties and representations made on behalf of Naylor Environmental is limited in accordance with the terms set out in the Manufactured Standard Conditions of Sale

NAYLOR ENVIRONMENTAL

in the UK

For further information contact Tel 01226 794135 Fax 01226 791531 E-mail environmental@naylor.co.uk Web: www.naylor.co.uk