# Ecosol™ Drop Trap
# Technical Specification

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for a better future

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## 1.0 Introduction

Increasingly stringent environmental best management practice requires planners and developers to apply a fit-for-purpose treatment train approach to stormwater treatment to achieve today's water quality objectives (WQO's). An integral element to any good WSUD is primary treatment or pre-screening of stormwater flows to remove coarse sediment and gross pollutants prior to downstream secondary or tertiary treatment systems such as wetlands.

The Ecosol™ Drop Trap provides effective primary treatment of stormwater flows thereby significantly enhancing the operational life of downstream secondary and tertiary treatment systems.

The system has been designed to provide a robust and durable cost effective primary treatment system that captures and retains solid pollutants conveyed in stormwater conduits.

In developing this innovative stormwater treatment system careful consideration has been given to durability, longevity, cost, and maintainability. Key commercial technical features include:

- low visual impact and energy footprint;
- designed hydraulics with proven performance and longevity;
- scalable design; and
- cost effective maintenance regime.

This technical manual describes the operation and performance characteristics of the system.

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## 1.1 How The Ecosol™ Drop Trap Works

The objective of stormwater treatment is to achieve a real, visible, and sustainable improvement in water quality. Pollution control measures, including Gross Pollutant Traps (GPT's), such as the Ecosol™ Drop Trap, litter baskets, sediment basins, grass swales, infiltration systems, and sand filters all reduce the level and concentration of a variety of pollutants, thereby enhancing water quality.

The Ecosol™ Drop Trap is designed to remove and retain solid pollutants larger than 3mm conveyed in stormwater run-off on a range of pipelines and consists of a pre-cast concrete pit containing a capture basket and overflow bypass flaps. The unit is installed either at-source, in-line, or at the end of the stormwater line, where there is a drop between the upstream invert and downstream obvert levels of at least 600mm, and preferably more. This drop is needed so that the structure can house an adequately sized basket and provide little to no hydraulic impact on drainage line.

Solid pollutants conveyed in flows from the upstream pipe are filtered through the basket positioned directly below the upstream pipe invert. The filtered stormwater then passes through the unit to the downstream outlet pipe and into the drainage network with minimal head/hydraulic loss through the unit. As the basket approaches 90% full, the by-pass flaps begin to open in response to the incoming flow.

Once the basket is 100% full the pressure of the incoming flow forces open the by-pass flaps, allowing the excess flow, to enter the drainage system through the by-pass openings.

When the flow ceases, the flaps return to their normal position (see figure 1 for a graphical representation of the unit in operation). In the unlikely event that the spring mechanism fails, or debris lodges in the by-pass flaps, they will be in the open position and will not obstruct the flow or cause flooding. The unique overflow by-pass minimises any hydraulic head loss on the drainage network under a worst-case scenario, which is defined as a full design flow and a full capture basket.

The Ecosol™ Drop Trap by design treats 100% of the incoming flow and collects, and retains more than 98% of solid pollutants greater than 3mm in size.

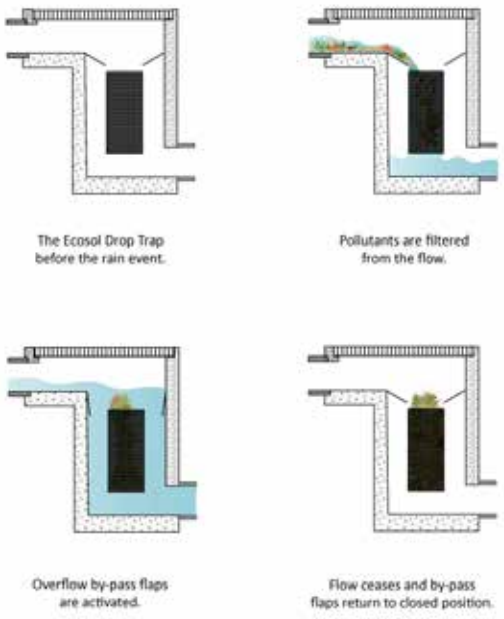


Figure 1 – Ecosol™ Drop Trap Operational Sequence

## 2.0 Ecosol™ Drop Trap Credentials

The Ecosol™ Drop Trap is designed specifically to provide essential pre-screening of stormwater runoff. It is a compact, efficient, and cost-effective solution to the ever-increasing problem of gross pollutants present in stormwater run-off. Key to its success is the robust engineered removable filtration basket housed in a pre-cast concrete pit.

University of South Australia

Since development of the technology began in 1996, Ecosol has commissioned a range of tests to confirm not only product performance but also to help with further research and development work. In 1996, the University of South Australia, tested Ecosol's Litter Basket, on which the Ecosol™ Drop Trap is based. The university's full-size Roadway Surface Drainage Rig was used to carry out a series of tests in two stages.

These tests measured the capture performance of the unit in both on-grade and sag situations for a range of flows containing full-size, real-life solid pollutants. The testing also focused on determining whether the unit had any hydraulic impact on the flows entering the pre-cast concrete pit. It found that the Ecosol™ Drop Trap did not reduce the pit's inlet capacity, a key benefit.

Field testing is an integral part of Urban Asset Solutions Pty Ltd commitment to product improvement and an understanding of all the facets that affect the performance of its products. Numerous field tests have been undertaken, often by Ecosol, in conjunction with, or independently of, its clients. The below Particle Size Distribution graph summarises data collected from three typical urban catchments where the Ecosol™ Drop Trap was utilised.

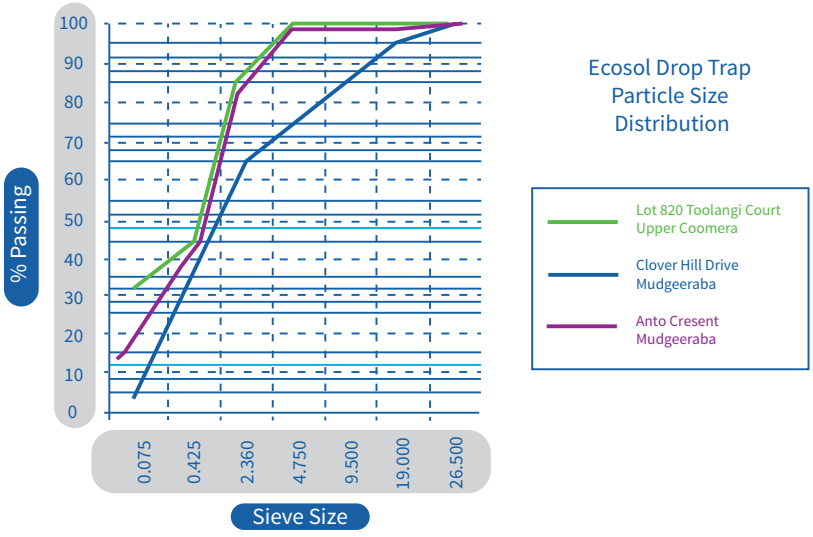


Figure 2 – Ecosol™ Drop Trap Particle Size Distribution

## 3.0 Warranty And Life Expectancy

The Ecosol™ Drop Trap has a one-year warranty covering all components and workmanship. Urban Asset Solutions Pty Ltd will rectify any defects that fall within the warranty period. The warranty does not cover damage caused by vandalism and may be invalidated by inappropriate cleaning procedures or where the unit is not cleaned within the recommended frequency. The Ecosol™ Drop Trap is designed to meet strict engineering guidelines and manufacturers guarantees and is one of the most durable in-line treatment systems available. The stainless steel components have a life expectancy of 25 years while the pre- cast concrete pit has a life expectancy of 50 years providing appropriate maintenance practices are employed.

## 4.0 Safety Considerations

The simple, yet effective design of the Ecosol™ Drop Trap reduces OH&S risks as most of the work is undertaken in a controlled factory environment. The unit arrives to site complete and ready for installation reducing significantly on-site time, an important factor given the costs associated with delays that can be caused by inclement weather.

## 5.0 Key Features And Benefits

The Ecosol™ Drop Trap is a robust and modern primary treatment stormwater filtration system for use where there are cost or space constraints, or specialised cleaning equipment is not available. The unit captures and retains more than 98% of solid pollutants larger than >3000µm, although, in practice, it has been found to collect much smaller particles, including fine sediments.

Easily installed, the unit's simple design overcomes any adverse hydraulic impact traditionally encountered with direct screening trash racks systems. The Ecosol™ Drop Trap is designed to remove and retain solid pollutants in stormwater flows on a range of pipelines and consists of a pre-cast concrete pit containing a capture basket and overflow by-pass flaps. The unit is installed either in-line, or at the end of the stormwater line, where there is a drop between the upstream pipe invert level and the downstream pipe obvert level of at least 600mm, and preferably more.

The Ecosol™ Drop Trap has many key features and benefits some of which are listed below. Crane truck for lifting the net and emptying the pollutants

| Key Features | Benefits |
|---|---|
| Effective Pollutant and Litter Retention | • Captures more than 98%of gross pollutants > 3mm.<br>• Collects significant quantities of sediment.<br>• Dry storage of pollutants and no toxic fermentation.<br>• No remobilisation of captured pollutants. |
| Cost - Effective Maintenance | • Capture basket easily removed by small crane truck for cleaning.<br>• Easily cleaned by most street-sweeping vehicles.<br>• Base trap door allows easy emptying onto truck tray.<br>• Pollutants are not handled during cleaning operation.<br>• Reduces sedimentation build-up & pipeline maintenance.<br>• Enables easy access to pit for maintenance. |
| Tested and Proven Fail-Safe Overflow System | • Unique by-pass overflow eliminates the risk of flooding.<br>• Minimal head/hydraulic loss.<br>• Principles independently tested.<br>• Meets EPA and ANZECC guidelines. |
| Cost Effective Design and Installation | • Simple design with corrosive-resistant materials.<br>• Delivered complete as a pre-cast concrete unit.<br>• Can be retro-fitted to existing pits.<br>• Manufactured to fit a range of pipe sizes up to 600mm.<br>• Customised designs to suit site specific requirements.<br>• Safe installation procedures minimise public risk. |

Figure 3– Ecosol™ Drop Trap Key Features and Benefit's

## 6.0 Key Dimensions

The Ecosol™ Drop Trap is able to be custom designed to suit most applications however the below tables provide a general guide on typical system dimensions for cylindrical pipe applications.

| Ecosol Product Code | Pipe Diameters | Approximate External Product Dimensions | | | | Pollutant Storage Capacity[3] | Designed Loading | Approximate Heaviest Lift[4] |
|---|---|---|---|---|---|---|---|---|
| | (mm) | Length (mm) | Width (mm) | Depth[1] (mm) | Drop[2] (mm) | (m)[3] | Class | Tonnes |
| Ecosol Drop Trap 1200 | 300 | 1500 | 1500 | 1,900 | 450 | 0.40 | B - D | 4.4 |
| | 375 | | | 2,125 | 600 | 0.51 | | 4.8 |
| | 450 | | | 2,350 | 750 | 0.66 | | 5.3 |
| | 525 | | | 2,575 | 900 | 0.82 | | 5.7 |
| | 600 | | | 2,800 | 1050 | 0.97 | | 6.2 |
| Ecosol Drop Trap 1500 | 300 | 1800 | 1800 | 1,900 | 450 | 0.70 | B - D | 5.6 |
| | 375 | | | 2,125 | 600 | 0.86 | | 6.0 |
| | 450 | | | 2,350 | 750 | 1.12 | | 6.6 |
| | 525 | | | 2,575 | 900 | 1.38 | | 7.2 |
| | 600 | | | 2,800 | 1050 | 1.64 | | 7.7 |

Table 1– Ecosol™ Drop Trap typical product dimensions and weights

1. Depth indicated is the overall external pit depth based on a the nominated drop between the upstream inlet pipe invert level and downstream outlet pipe obvert level inclusive of a 150mm base slab thickness and nominal 1.0m depth to inlet invert.·
2. Drop as shown is the drop indicated between the upstream inlet pipe invert level and downstream outlet pipe obvert level.
3. Pollutant storage capacities are determined by the available drop in the system.
4. Weights indicated are an indicative guide only and will vary depending on the depth to inlet invert and the available drop between the inlet and outlet pipes.

## 7.0 Collection And Removal Efficiencies

In recent years modern Water Sensitive Urban Design (WSUD) objectives and principles now applied to most urban development's require more onerous water quality objectives (WQO's) specifically targeting the removal of suspended solids, nitrogen, phosphorus and heavy metals. The Ecosol™ Drop Trap is an integral part of the treatment train providing essential pre-screening of stormwater flows and when used in conjunction with other treatment measures such as swales or sand filters will help achieve target water quality objectives.

| Pollutants | Pollutant Capture Efficiency (%) | Descrption |
|---|---|---|
| Gross Litter | 98% | Anthropogenic material such as cans, bottles, plastic bags and packing material (generally > 3mm in diameter). |
| Vegetation | 98% | Organic matter such as leaves and grass clippings. |
| Coarse Sediment | 98% | Solid material varying in size (generally >3mm in diameter both mineral and organic |

Table 2 - Ecosol™ Drop Trap typical pollutant capture efficiencies.

The Ecosol™ Drop Trap is designed specifically to capture and retain gross pollutants larger than 3mm, although it is widely accepted that smaller particulate bound material will also be retained as part of the filtration process.

For sediment retention the system design can incorporate a wet sump zone and for free floating oils and grease capture we can fit hydrocarbon socks within the system.

## 8.0 MUSIC Modelling Guidelines

These guidelines provide instruction to the creation and application of a treatment node for the Ecosol™ Drop Trap for the Model for Urban Stormwater Improvement Conceptualisation (MUSIC). The Ecosol™ Drop Trap can be modelled in MUSIC using the GPT Treatment node to represent the results derived from independent laboratory testing by the University of South Australia. The guidelines apply to the creation of the treatment node within MUSIC v610

Insert a GPT treatment node into your model by selecting "GPT" under the treatment nodes menu. When the node is created the node properties dialog is displayed There are several changes that need to be made in this dialog.

- Adjust the text in the Location box to read "Ecosol™ Drop Trap" plus any other relevant information.
- Adjust the low flow bypass to reflect any flow ($m^3$/sec) diverted away from the unit before treatment (usually zero).
- Adjust the high flow bypass to reflect the treatable flow rate (TFR values are detailed in table 4) ($m^3$/sec) any higher flows will bypass treatment.

NOTES: Can be used to describe assumptions or location of reduction values for authority approvals.

Adjust the transfer function for each pollutant selecting the pollutant and editing (right click on the function point) the input and output values on the graph below to reflect the capture efficiencies (CE) of the treatment device. Table 3 provides the input and output values for the Ecosol™ Drop Trap.

| Pollutant | Removal Rate (%) | Entered Input Value | Entered Output Value |
|---|---|---|---|
| Gross Pollutants >3mm | 98 | 1000 | 20 |

Table 3 - Ecosol™ Drop Trap – MUSIC node input and output values

Once the transfer functions have been defined for each of the pollutants the node has been fully defined. When completed the properties window can be closed by clicking the "Finish" button.

## 9.0 Design Guidelines

To ensure your system is appropriately designed for its intended application and meets local water quality objectives it is essential that the following minimum information is provided:

- Confirm the required treatable flow rate – this is the minimum stormwater run-off volume that must be treated. Typically this is the 1 in 3 month to 1 in 1 year ARI.
- Confirm the maximum design flow capacity of the drainage line. This is important as it allows us to appropriately design and model the system to cater for these peak flows at minimal head loss.
- Confirm the proposed number and locations of Ecosol™ Drop Trap to be installed. Where possible please provide clearly marked drainage plans indicating the proposed locations and confirming the available drop in the drainage line to accommodate the system.
- Confirm local water quality objectives - Recent state governmental planning policies have established clear stormwater quality bench mark objectives for local and regional councils. Accordingly local and regional council water sensitive urban design objectives have been amended to meet these stormwater pollution reduction targets. It is important we are provided this information specific to your site and local council regulations so that we can clearly advise you of the products removal efficiency relevant to these WQO's.

For further assistance in sizing or specifying a system for your next project please complete the form in Appendix 1 and forward to your local Urban Asset Solutions Pty Ltd representative.

Urban Asset Solutions Pty Ltd engineering team is able to provide a comprehensive design proposal for almost any project where the Ecosol™ Drop Trap is proposed either individually or in conjunction with any other filtration systems working together in a treatment-train approach. Services offered include preliminary hydraulic, structural, and total concept designs, as well as consideration to access and hardstand designs for cleaning and maintenance. This includes MUSIC (Model for Urban Stormwater Improvement Conceptualisation) modelling, CAD drawings and product specifications together with maintenance schedules and associated CAPEX and OPEX costs.

Further, Urban Asset Solutions Pty Ltd can also undertake all civil and structural installation works, and our complete turnkey service also includes full maintenance of the proposed stormwater treatment systems and reporting.

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## 10.0 Hydraulic Specification

The Ecosol™ Drop Trap is designed to treat 100% of the incoming flow and operates with little impact on the hydraulic performance of the upstream pipe. Utilising the drop between the upstream pipe invert and the downstream pipe obvert to accommodate the capture basket ensures there is no obstruction to the flow through the drainage line of the outlet pipe.

According to the report prepared independently by the University of South Australia the unit provides minimal Hydraulic Grade Line increases within the drainage design. In most cases, even with a full capture basket, the water level within the pit does not exceed the obvert level of the upstream pipe under full-flow conditions.

| Ecosol Product Code | Inlet &Outlet Pipe Diameters | Treatable Flow Rate[1] (L/s) | | By-pass Capacity[2] | Headloss[3] | Pollutant Storage Capacity[3] |
|---|---|---|---|---|---|---|
| | mm | Gradient 2% | Gradient 5% | L/s | mm | ($m^3$) |
| Ecosol Drop Trap 1200 | 300 | 130 | 216 | 400 | 240 | 0.40 |
| | 375 | 248 | 392 | 600 | 345 | 0.51 |
| | 450 | 403 | 637 | 900 | 455 | 0.66 |
| | 525 | 608 | 961 | 1,200 | 540 | 0.82 |
| | 600 | 868 | 1,120 | 1,372 | 660 | 0.97 |
| Ecosol Drop Trap 1500 | 300 | 130 | 216 | 400 | 240 | 0.70 |
| | 375 | 248 | 392 | 600 | 345 | 0.86 |
| | 450 | 403 | 637 | 900 | 455 | 1.12 |
| | 525 | 608 | 961 | 1,200 | 540 | 1.38 |
| | 600 | 868 | 1,120 | 1,372 | 660 | 1.64 |

Table 4 – Hydraulic specification

1. Treatable Flow Rate (TFR) is the maximum flow the unit can treat without by-pass in a surcharged pit based on outlet pipe gradients up to 5%. It is important to note that the TFR will decline as the basket fills with pollutants.

2. By-pass capacity is the maximum flow that can by-pass through a surcharged unit based on the nominated minimum drop of from inlet invert to outlet obvert.

3. Head loss figures quoted refers to the head above the upstream pipe invert level in a surcharged environment with full impermeable basket and full pipe flow (worst case scenario).

## 11.0 Cleaning And Maintenance

As with all filtration systems, the Ecosol™ Drop Trap should be cleaned regularly. The cleaning frequency and the cost depend heavily on the surrounding environment, the unit's proximity to a waste facility, the number of rain events, the catchment, and the type of pollution collected. The figures in the table below give a broad guideline about the optimal catchment size and the number of cleans required annually based on typical expected urban pollutant loads. Table 5

| Ecosol Drop Trap Product Code | Maximum Pipe Size | Gross Pollutants Holding Capacity | Optimal Catchment Area (Ha) | Recommended Cleaning Frequency |
|---|---|---|---|---|
| | mm | $m^3$ | Ha | Per Annum |
| Ecosol Drop Trap 1200 | 600 RCP | 0. 97 | 3.40 | 1 |
| Ecosol Drop Trap 1500 | 600 OCRP | 1.64 | 5.90 | 1 |

Table 5 – Indicative Cleaning Frequencies

Indicative cleaning frequency for the Ecosol™ Drop Trap is based on typical gross pollutant loads anticipated for standard commercial, residential and light industrial catchments. Gross pollutants in this instance includes vegetation as well as anthropogenic litter, however excludes sediment. Cleaning frequencies may vary based on local catchment conditions and rainfall however the above theoretical cleaning frequencies are based on a pollutant loading of 0.280m3/ha/year.

One of the key advantages of the Ecosol™ Drop Trap is that a small crane truck can easily lift the filtration basket for cleaning or alternatively is can also be easily cleaned from the surface using an industrial vacuum truck

A key benefit of this primary treatment device is its low capital cost along with its low ongoing cleaning an maintenance cost.

## 12.0 Monitoring

Initially, Urban Asset Solutions Pty Ltd recommends that monitoring is undertaken monthly. Once the unit has been in operation for an extended period of time (say, 12 months) the monitoring schedule can be adjusted to reflect the actual operating condition specific to the catchment. It is also recommended that the unit is inspected after every major storm event.

## 13.0 Cleaning And Maintenance Services

Urban Asset Solutions Pty Ltd has a very competitive cleaning service using a crane truck for the removal 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 Urban Asset Solutions Pty Ltd 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.

## 14.0 Applications And Configurations

The simplicity of the Ecosol™ Drop Trap enables it to be installed at-source, in-line or end-of-line on stormwater single pipes or box culvert ranging in size from 300mm to 600mm. It is however important to review the configuration of the stormwater system to ensure it can accommodate the necessary drop required to implement the installation of the Ecosol™ Drop Trap as your preferred primary treatment system.

The Ecosol™ Drop Trap is suitable for the following applications on drainage pipes not exceeding 600mm;

- Residential developments;
- Commercial developments; and
- Retrofitted at end of-line discharge points .

Typical Installation of an Ecosol™ Drop Trap At-Source for a small commercial development

Installation of an Ecosol™ Drop Trap end-of-line for a residential estate

## 15.0 Turnkey Services

Urban Asset Solutions Pty Ltd design and estimating staff provide a dedicated management approach towards your project. In addition all staff are capable of liaising with the client, the consulting engineer, the contractor, and all other interested third parties to achieve a successful outcome.

Given the wide range of pit types, sizes, and configurations, Urban Asset Solutions Pty Ltd provide a complete turnkey service inclusive of site measure, manufacture and installation on-site to suit each individual application. This flexibility enables the Ecosol™ Drop Trap to be appropriately sized, correctly installed and commissioned for efficient operation.

## 16.0 Accreditation

Urban Asset Solutions Pty Ltd is accredited to AS/NZS ISO 14001 (Environment) and AS/NZS 9001 (Quality). Our commitment to continuously improving our products and services is demonstrated by our ongoing accreditation for Quality and Environmental Management. Urban Asset Solutions Pty Ltd is also committed to a safe environment for its employees. We are fully third-party accredited to AS/NZS 4801 and also OHSAS 18001

ATLAS CERTIFICATION OHSAS 18001 | ATLAS CERTIFICATION AS/NZS 4801 | ATLAS CERTIFICATION ISO 9001 | ATLAS CERTIFICATION ISO 14001

## 17.0 Suppiler And Technical Product Contact Details

For any maintenance or technical product enquiries please contact:
Urban Asset Solutions Pty Ltd
Tel: 1300 706 624
Fax: 1300 706 634
Email: info@urbanassetsolutions.com.au

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# Appendix 1

## Ecosol™ Drop Trap Essential Information Form

To ensure your system is appropriately designed for its intended application and meets local water quality objectives it is essential that the following minimum information is provided:

| Customer Details | |
|---|---|
| Contact Person: | |
| Company Name: | |
| Phone: | |
| Fax: | |
| Email: | |

| Project and Site Information | |
|---|---|
| Project Name: | |
| Project Address: | |
| Type of Development/Catchment Type | |
| Catchment Size | |
| Percentage of impervious catchment area | |
| Local authority: | |
| Device Location or structure number: | |
| Designed Discharge (Peak ARI Flow Rate) L/s: | |
| Treatable Flow Rate (L/s): | |
| Tidal or submerged (inundated) system | |
| Preferred access cover type and loading (Grated or solid top) (Class A, B or D) | |
| Inlet Pipe Diameter | |
| Outlet Pipe Diameter | |
| Available drop between inlet invert and outlet obvert | |
| Other essential design or site relevant information | |

Please forward the above information for your next project to your local Urban Asset Solutions Pty Ltd representative. On receipt Urban Asset Solutions Pty Ltd will model and design the most appropriately sized system to suit your application and to assist you achieve the project Water Sensitive Urban design objectives

Email: info@urbanassetsolutions.com.au
Fax: 1300 706 634

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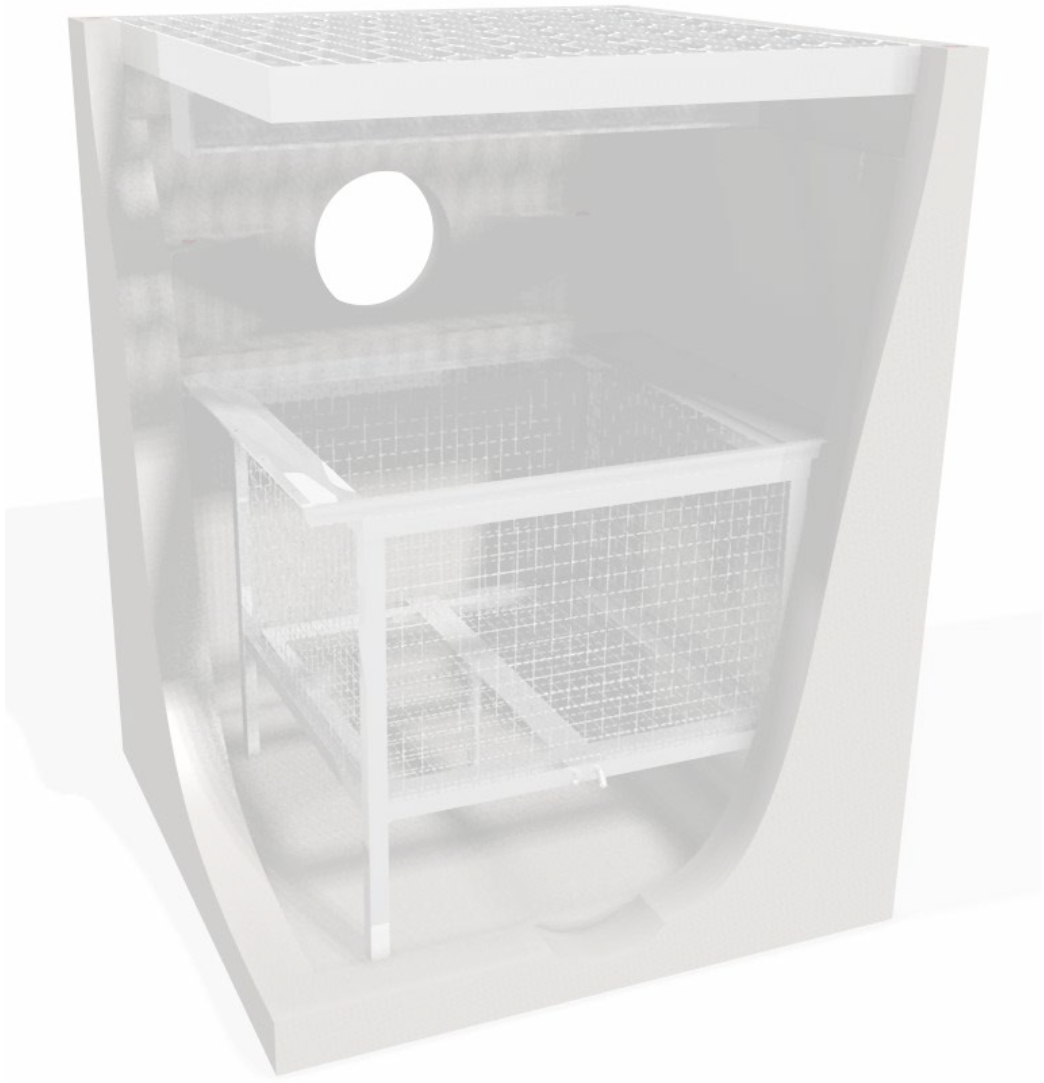



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