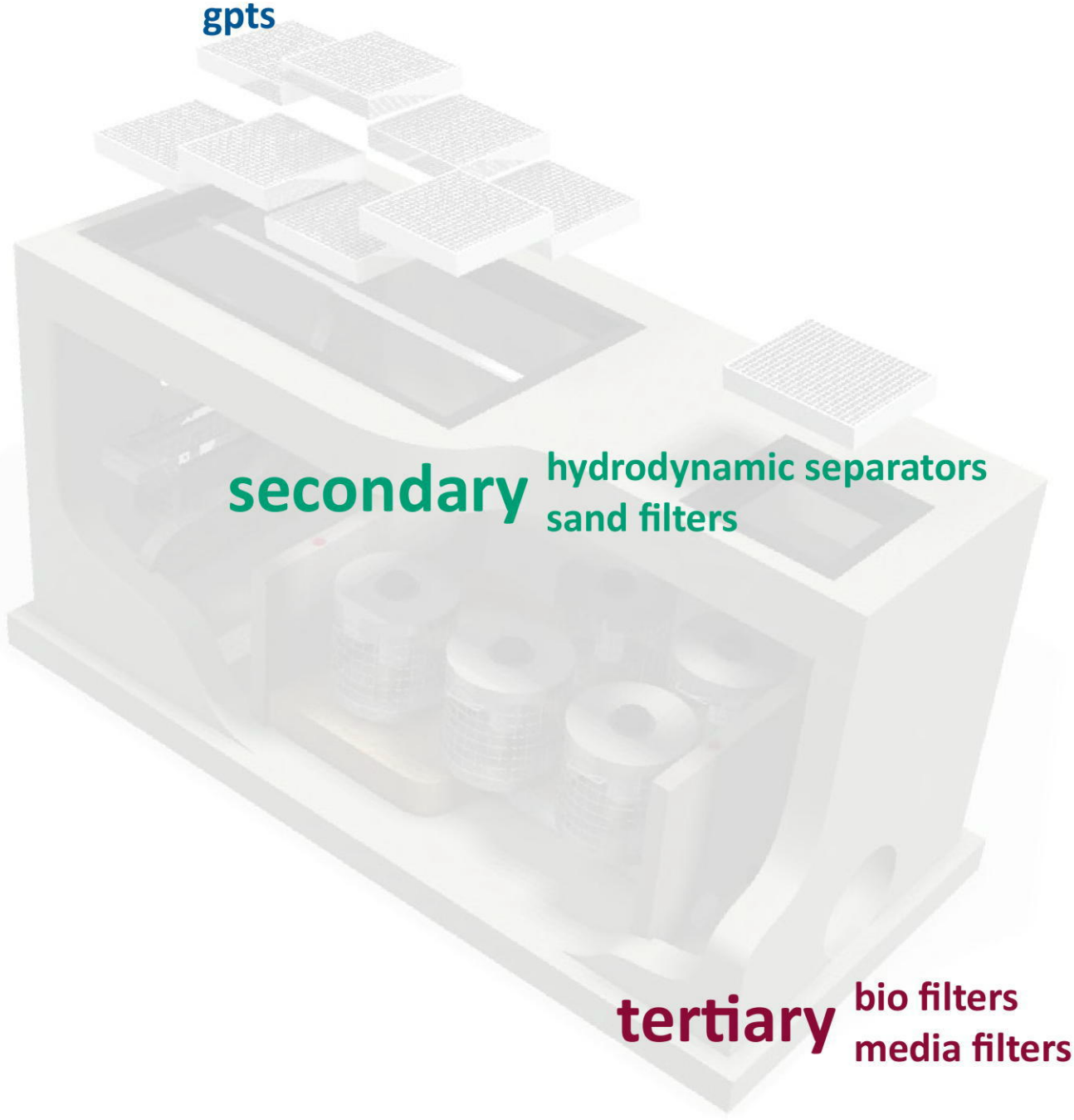
Ecosol™
WASTEWATER FILTRATION SYSTEMS

stormwater treatment solutions

primary
litter baskets
trash racks
gpts



secondary
hydrodynamic separators
sand filters

tertiary
bio filters
media filters

environmentally engineered for a better future

contents

Document Set ID: 6105320
Version: 1, Version Date: 20/08/2014

stormwater treatment objectives

Water Sensitive Urban Design (WSUD) objectives and principles are now applied to most urban developments with the aim of minimising adverse impacts that a development may have on the natural ecosystem.

The objective of stormwater treatment is to achieve a real, visible, and sustainable improvement in water quality. Treatment measures, such as gross pollutant traps, litter baskets, sediment basins, grass swales, infiltration and bio-filtration systems, and sand filters reduce the level and concentration of a range of pollutants, thereby enhancing water quality.

best management practices

Best Management Practices require planners and developers to apply a fit-for-purpose treatment-train approach to stormwater treatment because no one measure can remove all of the pollutants typically present in a catchment. Adopting such an approach is the key to achieving water quality objectives (WQOs), although the designed interaction of the different measures will vary depending on site characteristics, the catchment, and the needs of the receiving ecosystem. It is essential that WQOs are established as part of the conceptual design process for a development.

stormwater treatment measures

A treatment-train approach to stormwater management involves a range of measures (primary, secondary, and tertiary) that work together to enhance water quality.

primary treatment

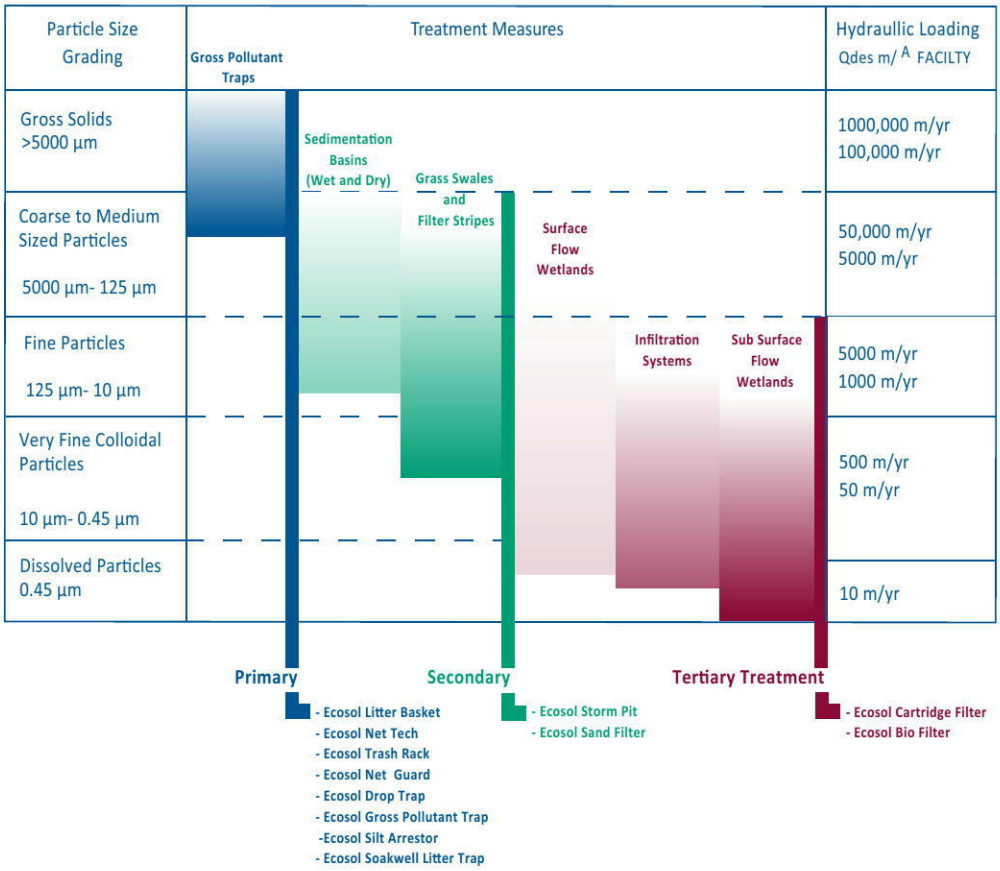
The aim is to remove gross pollutants and coarse sediment (>5mm in size) and help in the downstream treatment of smaller pollutants.

secondary treatment

These measures aim to remove fine particles, sedimentation, and attached pollutants.

tertiary treatment

Third-stage treatment measures remove very fine/colloidal particulates, dissolved nutrients, and heavy metals.



(extracted from the Australian Runoff Quality: A guide to Water Sensitive Urban Design)

about us

Ecosol is a privately-owned Australian company incorporated in 1996. The quality and reliability of our products and services are the foundation of our success. We are constantly developing and improving our solutions and striving to exceed customer expectations.

The group is headquartered in Adelaide, South Australia and has offices in most states as well as in New Zealand and Malaysia.

hydrology and MUSIC modelling

Increasingly, engineers, planners, and consultants are using software packages to help in the design of stormwater management systems. There are several available packages in Australia, the most popular of which is MUSIC (an acronym for Model for Urban Stormwater Improvement Conceptualisation).

Ecosol can provide preliminary civil engineering hydrology and also MUSIC input values to determine any of its products' suitability for a particular project.

testing

All Ecosol products are independently tested both in laboratory and field environments. Testing is an integral part of Ecosol's commitment to product improvement and is essential in determining a product's performance specifications.

Ecosol has since 2009 used a specially-designed in-house rig to test its products for a range of conditions, including treatable flow rates, capture efficiencies, and headlosses.

about us

in-house manufacturing

Ecosol manufactures all of its products in-house. Using the latest equipment and employing first-class tradespersons, Ecosol produces units of the highest quality under strict OH&S and environmental standards.

In-house manufacturing enables Ecosol to offer its clients industry-best lead times as well as customising its products to meet their specific needs.

materials and unit components

Ecosol only uses the best quality materials and components for its products. Strong, durable, and corrosive-resistant materials help optimise unit performance and enhance operating life expectancy.

warranty and life expectancy

Ecosol will rectify any defects that fall within its warranty terms and conditions.

All stainless-steel components have a life expectancy of 20 years, providing the unit is properly maintained. Pre-cast concrete pits have an estimated 50-year life span.

about us

engineered designs

All Ecosol products are designed to simplify the manufacturing process and reduce installation time. A major benefit of Ecosol's products is that the internal filtration components can often be pre-installed in a controlled factory environment reducing OH&S and environmental risks. This also enables the unit to be delivered to site in one piece, simplifying the installation process and reducing on-site time, an important factor given the costs associated with delays caused by, for example, inclement weather.

standards and accreditation

Ecosol's products are designed to meet the strictest engineering guidelines, and manufacturers' guarantees. All work meets the relevant Australian Standards.

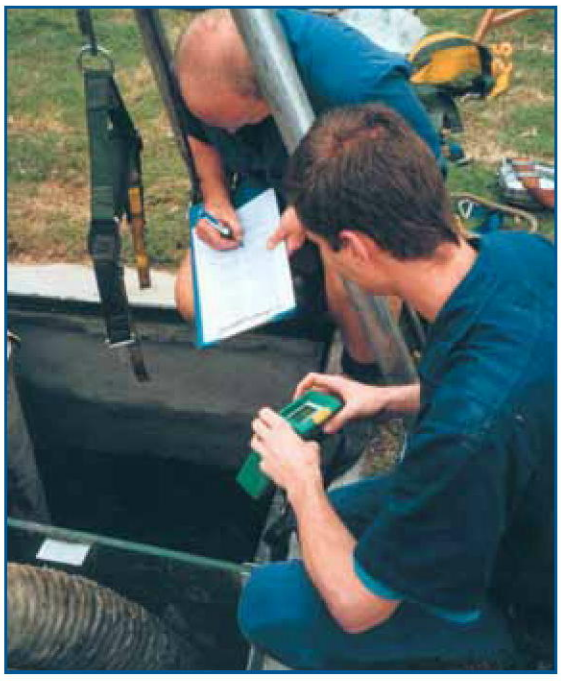
Ecosol is a quality-accredited company and meets the requirements of ISO 9001:2008 (Quality), ISO 14001:2004 (Environment), and AS/NZS 4801:2001 (OH&S).

cleaning and maintenance

All filtration systems need cleaning regularly to help ensure that they continue to operate optimally.

The cleaning frequency, and cost, depends heavily on the catchment type and size, the unit's proximity to a waste facility, and the type of pollution it captures.

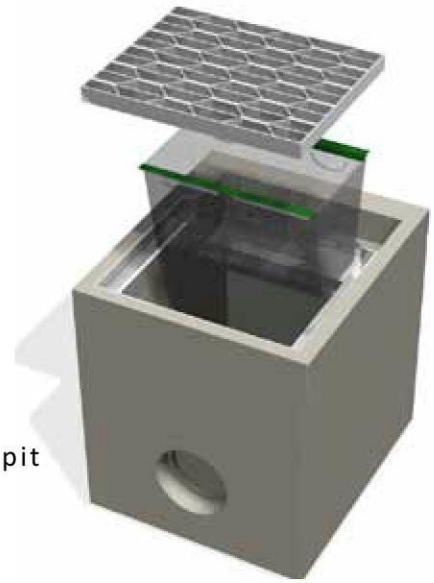
Ecosol has a dedicated team able to manage its clients' cleaning and maintenance needs.



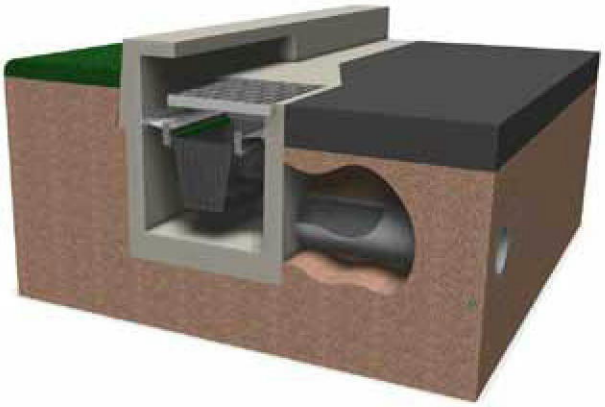
primary treatment

The **Ecosol™ Litter Basket** (at-source primary treatment solution) is an efficient and cost-effective pre-screening primary treatment system that captures and retains solid pollutants at drainage entry points.

key features



- minimal head/hydraulic loss
- no effect on stormwater inlet capacity
- unique by-pass overflow eliminates flooding risk
- no remobilisation of captured pollutants
- dry storage of pollutants and no toxic fermentation
- filter media available to suit a range of target pollutants
- can be retrofitted into existing pits or supplied in its own pit
- independently tested
- easily cleaned either manually or by vacuum



operation

The **Ecosol™ Litter Basket** consists of a capture basket, an overflow by-pass flap(s), and a filter mesh liner. The basket is fitted below road invert and is visually unobtrusive.

Key to its success is the unique overflow mechanism that eliminates the risk of road side ponding and flooding and helps ensure that already-captured pollutant are not remobilised.

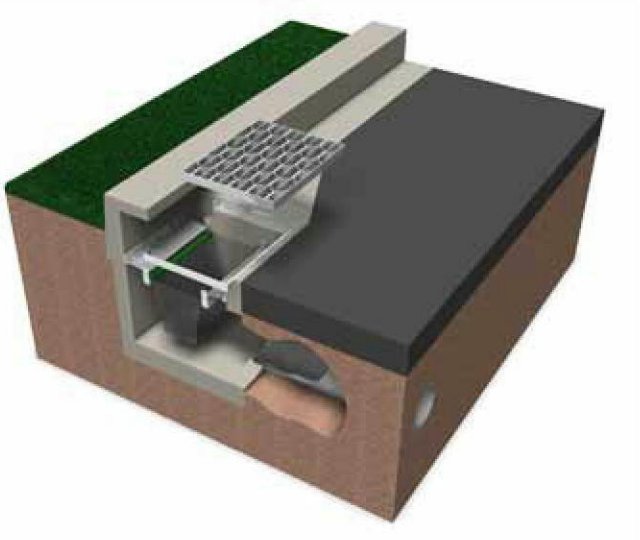
applications

The unit can be installed on most roads, in shopping precincts, industrial sites, and in residential developments.

primary treatment

hydraulics

The **Ecosol™ Litter Basket** treats 100% of all flows in both free-draining and submerged environments. When the filtration mesh liner becomes full the unit operates in by-pass until either the rain event ceases or the unit is cleaned.



configurations and sizes

The unit can be customised to fit almost any stormwater inlet pit but typically it is installed in single, double, and even triple side inlet pits, grated kerb inlets, cylindrical pits, and drainway pits.

The unit is available with filtration mesh liners ranging in size from 50mm to 200µm for targeted capture of solids, sediment (coarse and fine), and attached pollutants.

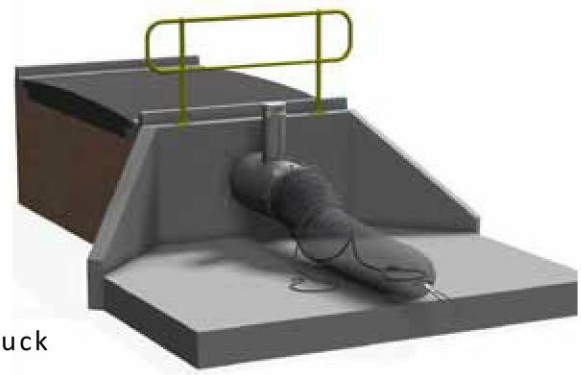
cleaning and maintenance

The **Ecosol™ Litter Basket** is easily cleaned either manually or using a small vacuum truck. The cleaning frequency depends on the catchment type and size but, as a guide, a unit serving a 0.3Ha residential catchment will need cleaning about four times annually.

primary treatment

The **Ecosol™ Net Tech** (in-line/end-of-line primary treatment solution) is a robust pre-screening net filtration system for use where there are cost or space constraints. It captures more than 91% of solids larger than 19mm.

key features



- fail-safe net release eliminates flooding risk
- easily installed with minimal disruption
- ideal in dry, tidal, and submerged environments
- independently tested
- net is easily removed for cleaning using crane truck

operation

The **Ecosol™ Net Tech** consists of a stainless-steel sleeve extension that is inserted and fixed into existing, or new, pipes and box culverts. This extension is fitted with a 50mm removable heavy-duty UV-stabilised polyethylene filtration net.

The unit continues to capture gross pollutants until the net is full, at which time, during the rain event, it disengages from the conduit, eliminating the potential for flooding during peak flow storm events. On disengagement a pull cord connected to the main unit tightens around the net throat preventing the remobilisation of captured pollutants larger than the net aperture.

applications

The unit can be installed end-of line on almost any pipe outlet or headwall and also in-line where concrete structures such as manholes and junction boxes can house the unit. It is a cost-effective and efficient pre-screening system for vegetated swales, wetlands, and on-site detention systems. It is also suitable for open channels.

primary treatment

hydraulics

The unit has minimal head/hydraulic loss as the net fills, reducing to zero when it disengages. It treats 100% of all flows in both free-draining and submerged environments. It has little or no impact on the drainage network's hydraulics.

configurations and sizes

The **Ecosol™ Net Tech** suits pipes and box culverts ranging in diameter from 300mm to 1500mm and up to 1500mm x 1200mm RCBC for single units and can also be installed as a multi-unit configuration on larger outlets.

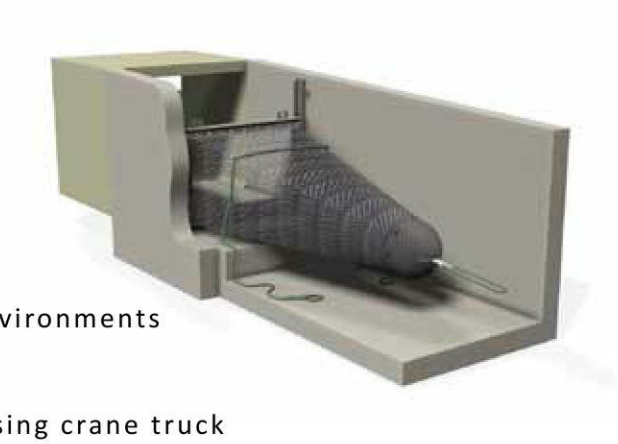
cleaning and maintenance

The unit's simple design and removable net makes access easy. It is best cleaned using a small crane truck, which eliminates any manual handling risks and the need for specialised equipment. The cleaning frequency depends on the catchment type and size but, as a guide, a unit serving a 17Ha residential catchment will need cleaning about twice annually.

primary treatment

The **Ecosol™ Trash Rack** (in-line/end-of-line primary treatment solution) is a modern primary treatment direct screening system for locations where conventional GPTs are not suitable owing to cost or space constraints.

key features



- minimal head/hydraulic loss
- can withstand peak flows without damage
- easily installed with minimal disruption
- ideal in dry, tidal, and partially submerged environments
- independently tested
- filtration net is easily removed for cleaning using crane truck

operation

The **Ecosol™ Trash Rack** consists of a strong stainless-steel frame with support legs and a removable heavy-duty UV-stabilised polyethylene filtration net (either 50mm or 115mm apertures) that can be easily lifted out using a small crane truck.

The unit will continue to capture gross pollutants until the net reaches its designed holding capacity, or in the event of a major rain event, when excess flows are designed to simply overtop the system. This by-pass facility helps eliminate any adverse hydraulic impact or potential for flooding during peak flow storm events.

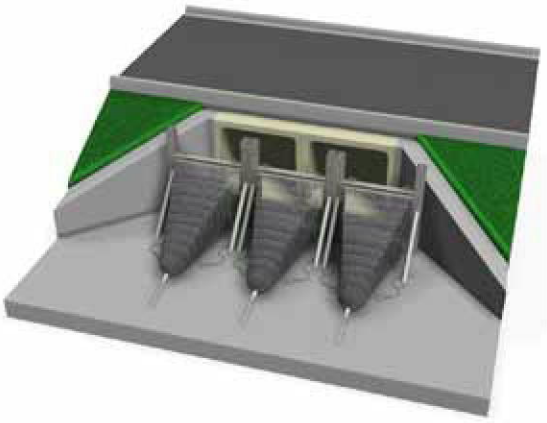
applications

The unit can be installed in most open channels, creeks, and estuaries. It is a cost-effective and efficient pre-screening system for vegetated swales, wetlands, and on-site detention systems. It is also suitable for open channels.

primary treatment

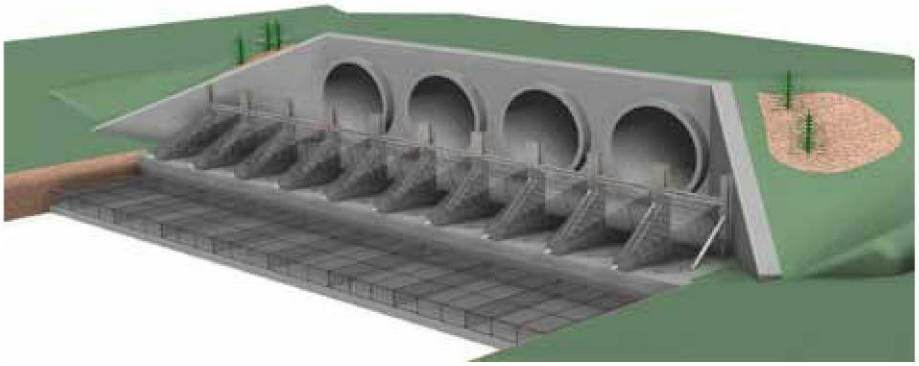
hydraulics

The unit can treat 100% of all flows up to its designed TFR and withstand a full-pipe flow by-pass. Headloss (***k*** factor) varies between 0.8 and 1.8 depending on site-specifics. Even in the worst-case scenario (full-pipe flow and full net effectively making it impervious), the maximum headloss of 1.8 has little or no impact on the drainage network's hydraulics.



configurations and sizes

The **Ecosol™ Trash Rack** suits pipes and box culverts ranging in diameter from 375mm to 1050mm and up to 1200mm x 1200mm RCBC for single units and can also be installed as a multi-unit configuration on larger outlets.



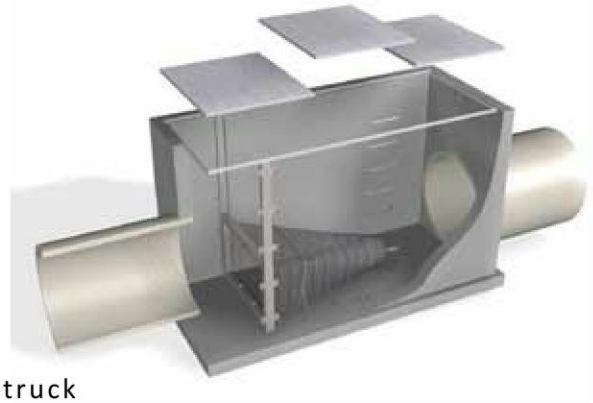
cleaning and maintenance

The unit's simple design and removable net makes access easy. It is best cleaned using a small crane truck, which eliminates any manual handling risks and the need for specialised equipment. The cleaning frequency depends on the catchment type and size but, as a guide, a unit serving a 5Ha residential catchment will need cleaning about twice annually.

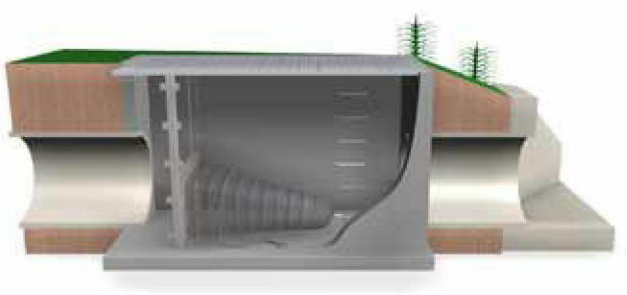
primary treatment

The **Ecosol™ Net Guard** (in-line/end-of-line primary treatment solution) is an efficient pre-screening filtration system that enhances the operational life of downstream secondary and tertiary treatment measures.

key features



- minimal head/hydraulic loss
- can withstand peak flows without damage
- visually unobtrusive in underground pit
- independently tested
- net is easily removed for cleaning using crane truck



operation

The **Ecosol™ Net Guard** consists of a pre-cast concrete pit that houses a strong stainless-steel frame and removable heavy-duty UV-stabilised polyethylene filtration net (either 50mm or 115mm apertures) that can be easily lifted out using a small crane truck.

The unit will continue to capture gross pollutants until the net reaches its designed holding capacity, or in the event of a major rain event, when excess flows are designed to simply overtop the system. This facility helps eliminate any adverse hydraulic impact or potential for flooding during peak flow storm events.

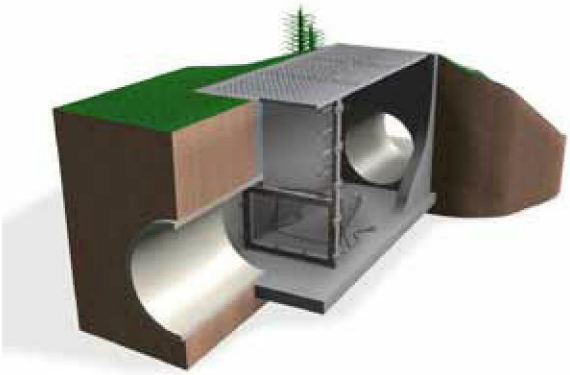
applications

The unit can be installed within most drainage lines to provide essential pre-screening of stormwater flows as an integral part of any treatment train. As the unit is underground in its own compact pre-cast concrete pit it is visually unobtrusive and safe from any tampering or vandalism.

primary treatment

hydraulics

The unit can treat 100% of all flows up to its designed TFR and withstand a full-pipe flow by-pass. Headloss (***k*** factor) varies between 0.8 and 1.8 depending on site-specifics. Even in the worst-case scenario (full-pipe flow and full net effectively making it impervious), the increased width within the chamber limits the headloss with little or no impact on the drainage network's hydraulics.



configurations and sizes

The **Ecosol™ Net Guard** suits pipes and box culverts ranging in diameter from 375mm to 1050mm and up to 1500mm x 900mm RCBC for single units and can also be installed as a multi-unit configuration on larger outlets.

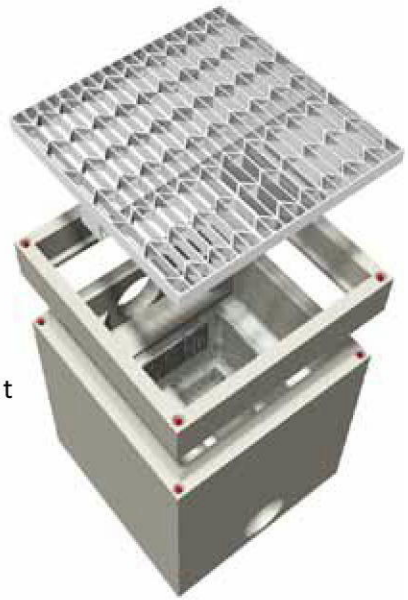
cleaning and maintenance

The unit's simple design and removable net makes access easy. It is best cleaned using a small crane truck, which eliminates any manual handling risks and the need for specialised equipment. The cleaning frequency depends on the catchment type and size but, as a guide, a unit serving a 1Ha commercial catchment will need cleaning about twice annually.

primary treatment

The **Ecosol™ Drop Trap** (in-line/end-of-line primary treatment solution) is an efficient and cost-effective pre-screening primary treatment system that captures and retains more than 95% of solid pollutants larger than 3mm.

key features



- minimal head/hydraulic loss
- no effect on stormwater drain capacity
- unique by-pass overflow eliminates flooding risk
- no remobilisation of captured pollutants
- dry storage of pollutants and no toxic fermentation
- can be retrofitted into existing pits or supplied in its own pit
- independently tested
- easily cleaned using a crane, or eductor, truck

operation

The **Ecosol™ Drop Trap** consists of a pre-cast concrete pit containing a filtration basket and overflow by-pass flaps. Key to its success is the unique overflow mechanism and drop that eliminates headloss buildup. This also helps ensure that already-captured pollutants are not remobilised.

applications

The unit is installed either in-line, or at the end of the stormwater line, where there is a drop between the upstream invert, and downstream obvert, level of at least 600mm, and preferably more, so that the structure can house an adequately-sized basket. Typical locations include car parks and shopping centres, residential developments, freeways, and discharge points to wetlands, shores, creeks, and rivers.

primary treatment

hydraulics

The unit can treat 100% of all flows and withstand a full-pipe flow by-pass. Headloss (***k*** factor) varies between 0.8 and 1.2 depending on site-specifics. Even in the worst-case scenario (full-pipe flow and full basket effectively making it impervious), the maximum headloss of 1.2 has little or no impact on the upstream pipe hydraulics.

configurations and sizes

The **Ecosol™ Drop Trap** suits pipes and box culverts up to 600mm in diameter and up to 450mm x 450mm RCBC.

cleaning and maintenance

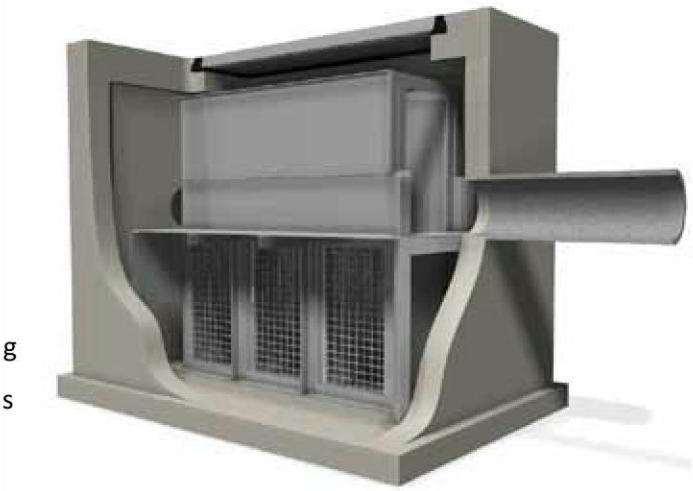
The unit's simple design and removable basket makes access easy. It is best cleaned using a small eductor truck, which eliminates any manual handling risks and the need for specialised equipment. The cleaning frequency depends on the catchment type and size but, as a guide, a unit serving a 2Ha residential catchment will need cleaning about twice annually.

primary treatment

The **Ecosol™ GPT** (in-line/off-line/end-of-line primary treatment solution) is a non-blocking tangential screen filtration system that captures and retains 99% of pollutants larger than 211µm and 90% of particles larger than 152µm at its designed TFR.

key features

- minimal head/hydraulic loss
- hydraulically-driven barrier reduces premature by-pass
- designed hydraulics eliminates blockage risk
- shallow depth below invert reduces water table problems
- visually unobtrusive
- independently tested
- easily cleaned using eductor truck



operation

The unit's non-blocking tangential screening system ensures high pollutant removal rates and TFRs along with low headlosses.

Key to its success is the unique design element that forces a proportion of the filtered water back upstream along the by-pass channels and against the main directional flow. As this water meets the flow entering the inlet to the capture silo, a hydraulically-driven barrier is created, helping ensure all flows up to the unit's TFR are directed into the capture silo, thereby enhancing considerably the unit's capture efficiency.

applications

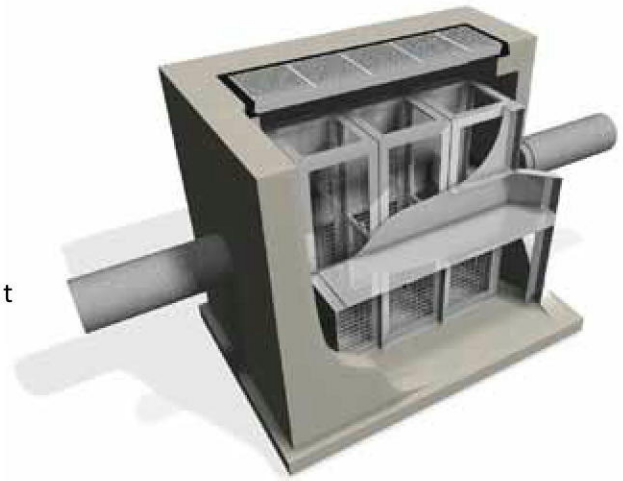
The unit is usually installed on industrial and commercial sites, such as car parks, shopping centres, and wash bays. It is also suitable for residential developments, airports, freeways, and most civil construction projects.

primary treatment

The **Ecosol™ In-line GPT** suits conduits of almost any size and shape, within the drainage network or end-of-line. It is available in 11 different sizes to treat piped flows ranging in diameter from 100mm to 2400mm.

hydraulics

The **Ecosol™ In-line GPT** is sized to treat between a 1:1 year to 1:3 month ARI. In addition to high treatable flow rates the unit has one of the lowest ***k*** factors of any GPT currently available.



Extensive independent testing has been carried out to confirm the unit's ***k*** factor for a range of pipes and unit sizes based on full flow, worst-case scenarios. These tests show that the ***k*** factor can vary between 1.2 and 1.8 depending on the pipe configuration and the unit size.

cleaning and maintenance

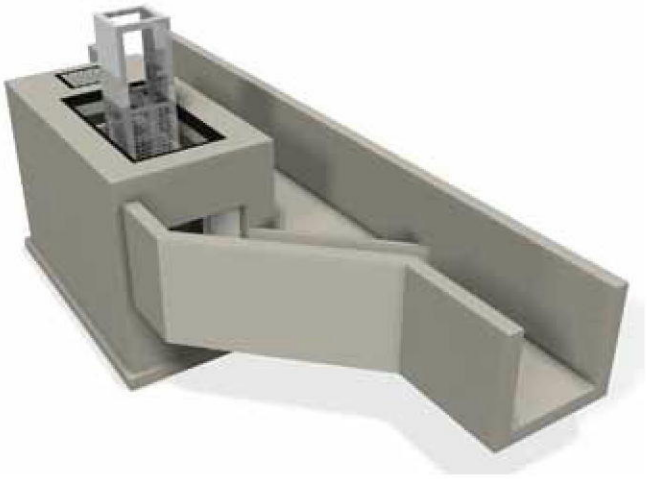
The unit's simple design makes access for cleaning and maintenance easy using an eductor truck. This eliminates any manual handling risks.

The cleaning frequency depends on the catchment type and size but, as a guide, a unit serving a 17Ha residential catchment will need cleaning about twice annually.

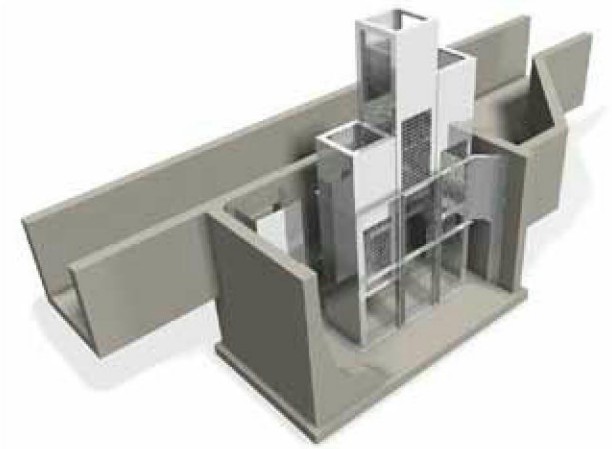
primary treatment

The **Ecosol™ Off-line GPT** suits conduits of almost any size and shape, off-line adjacent to creeks or in open channels as well as end-of-line. Its unique removable basket system enables captured pollutants to be easily removed without specialised cleaning equipment.

Many major drainage systems are designed with large open channels to allow significant flows to be conveyed away from urban catchments. In-line GPTs in such cases are often cost-prohibitive and almost always have a adverse impact on the drain's hydraulic capacity. The **Ecosol™ Off-line GPT** can be installed in such situations.



The unit has the added benefit of being able to accommodate tidal and tail water conditions.



hydraulics

The **Ecosol™ Off-line GPT** is available in many different sizes and is capable of treating flows ranging from 70L/sec to 4,200L/sec.

In addition to high TFRs the unit has a significant holding capacity sized to suit typical pollutant loadings for the catchment type and size that it services.

primary treatment

The pre-cast, modular design shown opposite incorporates a constructed on-grade weir in the existing channel that diverts the designed TFR (normally a 1:3 month to 1:1 year ARI) through the unit, which is installed parallel to the flow.

All flows exceeding the designed TFR overtop the weir and by-pass the unit to the open channel or canal. The simple yet effective design enables the unit to be installed where conventional in-line GPTs are either cost-prohibitive or require too much space.

cleaning and maintenance

The unit's removable modular basket system makes access easy for cleaning and maintenance using a crane or eductor truck. This eliminates any manual handling risks and the need for specialised equipment. Cleaning frequency depends on the catchment type and size but, as a guide, a unit serving a 17Ha residential catchment will need cleaning about twice annually.

primary treatment

The **Ecosol™ Silt Arrestor** is a purpose-built pre-cast concrete modular storage pit into which water contaminated with solids and suspended sediment flows for later release at predetermined flow rates.

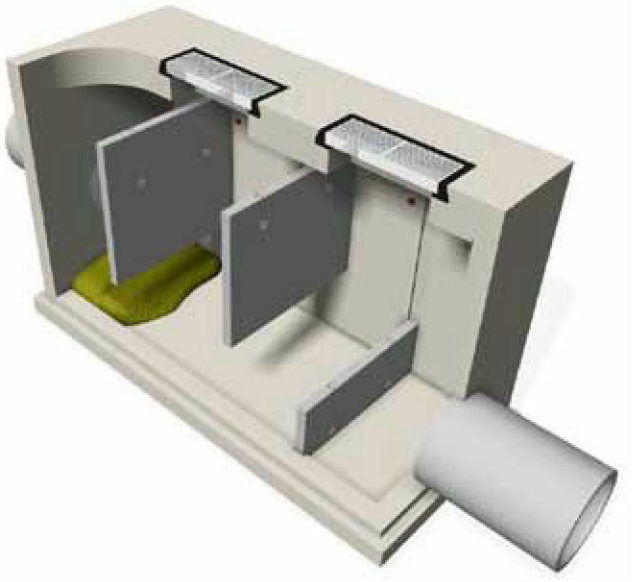
Visually unobtrusive, the unit enables suspended particulate matter conveyed in stormwater flows to settle to the bottom of the pit where it is retained until the unit requires cleaning.

Standard features

- pit is designed to class D (trafficable) loading classifications
- supplied complete with gas tight, ductile iron, bolt down, solid top, class D access lids
- inlet and outlet pipe penetrations to suit the required pipe size and type

Optional extras

- pre-cast access risers for depths greater than the nominal unit standard wall height
- internal acid-resistant epoxy coating
- cast-in vent connections
- step irons
- weep holes (40mm diameter) at the pit base



The grading of suspended sediments entering the unit is needed to determine settling velocities and also pit size. The estimated settling time of particles ranging in size from 0.07mm to 0.20mm is between 5-10 minutes.

As a guide, Ecosol's **ESA 450** to **ESA 600** units holding between between 850 litres and 1,370 litres are typically installed in industrial environments. **ESA 150** to **ESA 300** units holding between 130 litres and 350 litres would normally be used in small commercial applications such as wash down bays.

primary treatment

The **Ecosol™ Soakwell Litter Trap** is designed to pre-screen stormwater flows prior to its on-site detention and later infiltration into the soil.

The **Ecosol™ Soakwell Litter Trap** has a built-in pre-treatment litter trap that enhances significantly the life, and infiltration rate, of the soakwell. To optimise infiltration performance the unit must be cleaned and maintained regularly.

The unit can be custom-built to suit most diameter soakwells and is easily retrofitted. It is designed to capture and retain all pollutants conveyed in stormwater run-off larger than 3mm in diameter. The robust design of the stainless-steel filtration basket increases the life of the infiltration layer by preventing larger gross litter and vegetation from blinding the porous base of the soakwell.

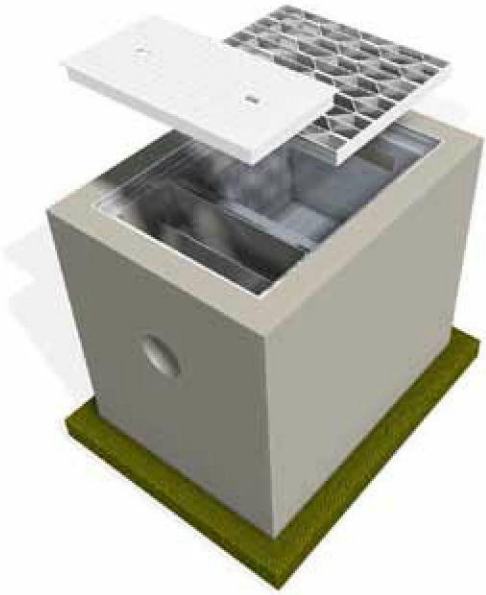
The unit is available as a circular pit ranging from 600mm to 1800mm in diameter with depths below surface level of 600mm to 1800mm. It has a storage volume up to 4,580 litres and can service an impervious catchment area of up to 375m^2.

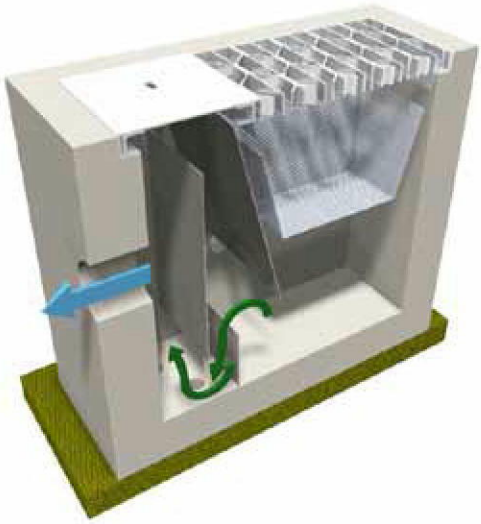
secondary treatment

The **Ecosol™ Storm Pit** (at-source or in-line/end-of-line solution) is an all-in-one, primary and secondary filtration system that helps overcome the need for multiple treatment measures on small catchments where gross pollutants, silts and sediment, and hydrocarbons are targeted for treatment.

key features

- minimal head/hydraulic loss
- no effect on stormwater inlet capacity
- compact and flexible and installed underground
- no remobilisation of captured pollutants
- arrives on-site complete with all components fitted





operation

The **Ecosol™ Storm Pit** consists of a removable capture basket for primary treatment and a series of baffles for secondary treatment of fine sediment and hydrocarbons. It is easily cleaned manually or using a small eductor truck.

The unit captures and retains pollutants conveyed from impervious areas in a rain event either at point of source or in-line for small diameter pipes. It also includes an option for seepage holes at the base of the clean chamber for gradual infiltration.

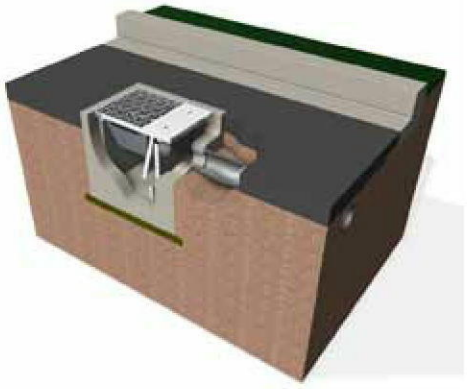
applications

The unit is designed for use in hardstand and trafficable car parks in typical medium-density housing estates and small commercial developments up to 1Ha in size.

secondary treatment

hydraulics

The unit can treat 100% of all flows in both free-draining and submerged environments. It is unique in that it will also capture and retain free floating oils at point of source. It has no effect on stormwater inlet capacity



configurations and sizes

The unit suits pipe sizes ranging from 100mm in diameter to 225mm and can be installed either as an at-source, or small in-line, treatment measure.

cleaning and maintenance

The unit can be easily inspected visually to determine whether it needs cleaning. This can be done using a small eductor truck once the capture silo reaches 80% of its capacity so as to avoid flows by-passing the unit and discharging untreated.

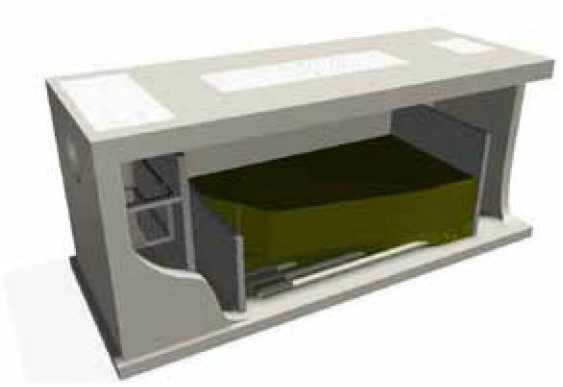
One of the key benefits of the **Ecosol™ Storm Pit** is that the primary filtration basket can be manually cleaned. As this is the area most likely to require regular maintenance the ability to clean the basket manually reduces significantly ongoing third-party maintenance costs.

secondary treatment

The **Ecosol™ Sand Filter** (off-line secondary solution) is an all-in-one primary and secondary filtration system that helps overcome the need for multiple treatment measures on catchments where space, or the drainage grade, limits the use of a bio-retention system.

key features

- 100% TFR and infiltration rate (IFR)
- efficiently removes TSS, TP, and TN
- self-contained reducing on-site installation time
- visually unobtrusive in underground pit
- drain-down system acts as dry sump for cleaning
- easily cleaned using an eductor truck



operation

The **Ecosol™ Sand Filter** is a multi-chamber pre-cast concrete system consisting of an inlet chamber with a removable primary filtration basket into which stormwater enters from a conventional underground pipe. Gross pollutants are captured and retained in this basket helping protect the sand filter from premature blocking.

The inlet chamber design enables free-floating oils and hydrocarbons that do not emulsify in aqueous solution to be captured and retained, again helping protect the sand filter media. The flow passes over a forebay weir and into a third chamber where it percolates downwards through the sand filter media, which consists of different grades of washed sand layered in such a way to avoid the finer sand being washed away. Secondary filtration helps ensure that the unit captures and retains fine silts, sediment, and hydrocarbons that have passed through the primary basket and the inlet forebay.

applications

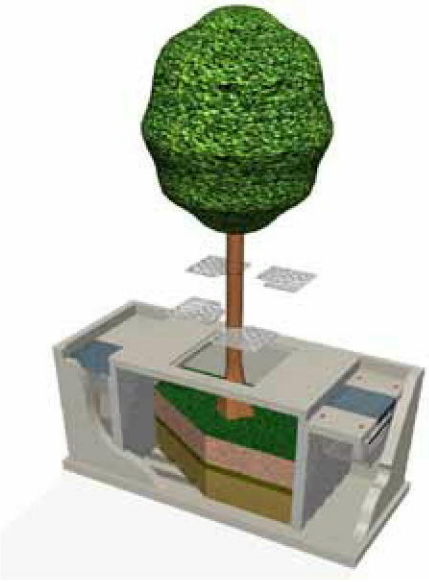
Typically, the unit, which is designed to trafficable loadings, is located in industrial and commercial car parks, shopping centres, truck stops, freeways, and high-density residential housing estates.

tertiary treatment

The **Ecosol™ Bio Filter** (at-source/in-line tertiary solution) provides not only conventional tertiary bio-filtration treatment of fine suspended solids and dissolved pollutants in stormwater flows but also primary treatment for capturing larger gross pollutants that may impede the unit's performance.

key features

- treats 100% of flows up to its designed TFR
- efficiently removes TSS, TP, TN, BOD, and pathogens
- self-contained reducing on-site installation time
- visually unobtrusive in underground pit
- easily cleaned using an eductor truck



operation

The **Ecosol™ Bio Filter** operates similarly to a sand filter. It is configured as a vegetated filtration system within a collection pit and is designed to remove fine suspended solids and dissolved pollutants. The vegetation planted within the unit acts to slow incoming stormwater, allowing suspended particles to settle.

The stormwater then seeps through the underlying sand, soil, or gravel filter media, where physical, chemical, and biological processes contribute to pollutant removal. Installed at street level to capture and treat stormwater runoff close to its source, the unit is effectively a fully self-contained treatment train system.

applications

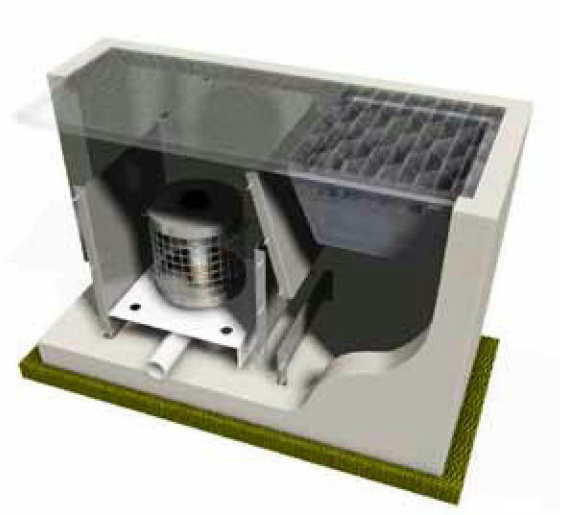
The **Ecosol™ Bio Filter** is available in two different configurations (at-source roadside kerb inlets or in-line for small pipe diameters up to 225mm). It is ideally suited for use in new urban greenfield developments but can also be easily retrofitted into existing kerbside urban drainage networks. It can be located in car parks, shopping, centres, and residential housing developments. The unit is typically installed within the parking lane or verge of the road.

tertiary treatment

The **Ecosol™ Cartridge Filter** (at-source/in-line/off-line tertiary solution) provides within one compact system not only primary treatment but also secondary and tertiary treatment of pollutants conveyed in stormwater flows

key features

- high flow by-pass capacity
- 100% TFR and infiltration rate (IFR)
- efficiently removes TSS, TP, and TN
- captures and retains free floating hydrocarbons
- self-contained unit reducing on-site installation time
- drain down system acts as dry sump for cleaning
- visually unobtrusive in underground pit
- independently tested
- easily cleaned by vacuum method



operation

The **Ecosol™ Cartridge Filter** consists of a series of cartridge filters installed into a steel-reinforced pre-cast concrete pit. The unit comes with a primary treatment system in the inlet chamber thereby increasing significantly the life of the cartridges

It is designed to filter stormwater run-off through a filter media that uses a physical process of filtering out particulates from the water.

applications

The unit is installed in industrial and commercial sites such as car parks, shopping centres, wash bays, and for retrofitting into high-density urban developments

tertiary treatment

hydraulics

The unit can be designed to treat 100% of all flows in free-draining environments. It is unique in that it also provides essential primary treatment within the one compact system.

configurations and sizes

The **Ecosol™ Cartridge Filter** can be designed to suit most applications. Typically, the unit is available at-source for kerb and gutter inlets and also in-line and off-line.

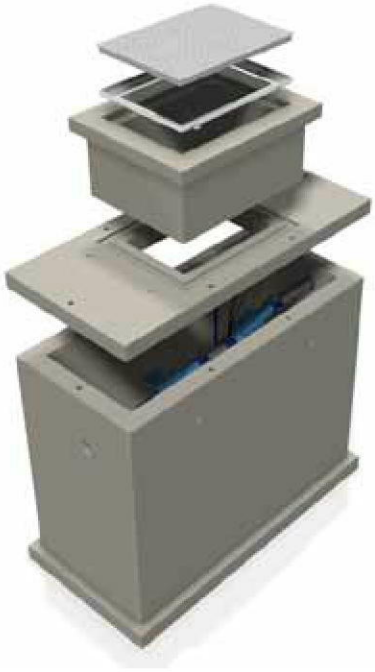
The flow rate for each application is determined by the number of filter cartridges installed into the underground pre-cast concrete tank and the hydraulic conductivity of the filter media being used.

cleaning and maintenance

The unit is easily cleaned by vacuum method. After each cartridge cover is taken off the filter media and captured particulate matter can then be removed and replaced with new filter media ready for immediate use.

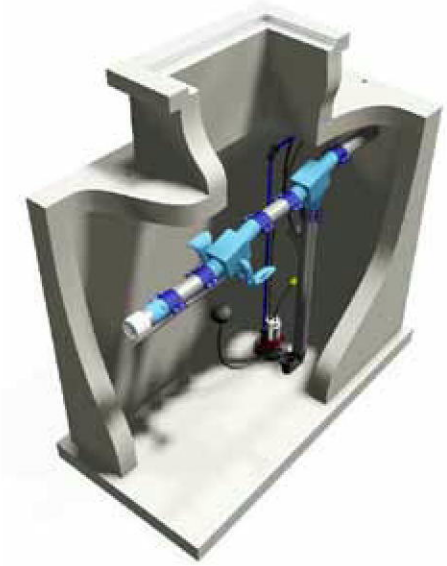
rainwater harvesting and re-use

The **Ecosol™ Rain Tank** is designed to store non-potable rainwater from impervious surfaces in commercial, industrial, and residential developments.



key features

- internal filtration system to improve water quality
- controlled inlet reduces remobilisation of settled solids
- fail-safe overflow siphon to discharge excess flows
- backflow valve prevents pollutants entering the unit
- underground storage reduces bacterial/algae growth
- visually unobtrusive
- easily accessed for inspection and cleaning



The system is delivered to site fully self-contained and fitted with an internal filter. It also has a controlled inlet device to reduce remobilisation of settled solids and manage flow velocities and, as with all Ecosol units, it has an overflow mechanism that enables the unit to discharge excess flows.

The fitted backflow valve prevents rainwater from travelling back into the unit. An optional pump with floating intake and controller can also be supplied to reticulate the stored stormwater at pre-determined volumes onwards to its destination.

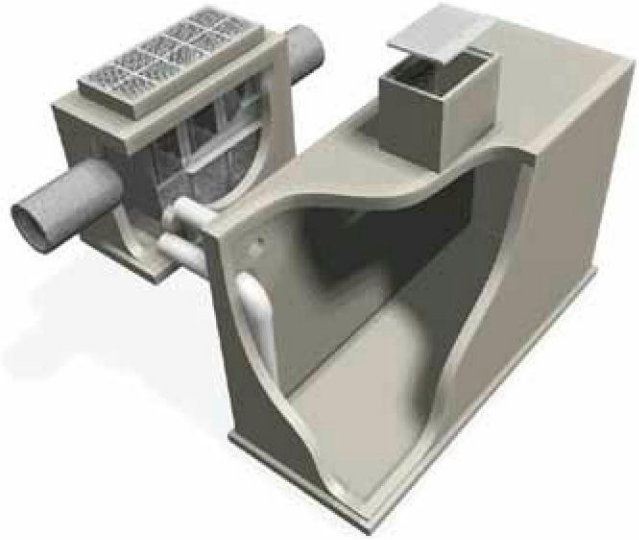
The unit is available in four different sizes ranging from 3,000 litres to 25,000 litres and is supplied with trafficable, solid-top sealed access covers that provide easy access for cleaning and maintenance. The unit is designed for use on high-density residential and commercial sites where re-use of the rainwater is both viable and desirable.

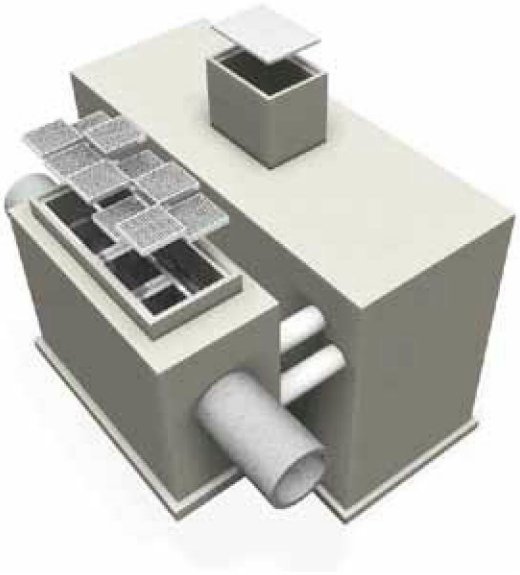
spill containment

The **Ecosol™ Spill Containment Unit** is designed to capture and retain contaminants such as oil, petrol, and rubber products carried in stormwater run-off from roads.

key features

- pre-cast concrete modular system
- secure containment of hydrocarbons in the event of a spill
- captures and retains significant volumes of hydrocarbons in oil spills
- robust durable design
- visually unobtrusive
- easily accessed for inspection and cleaning





This compact spill containment system consists of an **Ecosol™ GPT** for primary treatment of stormwater and an adjacent secondary storage tank to gravity feed from the GPT oils and grease. The secondary tank can hold between 2,000 litres and 80,000 litres depending on the configuration.

The unit is designed for use on roads and freeways where run-off from roads may contain petroleum-based contaminates and organic compounds, as well as rubber products.

Ecosol™
WASTEWATER FILTRATION SYSTEMS

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Ecosol Wastewater Filtration Systems

Website www.ecosol.com.au

Ecosol™
WASTEWATER FILTRATION SYSTEMS

INSTALLATION GUIDE

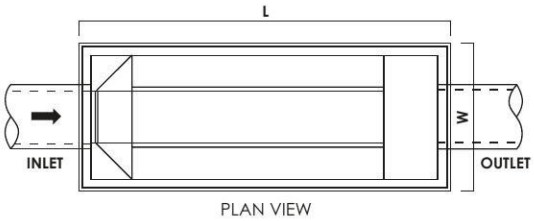
Ecosol™ GPT 4200

Unit Location: Andromeda Drive CRANEBROOK	
Structure No:	Ecosol Ref:
Unit Code: Ecosol™ GPT 4200	

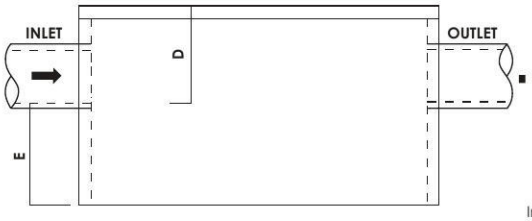
Approx. Component Weights (tonne)	
Pit Base:	4.200
Access Cover:	0.174
Access Cover Loading:	Class B

Note: Lifting requirements are 4 x 5.0 tonne Swiftlift lifting clutches

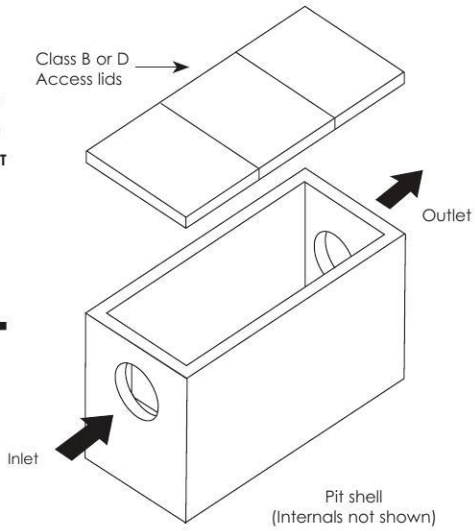
Unit Components and Dimensions



PLAN VIEW



ELEVATION



Pit shell
(Internals not shown)

Unit Dimensions (m)	
Length (L):	2.200
Width (W):	0.900
Depth to invert (D):	0.63-1.10
Depth below invert (E):	0.750
Inlet Penetration size:	0.500
Outlet Penetration size:	0.500

Installation Procedures

Excavation

- Excavate the hole to the required size and depth, confirming that the sub-grade and bearing capacity is adequate and compacted to not less than 95% standard compaction
- Ensure that the excavation is appropriately benched or shored, if applicable

Dewatering

- Install an appropriate dewatering system capable of lowering the groundwater locally below the confines of the works for the unit installation
- It is important that all stormwater flows are temporarily diverted around the excavation for the duration of the unit installation

Base Course

- A 100mm layer of quarry rubble must be placed under the base of the unit and compacted to not less than 98% standard compaction - the base course must be true to line and level and finished to provide a firm uniform base on which to place the unit
- Ensure a minimum fall of 1% along the unit length (L) and that the unit is level across the unit width (W)

Crane Hire

- Ensure a suitably sized crane is available on site and loaded with the necessary lifting chains and differential spreader beams necessary to safely lift all components into the excavation -for full details of the lifting requirements refer to the supplied engineered drawings

Handling

- Lifting must only be carried out using the specified lifting points
- The minimum sling length is 6.0m, unless shorter slings are specified on the drawings

Installation Procedures (cont.)

Handling Continued

- A differential spreader beam must be used for all lifts - the spreader beam must be oriented across the unit so that the slings are parallel to the long sides
- Adopting correct lifting techniques minimises adhesion forces between the unit and horizontal surfaces or moulds
- Care should be taken not to induce dynamic load effects while hoisting or moving the unit over rough terrain
- The unit must be installed to the correct line and level and in a manner that is safe and that does not cause it damage
- Installations must comply with statutory workplace regulations
- Connect the pipes into the penetrations at both the inlet and outlet of the unit and mortar inside and outside of the bandage joint ensuring a smooth transition between the unit and the invert of connecting pipes
- The unit is suitable for installation in non-aggressive soils - soils with ph <4.0, or with ground-water containing more than 1gm per litre of sulphate ions, or salt-rich soils in arid areas, are considered aggressive
- An Ecosol representative will be present for the installation of the unit

Access Cover

- Position the access cover on top of the unit, ensuring the frame is fully supported by the walls of the pre-cast unit
- Continue to secure the access cover in accordance with the engineering drawings and specification

Backfill

- The backfill around the pit should be comprised of natural soils, free from clay lumps, vegetation, or other deleterious materials, or quarry materials
- All backfill placed around the unit must be placed in uniform layers around each side of the unit
- The backfill around the unit should be compacted to not less than:
  - 98% standard compaction for units installed in roadways, paved or trafficable areas, etc;
  - 95% standard compaction for units in non-trafficable areas; or
  - any greater compaction if specified by others for the overall stormwater installation

Construct Access Cover Concrete Surrounds

- Refer to the engineered drawings for concrete surround construction details for securing the access cover

IMPORTANT NOTE

Once installed it is important that the unit is filled with water immediately to prevent any possibility of flotation in a severe rain event. This document is only provided as a guide. It is the sole responsibility of the purchaser/installer to familiarise themselves with the relevant drawings and specifications that they were provided with at the time of purchase. The purchaser/installer must also employ appropriate procedures to deal with all likely contingencies so that the unit is installed safely and in line with the relevant codes of practice and Australian Standards.

PROJECT NO: 21 LOT RESIDENTIAL SUBDIVISION AT ANDROMEDA DRIVE, CRANEBROOK

The procedures as listed below are set out as a guide only and do not take precedence over the manufacturers' maintenance warranty procedures and Authority requirements.

ECOSOL GROSS POLLUTANT TRAP 4200

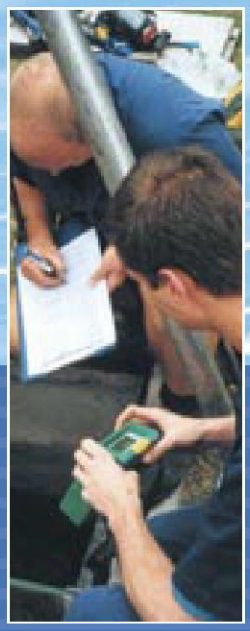
ITEM	PERIOD	RESPONSIBILITY	INDICATIVE COST (EX. GST)	MAINTENANCE PROCEDURE
Inspection	Monthly and after major storm events	Asset Owner	$25.00 per inspection	Follow procedure set out in Item 4.0, Page 8, of the Ecosol Operation & Maintenance Manual
Major Maintenance / Clean	Annually or as required	Maintenance Contractor	From $800.00 per clean (depending on local disposal costs)	Follow procedure set out in Item 4.2, Page 8, of the Ecosol Operation & Maintenance Manual
Emergency Maintenance	As required	Maintenance Contractor	-	Contact manufacturer

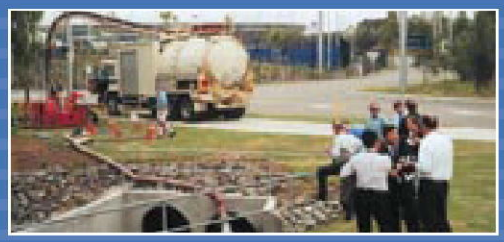
MANUFACTURERS' APPROVAL	
Name:	Jessica Warr
Signature:	Jessica Warr
Date:	21 May 2014

OPERATION & MAINTENANCE MANUAL

The In-Line/End-of-Line RSF 4000 Solid Pollutant Filter/Oil & Grease Arrester




.... to be recognised as an innovative, dynamic contributor to a better environment and a world leader in the removal of waste from stormwater, sewage, and other fluids with a range of technologies for use in the community, home, and industry ....

Ecosol™
WASTEWATER FILTRATION SYSTEMS

NATURAL ECOLOGICAL SOLUTIONS

* The numbered superscript references in the text refer to sources of information noted at the back of this document

1.0 Introduction

Thank you for choosing to install an Ecosol **RSF 4000** Solid Pollutant Filter, the result of more than ten year's research and market experience through direct contact with you, our client.

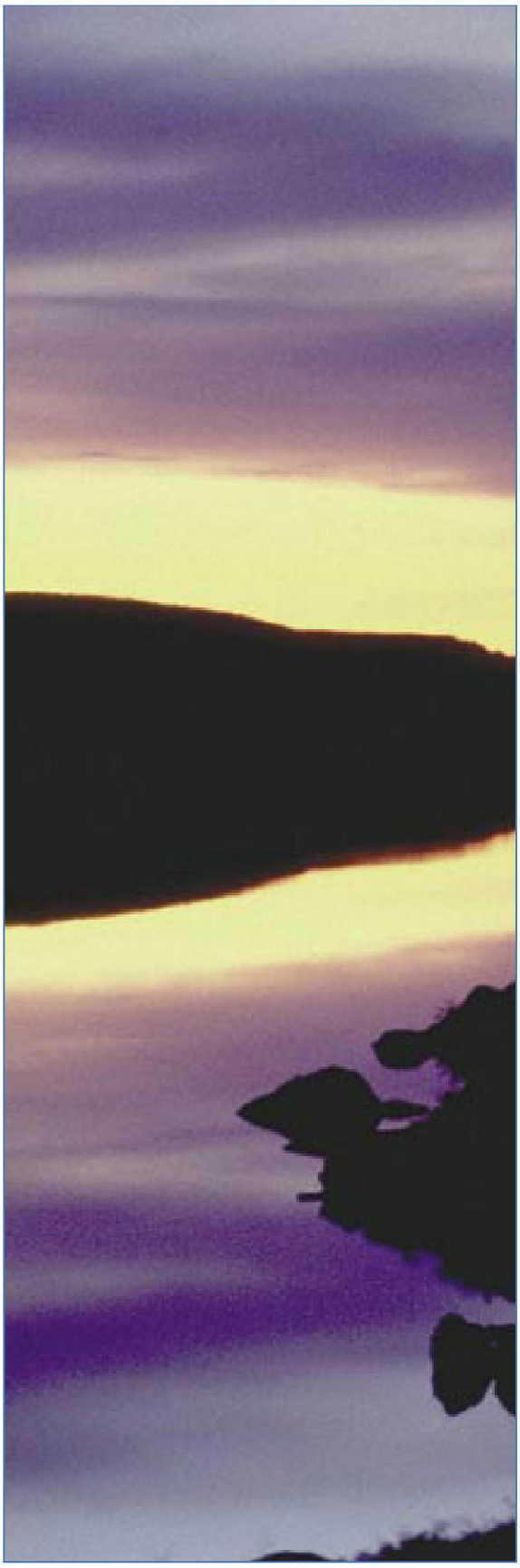
You have chosen a quality, durable, high-performance unit that will certainly meet your needs. Ecosol's products have for years been making a significant contribution to improving the environment and, in particular, the quality of our water, one of the world's most precious commodities.

This manual provides information about the unit's operation and the cleaning and maintenance requirements.

Please read the manual carefully as it provides important guidelines on how to clean and maintain your **RSF 4000** to ensure a long life operating at optimal efficiency and effectiveness. You should keep it in a safe place because, if you need to contact us for any reason, you will need to quote the information contained in it so that we will be able to help you promptly and efficiently.

Should you require assistance please contact your nearest Ecosol office shown in Section 7.0 of this document, email us on **info@ecosol.com.au**, or you can visit our website at **www.ecosol.com.au**.

Also, please do not hesitate to contact us if you need any information about Ecosol's other award-winning[1] products, which include the at-source **RSF 100**, and the in-line/end-of line **RSF 1000** and **Net Tech,** solid pollutant filters.



Ecosol's Vision

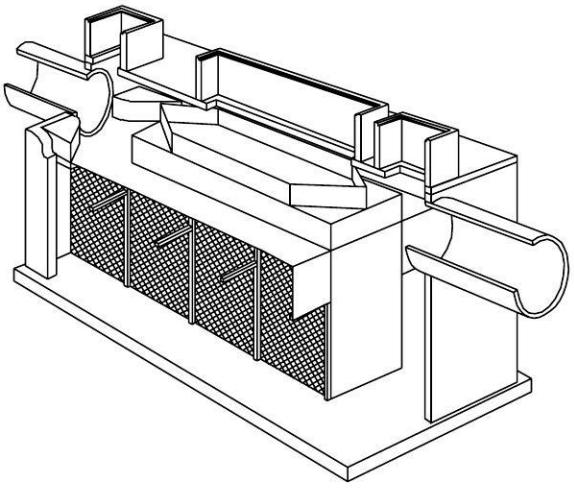
"*.... to be recognised as an innovative, dynamic contributor to a better environment and a world leader in the removal of waste from stormwater, sewage, and other fluids with a range of technologies for use in the community, home, and industry ....*"

2.0 About Your **RSF 4000** Solid Pollutant Filter

The **RSF 4000** Solid Pollutant Filter, along with Ecosol's other product, has helped define, and raise, the standards for stormwater filtration. Key to its success is the patented[2] hydraulic weir that not only enhances its capture efficiency but also enables the system to by-pass excess flows, thereby eliminating the risk of flooding.

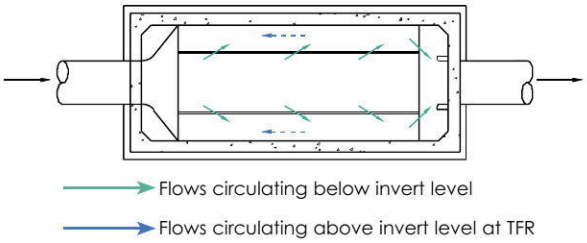
2.1 How the **RSF 4000** Operates

The Ecosol **RSF 4000** is designed for use in stormwater drains. Incoming flows enter the capture silo and pass through the filtration mesh located below invert level on both sides of the silo before entering the clean chamber and then exiting the unit. The unit separates, collects, and retains more than 98% of solid pollutants greater than 211µm and 91% of total suspended solids. It also collects 30% total phosphorous



Free oils and grease are captured in the outer channels below invert level by the use of two vertical baffles. Should an oil spill occur within the catchment, a clean of the unit should be undertaken immediately to remove these pollutants - refer to Section 4.0 for details.

The key to the **RSF 4000** success is the design that forces a proportion of the filtered water back upstream along the by-pass channels and against the main directional flow. As this water meets the flows entering the inlet to the capture silo, a unique hydraulically-driven barrier is created, ensuring all flows up to the Treatable Flow Rate (TFR) are directed into the capture silo, thereby enhancing considerably the unit's capture efficiency.



As flows of greater magnitude enter the unit, the hydraulic barrier gradually breaks down and in major pipe discharges, allows the excess flows to by-pass, without remobilising captured pollutants. It is important to note that the unit continues to collect and filter flows at least equivalent to the TFR, even when the pipe is in full discharge and the unit is in by-pass. Most other GPTs are unable to operate in this manner.

When the capture silo is full, the water cannot pass through the mesh and the hydraulically-driven barrier can no longer be formed. Concurrently, the pollutants form a barrier across the mouth of the filtration unit, directing the incoming water into the two overflow by-pass channels, thereby effectively eliminating the risk of flooding.

2.2 The Key **RSF 4000** Benefits

The key **RSF 4000** Solid Pollutant Filter benefits are:

- ☑ Captures more than 98% of solid pollutants > 211µm
- ☑ Captures 91% of total suspended solids
- ☑ Collects up to 97% free oils and grease at design flow
- ☑ No remobilisation or overtopping of captured pollutants
- ☑ Low headloss (***k***) factor
- ☑ Patented hydraulically-driven barrier reduces premature by-pass
- ☑ Designed and managed hydraulics eliminates blockage risk
- ☑ Can be sized to suit wide range of flows, gradients, & pipe sizes
- ☑ Independently tested by a NATA-approved facility
- ☑ Can be installed in one complete unit (up to **RSF 4900**)
- ☑ Shallow depth below invert reduces water table problems
- ☑ Cost-effective vacuum cleaning
- ☑ Dewatering facility ensures removal of all solids during cleaning
- ☑ Reduced costs as only solids transported to the waste facility

2.3 What Your **RSF 4000** Will Collect

The Ecosol **RSF 4000** Solid Pollutant Filter is designed to remove a range of gross pollutants from stormwater drains. The composition and quantity of pollutants captured depends heavily on the catchment size, land use, and rainfall patterns. However, with more than 6,000 units now installed throughout Australia, New Zealand, and Malaysia, Ecosol has found that the following pollutants are typically captured by the **RSF 4000**:

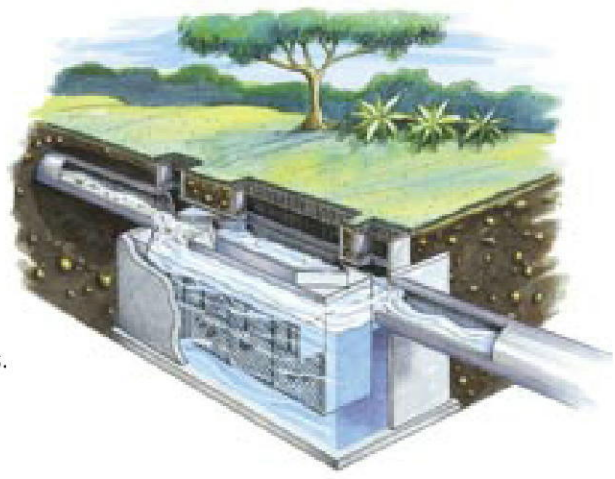
POLLUTANTS	POLLUTANT REMOVAL EFFICIENCY	DESCRIPTION
Gross Pollutants	98.0%	Anthropogenic materials such as cans, bottles, plastic bags, and packing materials (generally > 1.2mm in diameter)
Vegetation	98.0%	Organic material, such as leaves and grass clippings (generally >211µm)
Sediment	98.0%	Solid materials > 211µm, both mineral and organic
	90.0%	Solid materials > 152µm, both mineral and organic
	51.0%	Solid materials > 90µm, both mineral and organic
Total Suspended Solids (TSS)	91.0%	Fine inorganic solids suspended in water
Total Phosphorous (TP)	30.0%	Total phosphorous in suspended solids and organic materials
Total Nitrogen (TN)	13.0%	Total nitrogen in organic and inorganic forms
Hydrocarbons	up to 97.0%	Free floating oils that do not emulsify in aqueous solutions

2.4 Where The **RSF 4000** Is Installed

The **RSF 4000** operates in-line or end-of-line removing solid pollutants, free oils, grease, and fine sediment from stormwater. The pre-cast, modular unit can be fitted to conduits of almost any size and shape, either within the drainage network or off-line adjacent to creeks or in open channels. Its range of applications include:

- Industrial and commercial sites, such as car parks, shopping centres, and washbays;
- Residential developments; and
- Airports, freeways, civil construction projects, and wetlands.

Ecosol's range of products enables it to offer a specifically designed solution. A GPT is often the most appropriate choice but, in other situations, Ecosol's at-source filtration is the ideal solution.



The Ecosol **RSF 4000** Solid Pollutant Filter in the field

3.0 The **RSF 4000** Solid Pollutant Filter Components and Warranty

The **RSF 4000** units is made from the strongest and most durable materials available to ensure a long life and reduced ongoing maintenance. Wherever possible, recycled materials are used.

3.1 Unit Components

Each Ecosol **RSF 4000** is constructed from a system of pre-cast concrete components that includes:

- Pit base;
- Cover slab; and
- Access risers, if required.

One of the unit's major benefits is that, for all units up to the **RSF 4900**, the internal filtration components are pre-installed and the unit is delivered in one complete piece, thereby simplifying the installation process and reducing significantly on-site time.

Larger units require the on-site fitting of internals, which can be completed quickly and efficiently by qualified personnel.

Units can be delivered with either Class B or Class D trafficable lids with a range of options including:

- Ductile iron;
- Bolt down lockable; and
- Grated.

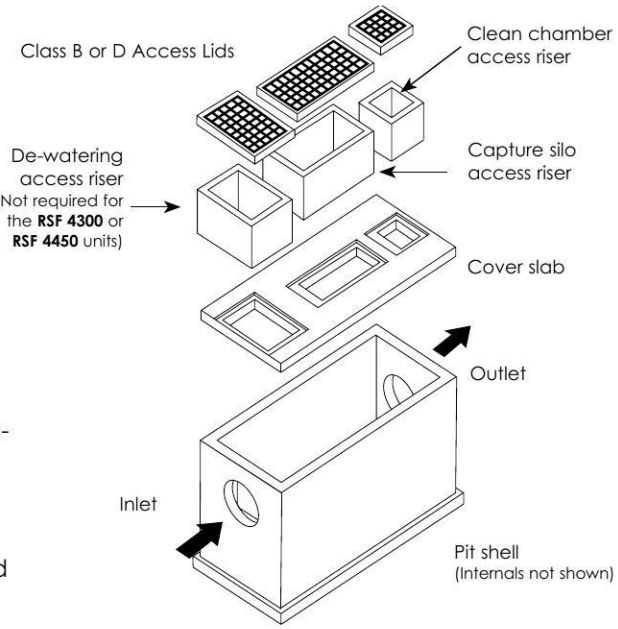
All materials and products used in the manufacture of the Ecosol **RSF 4000** Solid Pollutant Filter are constructed to the relevant Australian Standards and are specially selected for their durability.

Each unit has been engineer-designed and also meets internationally-accepted Occupational Health & Safety (OH&S) requirements.

The **RSF 4000** is made of strong, durable, and non-corrosive materials, including:

Reinforced concrete
All reinforced concrete work is designed to a minimum of 40 MPa with specific loading conditions to suit Class B and D classifications. For further details refer to AS 3996.

Steel reinforcing
All steel reinforcement used is in accordance with AS 1302 and AS 1304 for structural grade steel.



The **RSF 4000** external components

The **RSF 4000** pre-cast concrete pit showing the oil and grease baffles prior to fitting

Internals ready for factory installation into pre-cast concrete pit

3.1 The **RSF 4000** Components (cont)

Access lids

The access lids are designed specifically for use in stormwater and suit Class B or D loading capacities. Each access lid supplied is:

- Lockable and can be removed with readily-available lifters;
- Durable and suitable for use in marine environments
- Designed for a dynamic load factor of 2.0 and 1.5 ultimate LSF;
- Designed to comply with ultimate loads of Class B 8.0 tonne (80kN) to Class D 21.0 tonne (210kN);
- Can be lifted by a single person within OH&S regulations;
- Provided with a non-slip surface;
- Finished flush with FSL; and
- Manufactured in accordance with AS 3996.

The internal filtration components in each Ecosol **RSF 4000** Solid Pollutant Filter have been specifically designed and tested for the loadings and environment in which the unit is to be installed.

The internals are made from materials especially chosen for their durability:

- Stainless steel (304 or 316 grade);
- Stainless-steel, or galvanised, fasteners;
- Unimould, or stainless-steel, solid panels; and
- Polyethylene oyster mesh.

The **RSF 4000** access lids have minimal impact on the environment

3.2 Life Expectancy

The **RSF 4000** is designed to meet the strictest engineering guidelines. The reinforced concrete has an expected life span of 50 years while the internal filtration components have a life expectancy of 10 to 15 years.

3.3 Warranty

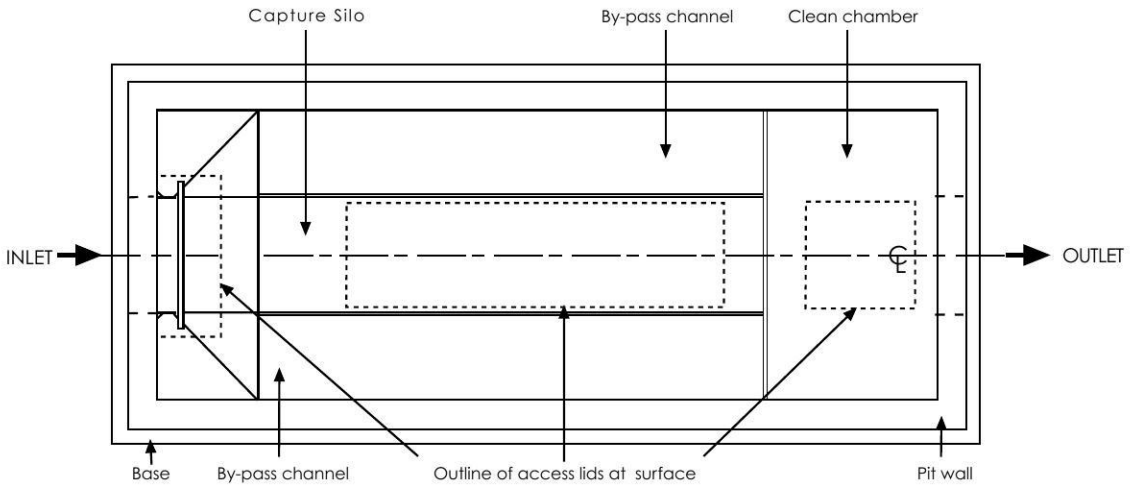
The **RSF 4000** has a one-year warranty covering all components and workmanship. Ecosol will rectify, at no charge, any problems that fall within the warranty terms. However, damage caused by vandalism and by outside parties is not covered by the warranty. This includes instances where the client cleans the unit, or employs others to do so, and damage is caused by inappropriate cleaning procedures.

The **RSF 4000** unit complete with risers and access lids ready for delivery

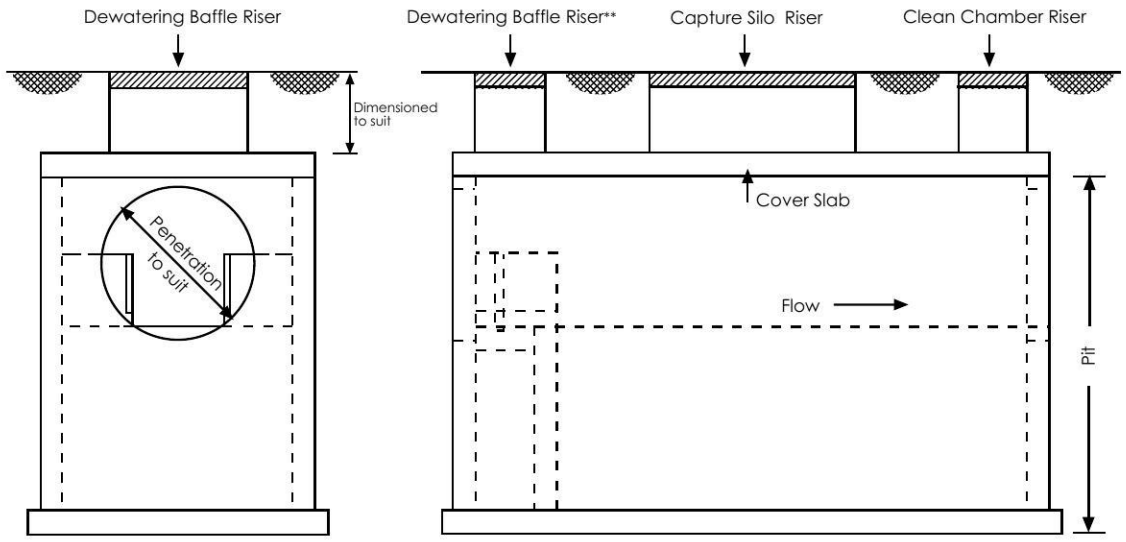
3.4 Engineered Design Drawings

The **RSF 4000** is specifically designed to simplify the manufacturing process and reduce installation time. The simple, yet effective design, shown below in different elevations, reduces significantly OH&S risks as most of the work is undertaken in a controlled factory environment. Units up to the **RSF 4900** arrive to site complete and ready for installation. The on-site installation time is much less than that for other comparable systems, an important factor given the costs associated with delays that can be caused, for example, by inclement weather.

The **RSF 4000** Solid Pollutant Filter



PIT PLAN



PIT INLET END ELEVATION **PIT SIDE ELEVATION**

** The dewatering baffle is not required on the **RSF 4300** and **RSF 4450**

Owing to transport restrictions the pit bases for the **RSF 4900B**, **RSF 41050A**, and **RSF 41050B** are manufactured in two components - larger size units can be designed to suit requirements

4.0 Monitoring, Cleaning, and Maintaining Your **RSF 4000** Solid Pollutant Filter

Cleaning the **RSF 4000** is easy and is usually done using a high-powered suction vehicle. The **RSF 4300** and **RSF 4450** can also be cleaned by most street-sweeping vehicles. Ecosol will monitor, clean, and maintain your unit as detailed below in Section 4.4 but, if you decide to undertake this work yourself, the procedures detailed in this section of the manual should be followed.

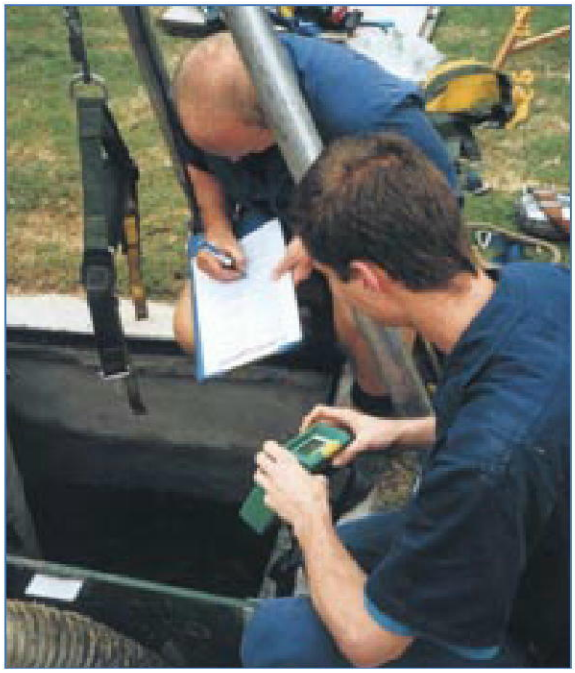
4.1 Monitoring

Under normal weather and operating conditions, your **RSF 4000** unit requires cleaning approximately every 3-4 months. However, it is important to monitor regularly the amount of material retained in the unit's capture silo.

The Inspection Form provided at the back of this document can be used to record the depths and approximate quantities of captured material together with other information relating to the unit's condition and the need for scheduling cleans and maintenance work, if required.

Initially, Ecosol recommends that monitoring is undertaken monthly. Once the unit has been in operation for an extended period of time (say, 6-9 months) the monitoring schedule can be adjusted to reflect the actual operating conditions specific to the catchment.

It is also recommended that the unit is inspected after every major storm event.



Ecosol staff monitoring the performance of an Ecosol unit

4.2 Cleaning and Maintenance Procedures

The steps to be followed for cleaning your **RSF 4000** Solid Pollutant Filter are as follows:

Prior to cleaning day

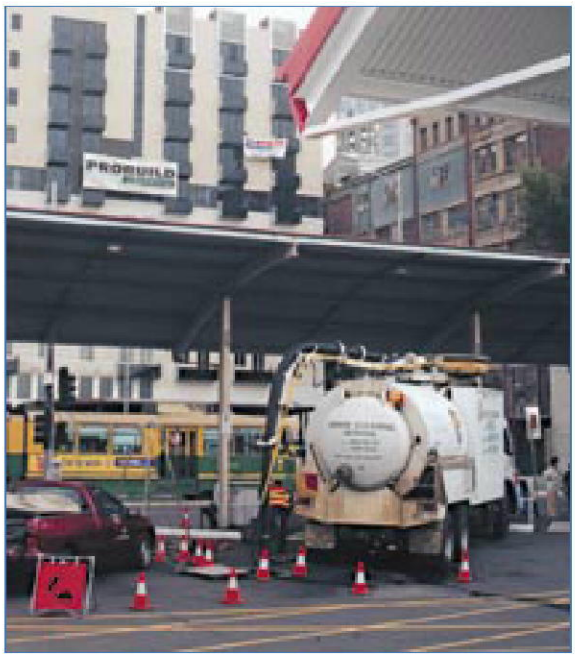
- Advise all concerned parties of the proposed date and time the clean is to take place
- Obtain approvals from the appropriate authorities

Site establishment

- Ensure that all access points are exposed and accessible
- Ensure barricades are provided at all working areas and that signs are in place to prevent injuries to public or staff
- Ensure all working areas are safe and all equipment, including hoses and machinery, are in place and ready for operation

Opening and testing of unit

- Open surface access lids
- Install the dewatering baffle boards and secure for dewatering (this is not required for the **RSF 4300** and **RSF 4450**)



Cleaning of an **RSF 4000** by eductor truck

4.2 Cleaning and Maintenance Procedures (cont)

Removal of floating materials, hydrocarbons, and dewatering

- Remove all hydrocarbon pollutants prior to dewatering by moving the eductor hose over the floating material at water level
- Dewater by pumping all water from the clean chamber to the upstream side of the inlet baffle board or to an approved sewer manhole

Gross pollutant removal and cleaning of internals

- When all excess water has been removed begin removing the solid pollutants using the suction hose
- Once the pollutants have been removed, clean the internal filtration screens with a high-pressure water hose

Site security

- On completion of the clean remove all baffle boards and secure the surface access lids
- Ensure the site is restored to its original condition

Pollutant disposal

- Dispose of the pollutants at an approved waste disposal facility, repeating these procedures, if necessary

Important Points to Note

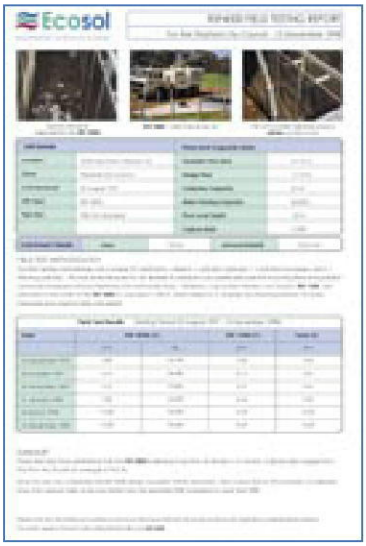
1. It is important that the by-pass chambers, located on either side of the central capture silo, are inspected with each clean. Any material built up in these chambers should be removed during cleaning.
2. Access to the by-pass chambers is by the outlet access opening or removing the by-pass chamber platform boards at invert level and then lowering the eductor hose from this position.
3. Entry to the unit to remove large debris, or maintenance, should only be undertaken by appropriately trained personnel.

4.3 Reporting

After each clean it is important that all cleaning data is recorded for use in ongoing asset management activities. A cleaning report should be prepared that details as a minimum the following information:

- Site location;
- Date and time of the clean;
- Duration of the clean;
- Volume or weight of material removed;
- Composition of the captured material e.g sediment, vegetation, litter, etc; and
- Details of any remedial work undertaken or required at a later stage.

Reporting of the above information is included in the cost of any clean undertaken by Ecosol - please refer to the next section for more details.



4.4 Ecosol Monitoring, Cleaning, and Maintenance Service

Ecosol has a very competitive cleaning service using an eductor truck for dewatering and removing of all captured pollutants. After each clean we provide a full report detailing the volume and type of pollutants removed. We believe that it is in your best interests for Ecosol staff to clean and maintain the unit, not only because we are specialists, but also because proper monitoring and maintenance enhances the unit life significantly.

4.4 Ecosol Monitoring, Cleaning, and Maintenance Service (cont)

The cleaning frequency, and the cost, depend heavily on the surrounding environment, the unit's proximity to an approved waste facility, the number of units and their location, and the type of pollution collected. The advantages of using Ecosol to clean and maintain your unit are:

- regular inspections of your unit (see below for the recommended inspection schedule for first 12 months);
- comprehensive cleaning service with the removal and disposal of all captured pollutants;
- a detailed report provided on completion of each clean;
- trained and experienced staff; and
- remedial work completed, if required.

Recommended Inspection and Maintenance Schedule (for the first 12 months)

Purpose of Visit	Frequency	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Routine Inspection	Monthly	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Routine Clean Out	Quarterly	✓			✓			✓			✓		

For further information about cleaning and maintaining your **RSF 4000** please contact your nearest Ecosol office.

5.0 Frequently-Asked Questions

This document aims to provide you with information about Ecosol's products and the wastewater filtration industry in general. However, clients, consulting engineers, and other interested parties often have questions and we have tried here to answer those most frequently asked.

What are the most important criteria in selecting the most appropriate pollution control device?

Ecosol believes in the treatment-train approach to pollution control. No one system can provide, in isolation, the solution to every problem. GPTs are usually the primary element of a treatment train and we believe that, often, it is important to incorporate secondary measures to achieve the optimal WQOs.

Treatment devices should be assessed firstly on their ability to treat the required volume of discharge prior to by-pass, and, secondly, on their capacity to store the volume of pollutants generated by the catchment. Some of the criteria that should be used in selecting the right proprietary stormwater treatment device for a particular site are its:

- Effectiveness in trapping the target pollutants up to TFR;
- Hydraulic impact on the drainage network;
- Whole-of-life cost and not just the capital cost;
- Compatibility with site constraints ;
- Ease of installation;
- Compliance with the local and regulatory guidelines; and
- Life expectancy.

Regular cleaning and maintenance of your unit will increase its operating life significantly

What is more important in selecting the right system to do the job, catchment area or treatable flow?

In recent years the industry has seen some proprietary GPT providers sizing their units using potential catchment pollutant loadings rather than TFR. This practice not only confuses those wishing to compare different proprietary systems but, significantly, it enables those GPT providers to provide under-sized alternatives that compromise the optimal pollutant removal efficiency.

Systems sized using catchment area invariably result in smaller units, which have a lower-designed TFR and go into by-pass prematurely. Consequently, the product does not treat the catchment's optimal pollutant loading and may even cause flooding as under-sized units usually have insufficient by-pass capacity at the designed peak discharge flows. Also, they usually have inadequate storage capacity for the expected pollutant loadings.

Ecosol always ensures that its units are appropriately sized for optimal capture efficiencies with minimal hydraulic impact at peak design discharge flows. Each product consists of different sized units with a TFR capacity that is dependent on the size and slope of the outlet pipe and the average recurrence interval (ARI).

The flow generated by any catchment is matched to the appropriately-sized unit to ensure it is treated up to the designed TFR, with flows greater than the TFR by-passing. It should be noted that the location and level of imperviousness in a catchment can greatly affect the quantity of runoff and volume of pollutants.

5.0 Frequently-Asked Questions (cont)

When comparing different proprietary units, is capital cost per cubic metre of pollutants captured a guide?

This is a mistake many clients and consulting engineers make when trying to compare the performance and cost-effectiveness of different proprietary products. There are several flaws with this approach.

Whilst the capital cost can be readily found the ongoing cleaning and maintenance costs are often not added to determine a more accurate whole of life cost.

Also, the effectiveness of the cleaning regime is a critical factor in the equation. If a unit is cleaned only once in a year, when in fact it requires cleaning, say, three times, it will obviously have been in by-pass for much of the year and so the amount of pollution collected will be less than if it had been more regularly cleaned. This would make a nonsense of any attempt to compare different units using the level of captured pollutants as a key factor. Other factors such as differences in catchment characteristics, hydrological conditions, and different methods of cleaning will also affect any comparisons.

How often do Ecosol units need to be cleaned?

This varies between the different types of units. The cleaning frequency depends heavily on weather patterns, pollutant load and activity within the catchment. Under normal operating conditions, we recommend the larger in-line/end-of-line units are cleaned every 3-4 months and the at-source units every 1-2 months.

How are Ecosol units cleaned?

All Ecosol units are designed for cleaning with little or no manual handling of captured pollutants, thereby helping ensure safe working conditions. Ecosol staff can help you not only determine how often your unit should be cleaned but also the best method, which varies with the unit. For example, the **RSF 4000** is best cleaned by vacuum, while the **RSF 100** can be cleaned by manually removing the liner bag.

Can units be cleaned by simply removing the basket rather than using suction cleaning?

Cleaning your unit is essential to ensure that it continues to capture and retain pollutants as specified and without any premature bypass.

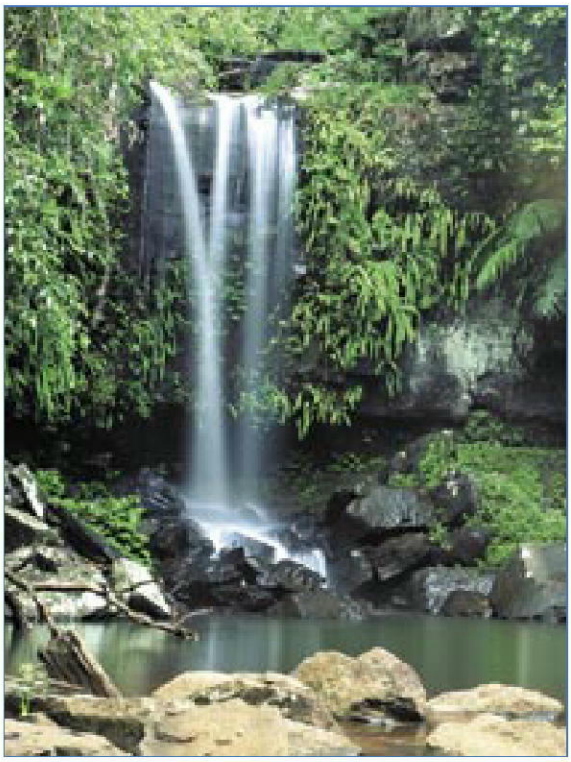
The methods for cleaning GPTs have been widely debated for many years. The Ecosol **RSF 4000** unit has been specifically designed for cleaning by vacuum method, which we believe offers far greater benefits than, for example, a removable internal filtration basket. After many years of industry experience we have confirmed that this is the safest, most efficient, and cost-effective method, because:

- Removed pollutants are appropriately stored for transportation;
- Pollutants do not need to be manually handled and can be safely stored and transported;
- Free oils and grease (hydrocarbons) are able to be efficiently removed and stored;
- Harmful pollutants such as fine sediments, heavy metals, and nutrients are not remobilised;
- No additional machinery other than the eductor truck is required;
- The internal filtration system is unlikely to suffer any damage during the cleaning process; and
- All pollutants are removed from the capture silo, unlike alternative methods.

The Ecosol **Net Tech**, which targets gross pollutants rather than fine sediment, is, however, best cleaned by removing the filtration net using a crane truck.

6.0 Corporate Profile

Ecosol was established in February 1996 to develop and commercialise the **RSF** technology. It correctly identified that any company providing cost-effective, engineered solutions to the growing problem of water pollution would be well placed to benefit from a rapidly-growing domestic and international market.



Ecosol's products are the result of many years of work by Ecosol's innovative research and development team. Its continued commitment to product development enables the company to remain at the forefront of the environment industry.

Ecosol is making a significant contribution to the restoration of the world's waterways by providing a range of technologies for use in the community, home, and industry. It wishes to be recognised as an innovative, dynamic contributor to a better environment and a world leader in the removal of waste from stormwater, sewage, and other fluids.

The group operates in the rapidly-expanding natural resource management industry, providing its clients with high-performance technology solutions that remove pollutants from wastewater. It also provides associated monitoring, cleaning, and maintenance services, striving at all times to create long-term relationships with not only its clients but also its sub-contractors, suppliers, and employees.

Offering a high-quality turnkey, customer-focused service from design through to commissioning, Ecosol works closely with local councils, authorities, water utilities, consulting engineers, and property developers in their choice for the most appropriate system to meet their needs.

The company is proud to be a preferred supplier to many domestic and international council authorities and bodies.

Ecosol encourages community involvement by participating in school and youth activities and actively promoting the benefits of a cleaner environment to the community.

Ecosol is accredited for quality, environment, and OH&S and supports equal employment opportunities for all employees and members of the community.

7.0 Corporate Directory

AUSTRALIA

ADELAIDE
121 Wright Street Adelaide SA 5000
Phone: +61 8 8212 9733 Fax: +61 8 8212 9766

BRISBANE
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HOBART
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SYDNEY
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Email: info@ecosol.com.au

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Email: admin@ecosolnz.co.nz

MALAYSIA

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Phone: +60 3 7710 6514 Fax: +60 3 7710 2586

Email: info@ecosol.com.my

WEBSITE: www.ecosol.com.au

Staff at the Brisbane Office

Ecosol's Sydney Office

Ecosol's New Zealand Office

Ecosol's Malaysian Office

8.0 Reference Material

The following details refer to the numbered superscript references in the text of the main body of this document. Further details can be obtained by contacting your nearest Ecosol office:

1. 1998 AWA and 2003 Nature Foundation SA Environment Awards
2. Patented in various countries
3. University of South Australia Report dated 23 January 1998
University of Adelaide Reports dated 20 October 1998 and 4 May 2001
Avocet Consulting Pty Ltd Various Reports 1998 - 2007

Ecosol™
WASTEWATER FILTRATION SYSTEMS

INSPECTION FORM

The RSF 4000 Solid Pollutant Filter

Asset Owner _____ Contact _____

Telephone _____ Fax _____

Unit Location _____ Date Commissioned _____

Unit/Structure No/Ref _____

Visual Inspection of Unit Components

	Good	Fair	Damaged	Remarks
Access cover	◯	◯	◯	_____
Surrounding surfaces	◯	◯	◯	_____
Capture silo	◯	◯	◯	_____
Oli and grease baffles	◯	◯	◯	_____
Pre-cast pit	◯	◯	◯	_____
				_____

Visual Inspection of Composition and Percentages of Pollutants

	%	Description of pollutants and general comments
Gross pollutants	____	_____
		_____
Sediment	____	_____
		_____
Plastics, paper, etc	____	_____
		_____
Olis and grease	____	_____
		_____

Work Carried Out or Scheduled Maintenance

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Unit Location _____

Checklist Completed By _____

Date _____

Plant and Equipment Required to Complete Clean

1. Eductor truck/Wet Vac with six-inch snorkel* ☐
2. Long-handle access lifters (to remove access covers) ☐
3. Screwdriver set ☐
4. Long-handle broom ☐
5. Long-handle spade and shovel ☐
6. Cleaning report form ☐
7. Operation and maintenance manual ☐
8. Pen ☐
9. Barriers (temporary barrier fencing to be placed around access opening) ☐
10. Traffic cones to place around vehicle ☐
11. Replacement filtration baffle ☐

* Maintenance records and pre-start checklists should be available with the vehicle

Recommended Personal Protective Equipment

1. Gloves latex/nitrile
2. High-visy Vest ☐
3. Steel-capped gum boots ☐
4. Earplugs ☐
5. Safety glasses ☐
6. Sharps kit ☐
7. First aid kit ☐
8. Workwear ☐

☐

General Notes

1. Should damage to the GPT be noticed during the cleaning process then this should be recorded and your local Ecosol representative contacted. Please do not attempt to undertake repair works yourself as this may invalidate the product warranty
2. The **RSF 4000** has been designed for cleaning by vacuum from the surface. Should confined space entry be necessary during the cleaning operation to remove large debris only fully trained and accredited confined space entry and rescue personnel are to enter the unit
3. If entry is required to the unit, all confined space entry procedures must be strictly adhered to at all times

Comments

_____

_____

_____

_____

_____

Asset Owner _____ Asset ID _____

Unit Location _____ Ecosol Ref. **RSF** _____

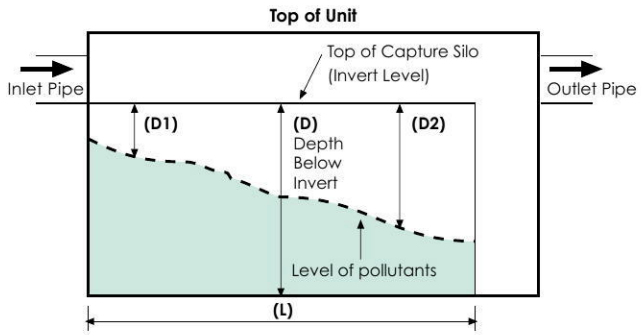
Date _____ Time _____ Unit Type _____

Inspected By _____

Visual Inspection

	Good	Fair	Damaged	Remarks
Access Lids	◯	◯	◯	
Access Lid Surrounds	◯	◯	◯	
Surrounding Surfaces	◯	◯	◯	
Internal Components	◯	◯	◯	
Other	◯	◯	◯	
Floatables Visible?	Yes	No		

Amount of Captured Material



Elevation of Capture Silo

Capture Silo Dimensions

Unit Size	D (m)	L (m)	Width (W) (m)	Silo Vol (m^3)
4200	0.600	1.310	0.250	0.23
4300	0.600	1.500	0.300	0.32
4450	0.900	2.250	0.450	1.03
4600	1.200	3.000	0.600	2.43
4750	1.500	3.750	0.750	4.83
4900	1.800	4.500	0.900	8.30
41050	2.100	5.250	1.050	13.11
41200	2.400	6.000	1.200	19.52
41350	2.700	6.750	1.350	27.70
41500	3.000	7.500	1.500	37.94
41800	3.600	9.000	1.800	65.33

D = _____ m D1 = _____ m D2 = _____ m Dav.= (D1+D2) / 2 = _____ m

L = _____ m W = _____ m Vol = (D - Dav.) x L x W = _____ m^3

NOTE: *Cleaning to be arranged when the capture silo is approximately 60-70% full*

Work Carried Out or Scheduled Maintenance

_____

_____

_____

_____

_____

_____

Adelaide
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East Tamaki Manukau 2013
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WASTEWATER FILTRATION SYSTEMS

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