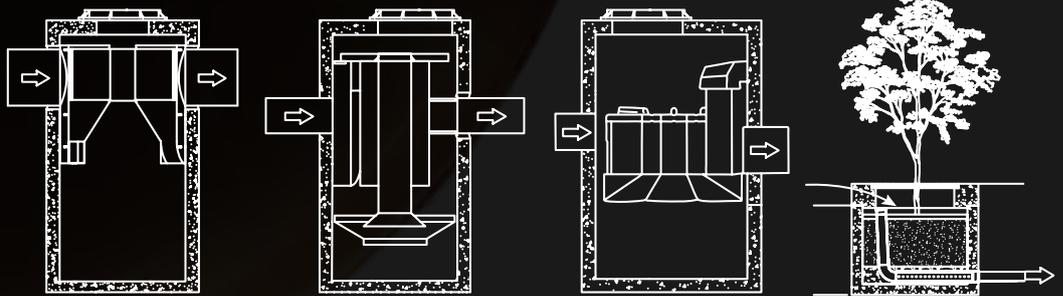




The **Hydro StormTrain**[®] Series of Surface Water Treatment Devices

First Defense[®] • **Downstream Defender**[®] • **Up-Flo**[™] Filter • **Hydro Biofilter**[™]



Repeatable performance
inspired by nature.

Stormwater Solutions
Turning Water Around[®]



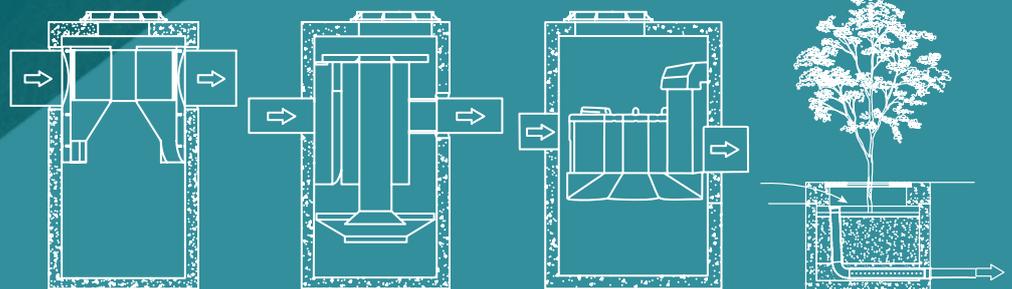
The Hydro StormTrain® Series

A Comprehensive Toolbox for Surface Water Treatment

Each Hydro StormTrain® device delivers proven, measurable and repeatable surface water treatment performance. Each can be used independently to meet the specific treatment needs of a site or combined to form a management train.

Engineers may also choose to select Hydro StormTrain® devices to work alongside natural SuDS features to protect, enable or enhance them.

First Defense® • Downstream Defender® • Up-Flo™ Filter • Hydro Biofilter™



Access our unique Treatment Selection Tool and explore the results of combining proprietary and natural treatment solutions.

www.hydro-int.com/stormtrain/tool



Repeatable Performance, Inspired by Nature

Nature can often be the inspiration for best practice in simple and sustainable drainage design in the urban environment.

By engineering in nature's way, Hydro's treatment systems can deliver sustainable solutions which enhance – and even outperform nature itself.

Selecting from the Hydro StormTrain® Series of surface water treatment devices offers the advantages of:

- Repeatable, tried and tested performance.
- Minimal maintenance that is planned and predictable.
- Reduced land take to maximise developer returns.
- Buildability – pre-packaged for ease of installation with low construction costs.

SuDS-Compliant Confidence

Hydro treatment devices can be designed with confidence to reliably deliver appropriate 'levels of treatment' as part of a SuDS management train.

The expectations of the EU Water Framework Directive (WFD) are influencing the development of legislation in England, Wales and Northern Ireland, as well as driving the implementation of established regulations in Scotland. In every case, Hydro's treatment devices offer future-proof SuDS-compliance.

Extensively Tested and Verified

Hydro's surface water treatment devices are performance-verified for use by many independent regulatory bodies in the UK, US and other select territories around the world. Hydro products are extensively tested through Hydro's own world-class Research and Development facilities, ensuring predictable performance to the highest standard.

For free technical advice on any of our surface water quality products please phone 01275 337955 or email stormtrain@hydro-int.com

First Defense®

Vortex Separator

The First Defense® is an economical hydrodynamic vortex separator for effective removal of sediment, litter and oil from surface water runoff. Captured pollutants are kept safely within the device keeping public areas free from harmful pollutants.

Suitable for at-source pollution control in small to medium size catchments, the First Defense® provides space-saving, easy-to-install surface water treatment in a standard size manhole.



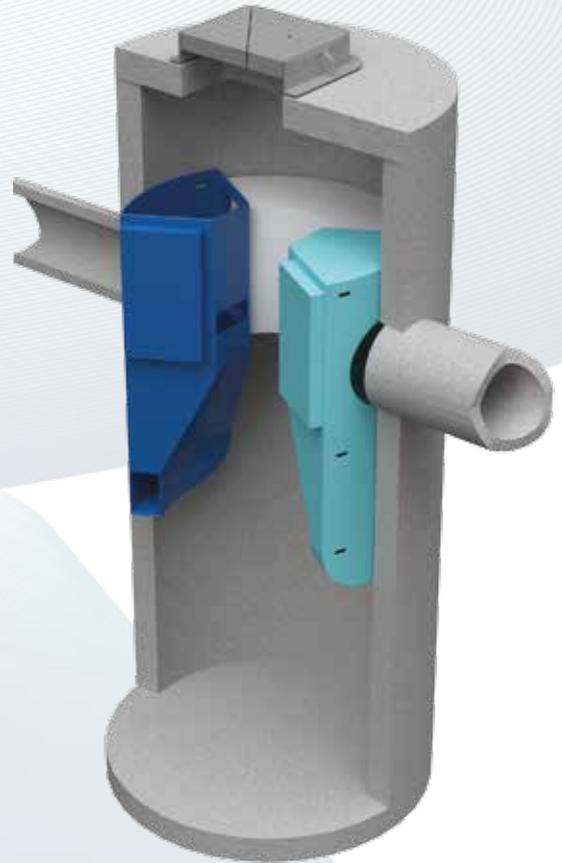
Coarse particles



Gross pollutants



Liquid and sediment bound hydrocarbons



Repeatable, Reliable Performance

The First Defense® internal components have been carefully designed to create a low energy rotational flow within the chamber to encourage pollution separation. This vortex separation allows sediments to settle to the sump whilst oils, floating litter and debris rise to the upper containment area.

Avoids Pollutant Wash Out

The First Defense® contains an integral bypass that conveys large, infrequent rainfall events directly to the outlet chute. This prevents turbulence and wash out of the captured pollutants and also eliminates the need for, and expense of, external bypass structures.

Its low-energy vortex separation generates a gentle action that eliminates unnecessary or excessive agitation of captured pollutants and avoids resuspension of pollutants during peak flows.

Saves on Construction Costs

Installation of the First Defense® is as easy as fitting any manhole on site. The compact unit is delivered as a pre-cast concrete manhole with internal components pre-fitted, and a cover slab appropriately rated for the application.

The integral flow bypass design means there is no need to construct external bypass control structures and choosing the surface grate inlet option can eliminate the need for an inlet pipe.

Easy to Maintain

The First Defense® is easily maintained from the surface by standard vacuum tanker and no other specialist equipment is needed.

Adaptable

The First Defense® can accommodate a change in outlet orientation to suit site specific conditions. Single and multiple inlet pipes can also be offered along with an inlet surface grate to offer maximum design flexibility.

Applications

The First Defense® reliably treats runoff from impermeable surfaces across a broad range of catchments. Already proven in hundreds of installations across the globe, First Defense® provides at-source pollution control for residential and commercial developments, highways and car parks.

The First Defense® also operates successfully as part of a management train alongside other proprietary or natural SuDS features, for example as treatment before infiltration.

Case Studies



Beach Sixty

The smooth installation of 60 First Defense® separators at Revere Beach in Massachusetts provided a cost- and time-saving solution to removing sand, grit, litter, oil and debris from runoff along a 1.5 mile section of highway boulevard. The solution provided treatment at each drainage inlet prior to infiltration of the surface water as part of a major urban regeneration initiative.



Small is Beautiful

A First Defense® unit provided a much-needed small footprint solution to meeting regulatory treatment requirements on a confined site for a new commercial office development in Perkins Township, Ohio. The unit's compact size fitted the terrain and also met the need for speedy 'plug and play' installation that delivered considerable cost savings.

Treatment Processes

Enhanced Sedimentation

Flotation

Explore the Options with our Treatment Selection Tool



www.hydro-int.com/stormtrain/tool

A Proven Track Record

Hydro International's First Defense® has a proven track record with regulatory agencies around the world, including:

- Colorado Department of Transportation
- New York State Department of Transportation
- Maine Department of Environmental Protection
- Massachusetts Department of Environmental Protection
- Wisconsin Department of Commerce
- Ohio Environmental Protection Agency

Downstream Defender[®]

Advanced Hydrodynamic Vortex Separator

The Downstream Defender[®] is an advanced hydrodynamic vortex separator for the effective and reliable removal of fine particles along with oils and other floatable debris from surface water runoff.

Its innovative design delivers high efficiency across a wide range of flows in a much smaller footprint than conventional or other swirl-type devices and is the perfect choice for any catchment likely to convey high quantities of contamination.



Fine particles



Heavy Metals

Sediment bound



Gross pollutants

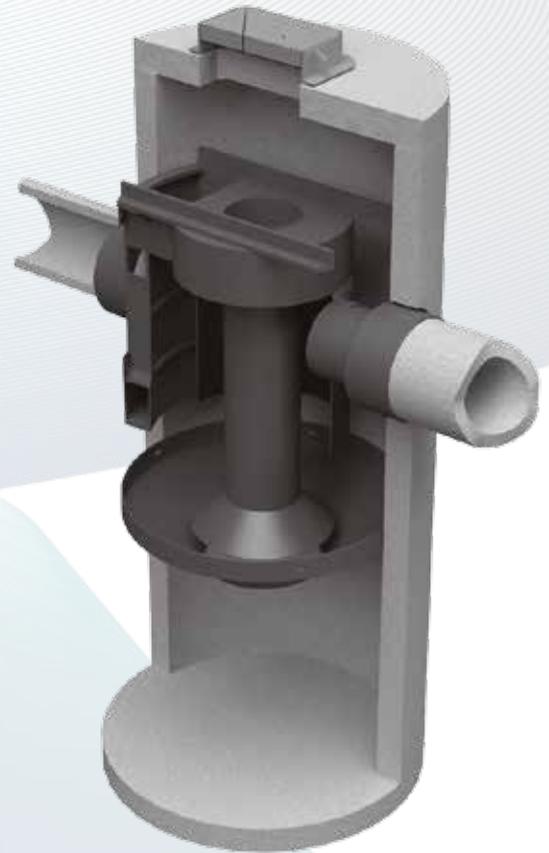


Nutrients

Sediment bound



Liquid and sediment bound hydrocarbons



Repeatable, Reliable Performance

The Downstream Defender[®] delivers high removal of pollutants through advanced hydrodynamic vortex separation across a wide range of flows, achieving a long stable flow path to maximise pollutant capture from surface runoff.

The device is able to tackle an assortment of pollutants including gross debris, litter, hydrocarbons, coarse sediments, fine sediments and particulate organics. In the field, pollution captured by the Downstream Defender[®] has been shown to be as fine as the pollutants captured in much larger settling ponds.

No Risk of Pollutant Wash Out

The Downstream Defender[®] is proven to prevent wash out of captured pollutants. Carefully designed internal components isolate the pollution storage areas ensuring what is captured is retained, even during high flows.

Easy to Install and Maintain

The Downstream Defender[®] is delivered to site as a pre-cast concrete manhole chamber with internal components already installed.

Maintenance of the Downstream Defender[®] is significantly easier than for diffuse solutions (such as swales and trenches) or large management structures (such as ponds and wetlands) as it offers long maintenance intervals and consolidates activity to a single point within the drainage system. Maintenance of

the device is carried out from the surface using a standard vacuum tanker and personnel are not required to enter the device.

Adaptable

The Downstream Defender[®] can accommodate a change in outlet pipe direction to suit site specific requirements, helping meet Building Regulations without the need to construct a second manhole.

Applications

The Downstream Defender[®] reliably treats runoff from any impermeable surfaces including highways, car parks and industrial areas.

It is also widely used to control siltation upstream of wetlands, ponds and basins, for example as an alternative to a sediment forebay, and can help to reduce the maintenance burden of natural SuDS features.

Case Studies



Pollution Protection in Whisky Country

Highway degradation and surface water pollution were averted on the A95 near Craigellachie in an environmentally sensitive area of the Scottish Cairngorms thanks to an imaginative SuDS Solution using 3 Hydro-Brake® Flow Controls and a Downstream Defender®.



Sustainable Homes Infrastructure

The exemplary sustainable drainage infrastructure for the 2300-home Great Kneighton Housing Development in Cambridgeshire is based on a series of four large ponds with infiltration and settling basins located across the 109 hectare site. Downstream Defender® hydrodynamic separators are used to remove sediments, floatables and any hydrocarbons before they reach the ponds. Discharge from the ponds into the receiving watercourse is controlled via Hydro-Brake® Flow Control Devices.

Treatment Processes

Enhanced Sedimentation

Flotation

Explore the Options with our Treatment Selection Tool



A Proven Track Record

Hydro International's Downstream Defender® has a proven track record with regulatory agencies around the world, including:

- Transport for London London Underground Approved Products Register.
- US Environmental Protection Agency - Environmental Technology Verification scheme.
- New Jersey Department of Environmental Protection
- State of Washington Department of Ecology
- Ontario Ministry of the Environment
- The City of Calgary
- Connecticut Department of Transportation
- Oregon Department of Transportation
- Delaware Department of Natural Resources and Environmental Control
- Colorado Department of Transportation
- New York State Department of Transportation
- Maine Department of Environmental Protection
- Massachusetts Department of Environmental Protection
- Wisconsin Department of Commerce
- Virginia Department of Transportation
- Ohio Environmental Protection Agency

www.hydro-int.com/stormtrain/tool

Up-Flo™ Filter

Fluidised Bed Up Flow Filtration System

The Up-Flo™ Filter is an innovative surface water filtration technology that delivers a high-performance multi-stage treatment train within a single device. The Up-Flo™ Filter combines sedimentation and screening with fluidised bed filtration technology to deliver high levels of performance.

Easy to maintain and with low construction costs, the Up-Flo™ Filter achieves a high quality of surface water discharge in a much smaller footprint than alternative systems.



Very fine particles



Gross pollutants



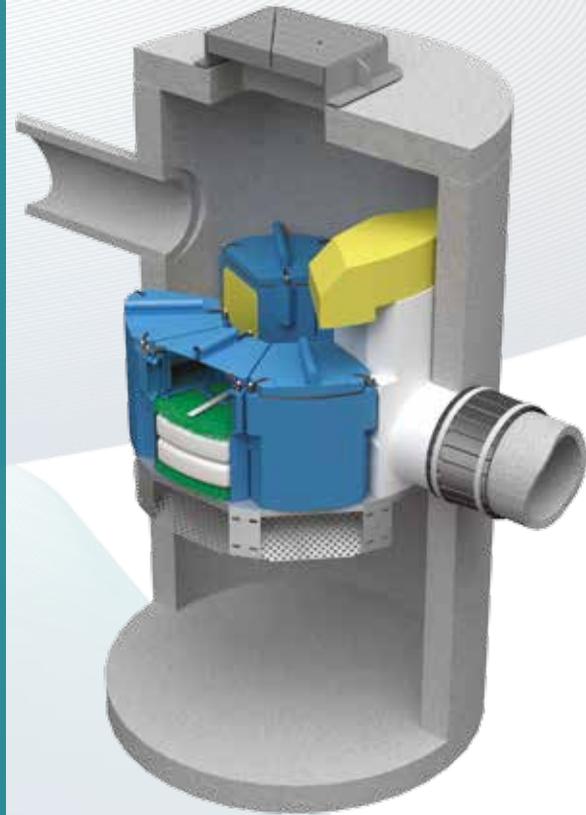
Liquid and sediment bound hydrocarbons

Heavy Metals

Sediment bound

Nutrients

Sediment bound



Repeatable, Reliable Performance

The unique Hydro Up-Flo™ Filter combines multiple, sequential treatment processes to deliver sedimentation, screening and filtration all in one compact unit.

The Up-Flo™ Filter removes litter, sediments, nutrients, metals and hydrocarbons. Specific pollutants can be targeted through a wide choice of media options.

During extreme rainfall events, a patented high-flow bypass system is activated preventing the device from being overloaded.

High-performance, Advanced Technology

The upwards flow, fluidised bed technology of the Up-Flo™ Filter delivers high-levels of repeatable, predictable surface water treatment. There is no blinding or clogging of the filter media and the Up-Flo™ Filter's patented drain down system initiates a backwash to recharge media between storm events.

Easy Installation for Trouble-free Construction

Up-Flo™ Filter is supplied fully assembled in a pre-cast concrete manhole or in a concrete vault arrangement for higher flows. Its advanced filter units can also be simply retrofitted into an existing chamber on-site.

Simple and Cost-effective Maintenance

The gentle and effective action of the Up-Flo™ Filter ensures the filtration media have a much longer life than comparable systems, so maintenance is infrequent, cost-effective and simple. The filter media packs can be exchanged manually without the need for specialist equipment.

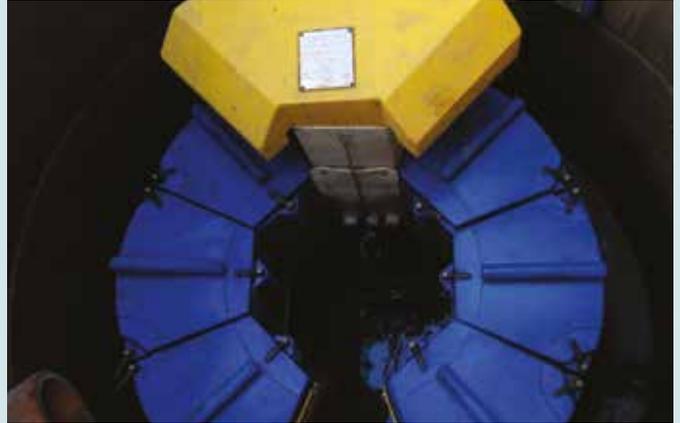
Sediment collected in the sump is removed with a standard vacuum tanker.

Applications

The Up-Flo™ Filter is especially useful in high-density urban environments, where high pollutant loadings need to be managed in limited space or where it is difficult to control the quality of surface water runoff using conventional or natural SuDS techniques alone.

The Up-Flo™ Filter provides an effective solution in both new-build or retrofit situations for residential, commercial or industrial developments, highways or car parks.

Case Study



Natural SuDS 'Not Possible'

A unique solution for a new homes development in Kent enabled SuDS with two levels of treatment for a new access road, combining Up-Flo™ filtration technology with Hydro Stormbloc® modular storage and infiltration blocks.

A custom-modified Up-Flo™ Filter provides effective settlement, screening and filtration to meet Environment Agency water quality requirements while also satisfying the maintenance needs of the highways authority.

To meet the surface water discharge constraints for the site, the final discharge from the filtration unit is infiltrated into the ground using Hydro's modular construction Stormbloc® storage infiltration tank. Because it is load bearing, it could be easily sited under public space in a shallow excavation and landscaped over. This provides around 180 cu. m. of storage attenuation and infiltration, without occupying valuable surface area.

Treatment Processes

Sedimentation

Flotation

Screening

Inert Filtration

Reactive Filtration

Explore the Options with our Treatment Selection Tool



www.hydro-int.com/stormtrain/tool

A Proven Track Record

Hydro International's Up-Flo™ Filter has a proven track record with regulatory agencies around the world, including:

- US Environmental Protection Agency - Environmental Technology Verification scheme.
- New Jersey Department of Environmental Protection
- State of Washington Department of Ecology
- Massachusetts Department of Environmental Protection
- Wisconsin Department of Commerce
- Maryland Department of the Environment
- Oregon Department of Transportation

Hydro Biofilter™

Biofiltration System

The Hydro Biofilter™ is an innovative biofiltration system that harnesses the natural treatment action of vegetation and the filtration power of specially-engineered soils.

From the surface Hydro Biofilter™ looks like a tree box, with a suitable shrub or small tree protruding through a decorative grating in a concrete slab at pavement level. Underneath, the pre-cast concrete chamber contains a layer of enhanced mulch, on top of a unique soil filter medium to deliver high levels of surface water treatment.



Very fine particles



Heavy Metals Sediment bound



Gross pollutants



Nutrients Sediment bound



Liquid and sediment bound hydrocarbons



Dissolved pollutants



Repeatable, Reliable High-performance

Surface water is channelled into the unit through a kerbside inlet, through an inlet pipe or directly from the surface and flows through the mulch and soil filter media, providing high-performance, high-flow filtration that targets sediment, hydrocarbons, heavy metals and nutrients.

Attractive and Space-saving

Hydro Biofilter™ contributes to attractive urban areas and street scenes and supports local biodiversity. Its compact design makes it ideal for both new build and retrofit applications.

Versatile

The treated water is discharged via the under drain system to a drainage outflow, watercourse, or onwards for infiltration if soil conditions allow. It can also be integrated with Hydro's Stormcell® or Stormbloc® Storage and Infiltration Systems.

Low-cost Maintenance

Maintenance is similar to landscaped areas and each unit is supplied with a 12-month maintenance agreement.

Easy, Cost-effective Installation

While the chemical and biological processes behind Hydro Biofilter™ are complex, installation is simple. The filter media and ready-fitted internal components are pre-packaged in the concrete chamber to facilitate easy drop-in-place construction.

Applications

Hydro Biofilter™ engineers in nature's way to enhance any urban environment even where space is at a premium or where a retrofit surface water treatment solution is required. Suitable for residential or commercial settings, car parks and highways.

Case Study



Stringent Quality Control, Naturally

Hydro Biofilter™ have brought attractive landscaping and stringent surface water quality control to a sensitive location in Barry, South Wales. Vale of Glamorgan Council retrofitted three Hydro Biofilter™ units at the Barry Business Support Centre car park to upgrade the site to meet SuDS requirements and provide urban planting and landscaping for much-needed urban regeneration.

This typical urban location is surrounded by buildings and infrastructure and the three Hydro Biofilter™ units enabled Environment Agency requirements to be met for removing pollutants from surface water runoff before discharge via the storm sewer into the adjacent docks.

Treatment Processes

Sedimentation

Inert Filtration

Reactive Filtration

Media Recharge

Explore the Options with our Treatment Selection Tool



www.hydro-int.com/stormtrain/tool

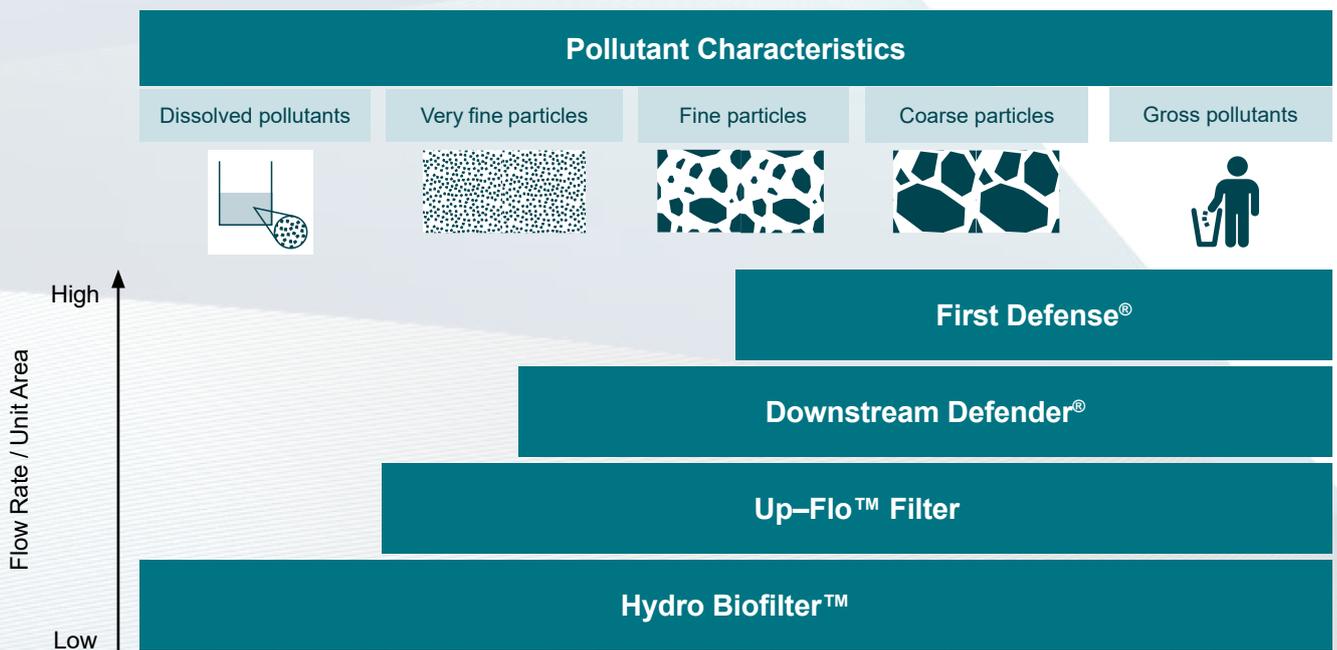
Selection Guide

Selecting from the Hydro StormTrain® Series

To select the right treatment product for your application the following parameters need to be considered:

- Catchment area.
- Land use characteristics.
- Local rainfall data.
- Available depth.
- Specific site constraints.
- Sensitivity of receiving waters.

The Hydro StormTrain® Series



Key Pollutants

Product	Description	Catchment Size			Target Particle Size (Average) (microns)	Targeted pollutants
		Small	Medium	Large		
First Defense®	Vortex separator	✓	✓	✗	240**	Coarse sediment, litter, debris
Downstream Defender®	Advanced hydrodynamic vortex separator	✗	✓	✓	106**	Fine sediment, litter, debris, hydrocarbons, sediment bound metals, hydrocarbons and nutrients
Up-Flo™ Filter	Fluidised bed up flow filtration system	✓	✓*	✗	20	Very fine sediment, litter, debris, hydrocarbons, metals and nutrients
Hydro Biofilter™	Biofiltration system	✓	✗	✗	Dissolved	Very fine and dissolved sediments, litter, debris, hydrocarbons, metals and nutrients

*With the use of vault design

** May be sized for different target particle sizes and removal efficiencies – contact us for site specific design.

Expert Design Service

Hydro's professional engineers are on hand to provide free support to designers and specifiers to aid with the correct selection and application of Hydro products within each drainage design.

Our dedicated design support team is available to advise on best-practice integration of the Hydro StormTrain® Series within the SuDS management train. Our engineers are well informed about the latest design guidance for SuDS across the UK.

The Hydro design team is well-qualified to advise on correct sizing of devices to meet flow and water quality requirements and can provide drawings as required.

Advice

A full range of design, installation and maintenance advice is available by contacting the StormTrain® hotline on **01275 337955** or emailing stormtrain@hydro-int.com



Try the Treatment Selection Tool

Hydro has developed a unique Treatment Selection Tool to enable designers to explore the consequences of combining proprietary and natural SuDS techniques in a variety of applications.

The tool helps users develop 'what if' scenarios and build example treatment trains, then calculates potential outcomes in terms of pollutant removal and cost implications.

Explore the options for surface water treatment with Hydro's unique Treatment Selection Tool at:

www.hydro-int.com/stormtrain/tool

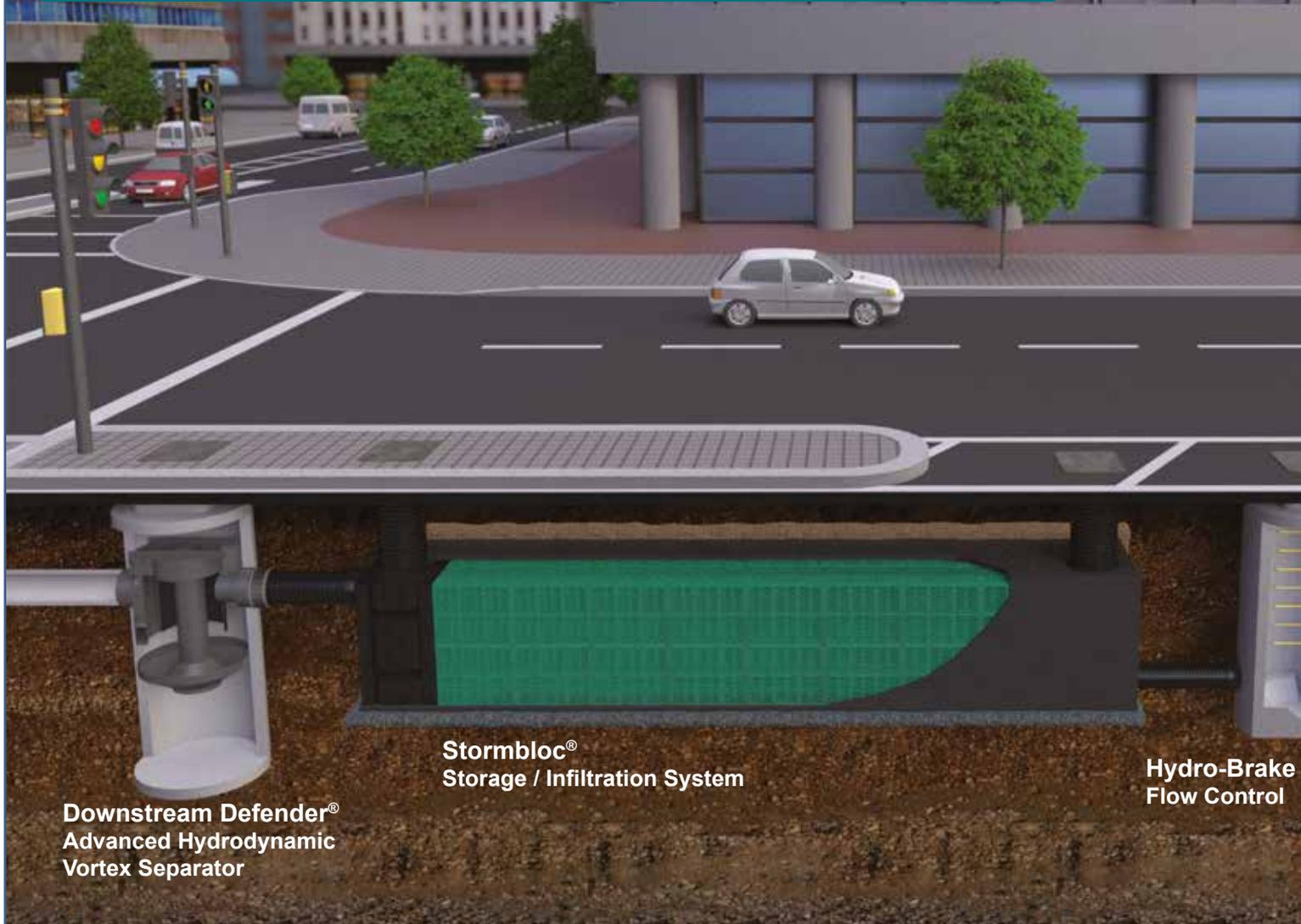


The Treatment Selection Tool is free to use at:

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Integration with Hydro Products

The Hydro StormTrain® Series can be integrated with Hydro's industry-leading products for surface water attenuation, storage and infiltration as part of the SuDS management train.



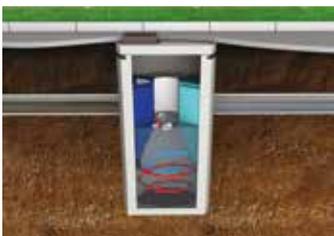
Downstream Defender®
Advanced Hydrodynamic
Vortex Separator

Stormbloc®
Storage / Infiltration System

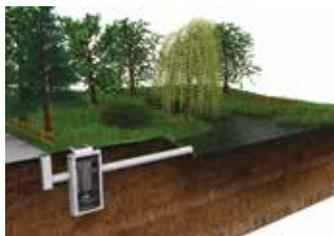
Hydro-Brake
Flow Control

The Hydro StormTrain® Series

First Defense®
Vortex Separator



Downstream Defender®
Advanced Hydrodynamic Vortex
Separator



Up-Flo™ Filter
Fluidised Bed Up Flow Filtration
System



Hydro Biofilter™
Biofiltration System





Other Surface Water Management Solutions from Hydro International

Hydro-Brake Optimum® Flow Control

There is no equivalent

Providing unrivalled hydraulic performance and allowing unique customisation of hydraulic characteristics, the Hydro-Brake Optimum® is the only passive vortex flow control device with both BBA and WRc Approved verification.



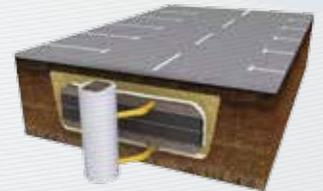
Stormbloc® Storage and Infiltration

Stormbloc® provides BBA approved below ground storage and infiltration, maximising contact with the surrounding soils to optimise infiltration potential, while retaining functional use of the land above, especially in urban environments where space is limited.



Stormcell® Storage

Stormcell® is a cost-effective, versatile modular underground surface water storage system suitable for installation beneath roads, car parks and amenity areas and permits access for inspection. Stormcell® units are installed utilising a pipework system which prevents the entry of silts and grits into the storage volume.



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Email: stormtrain@hydro-int.com



The Treatment Selection Tool is free to use at:
www.hydro-int.com/stormtrain/tool



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Turning Water Around...®