GEOFABRICS®

ecoAID®

Underground Stormwater Management Installation Guide

ABOUT ecoAID®

ecoAID® is an underground modular stormwater system used for detention, infiltration or harvesting stormwater runoff. The system also provides stormwater treatment by utilising a 'Catch-All-Row' (C-A-R) as an internal gross pollutant and sediment trap. The dual function of stormwater collection and treatment allows the engineer to optimise the drainage layout by minimising the number of manhole pits, with the added benefit of omitting the need for external gross pollutant and sediment traps.

The ecoAID® chamber system can provide both primary and secondary treatment through the removal of gross pollutants and sediment via physical screening, sedimentation and filtration techniques. The ecoAID® system is easily maintained from street level via the C-A-R utilising a Jet-Vac cleaning unit with a high pressure hose.

ecoAID® is an exceptionally strong and robust water storage and treatment system that is capable of being used under public roads, car parks, sports fields and public open space. This provides the engineer with opportunities to save valuable land space and protect natural waterways from the damaging effects of pollution from both new and existing developments.

The ecoAID® system is manufactured in Australia and is a proven cost effective alternative to imported systems. Local manufacture not only supports the Australian manufacturing industry, it also provides shorter product lead times and a financial boost to the local economy.

BEFORE YOU BEGIN

Materials Needed

- **ecoAID®** Chamber System, containing:
  - » **ecoAID® chambers.**
  - » **ecoAID® end caps (2 for each row typically).**
- **bidim® A24** geotextile for separation of drainage stone and in-situ material or fill.
- **Filterwrap** geotextile for "Catch-all Row" filter.
- **WP40** 1.33 m wide roll (or equivalent 40 kN woven geotextile) Catch-all base geocompsite.
- **Megaflo®** flat panel drain (for detention systems).

Items Supplied By Others

- Manhole/pit(s) for inflow distribution and catch-all row cleaning access.
- Inlet pipe stubs/manifolds from manhole into chambers via the end caps.
- PVC distribution pipe (ø150 mm typically).
- Inspection and air venting risers (ø150 mm PVC pipe), and suitable access lids/grates.
- Drainage stone (as per Table 1 on page 5).
- Acceptable fill over installation.

Equipment Needed

- Tracked excavator, size will depend on reach required. Long reach excavator is recommended for excavations wider than 5 m.
- Posi-track/bobcat, for moving and levelling drainage stone within the excavation.
- Reciprocating saw or hole saw (to custom cut end caps and top/side pipe ports).
- Scissors or stanley knife to cut geotextile rolls.
- Laser or spirit level, measuring tape.
- Spray paint or survey pegs for setting out.
- Shovels, rakes and wheelbarrow for moving and levelling stone.
- Protective/safety- gloves, eye wear, safety boots, hard-hats and hearing protection (if working around machinery and compaction equipment).

Permissions and Requirements

- Check local council regulations regarding storage size, location, allowable stormwater discharge rate and permit requirements.
- Dial Before You Dig: contact local council and underground utility companies prior to any excavation works to ensure excavation activities do not damage existing utilities.
- Contractors are required to report any discrepancy in the subgrade's bearing capacity (actual vs design) to the design engineer. It is the design engineer's responsibility to document the minimum required bearing capacity of the subgrade for the given application on any drawings or specifications.
- Failure to install the system in accordance with **ecoAID**®'s current minimum requirements and installation guidelines will void product limited warranty. If you are unsure of any of the minimum installation requirements please contact the supplier. Check online for updates of this document.
- **Geofabrics**® offers installation briefing to contractors. Please contact your local Geofabrics branch at least 7 days prior to starting to arrange an installation briefing meeting.
- Check the product delivered to site for damage during shipping and off-loading. Damaged units must be reported to the delivery company and Geofabrics and must not be installed.
- Check the weights and vehicle loads of construction equipment against the minimum cover requirements over the chambers in Tables 2 and 3 and ensure vehicles and equipment exceeding the safe working loads at various depths of cover do not traffic the installation.
- Sediment control measures must be used at all phases of construction upstream and adjacent to the installation to ensure silt, sediment and other construction materials do not enter the system. It is the contractor's responsibility to ensure the system receives no sediment or gross pollutant load prior to commissioning.

Allowable Construction Vehicle Loads

Table 2- Maximum allowable axle loads for wheeled vehicles at various cover soil layer thickness over the top of the chambers.

COVER THICKNESS MM	MAX AXLE LOAD KG (KN)
150	3,500 (37)
300	7,000 (72)
450	12,000 (118)*
600	15,000 (147)*

** Values can be increased for certain pavement structure types and designs, such as well-compacted road-base materials, and reinforced concrete wearing courses, with the Design Engineer's approval.*

Table 3- Maximum allowable ground pressures for tracked vehicles at various cover soil layer thickness over the top of the chambers.

COVER THICKNESS MM	TRACK WIDTH MM	GROUND PRESSURE (KPA)
150	300 450 600	51.2 43.1 33.3
300	300 450 600	73.7 57.0 43.4
450	300 450 600	93.2 70.9 53.4

INSTALLATION

Excavation & Subgrade Preparation

1 Mark out the location for the **ecoAID®** stormwater system and excavate the required depth as per the design drawings. Depending on soil quality, you may have vertical side slopes, or the sides of the excavation will need to be battered to avoid soil collapse. The storage excavation depth can vary, from 1.3 m to 3.5 m depending on site constraints (eg pipe levels), and bedding layer thickness. Ensure Occupational Health and Safety (OH&S) requirements relating to deep excavations/trenches are met.

2 The excavation base should be firm and level. The following requirements must be met before lining the excavation base and walls with **bidim® A24** geotextile panels:

- No freestanding water. If the excavation fills with water it must be pumped out prior to liner placement, and drainage maintained during the installation process.
- The subgrade soil needs to be prepared as per the engineer's requirements. If the subgrade strength is less than specified corrective action needs to be taken e.g. excavate weak subgrade material further and replace with compacted crushed rock or select material, and/or use geogrid reinforcement.

For systems under road pavements and/or with regular heavy vehicle loading, the subgrade generally needs an undrained shear strength of > 88kPa (or CBR > 4), however this requirement may vary depending on the pavement design e.g. layer thickness and quality) and performance requirements e.g. allowable global settlement, design traffic loading (ESAs), etc.

3 Place the **bidim® A24** nonwoven separation geotextile along the base and side walls of the excavation (see Figure 1). Overlap adjacent panels a minimum of 300 mm to ensure fines migration into the storage does not occur. **bidim® A24** is also required over the top of the chamber storage once the drainage stone cover layer has been placed.

Stone Bedding Layer for Chambers

1 Place a bedding layer of drainage stone (see Table 1- Acceptable Drainage Stone) over the **bidim® A24** geotextile. Refer to the engineer's drawings for the minimum bedding layer thickness. If perforated drainage pipe (**Megaflo®**) has been specified around the perimeter (typical of detention applications), ensure it is positioned before placing any stone.

2 The stone layer should be level. Compact the layer with a vibrating plate compactor or roller to ensure the feet of the aches will sit flat.

Table 1 - Acceptable Drainage Stone

Crushed Rock	Particle Size
Recycled Crushed Concrete (RRC) or Brick[+]	d_{min} = 20 mm d_{max} = 50 mm <2% fines Sub-rounded or rounded rock or aggregate is not acceptable. The Wet/Dry Strength Variation (AS 1141.22) of the embedment material must be less than 35%

[+] the foreign materials content must be less than 5% (less than 2% for Foreign Material Types II and III) according to RTA test method T276

Inlets Into Chambers

Stormwater generally enters the chamber storage from a manhole, pit or soak well located at the start of the inlet row(s) via the End Caps, using short lengths of pipe up to ø600 mm O.D, or via the top ports (up to ø150 mm) on smaller systems.

1 Chamber rows with pipe inlets should be positioned first as per the engineer's drawings. Inlet rows typically start in line and close to pits or manholes to allow access to inlet rows for servicing. Cut out pipe openings in the end caps or pipe ports using either a hole saw and/or reciprocating (sabre) saw at the level shown on the engineers drawings.

2 Inlet pipes should extend at least 50 mm past the corrugation on the chamber that the end cap is recessed under.

3 If there are any gaps larger than 20 mm (d_{min} of the drainage stone) between the inlet pipe and end cap, tape a panel or strip of nonwoven geotextile over the gap, or extend the Catch-all row cover geotextile 1 m or so past the last corrugation (where inlet rows are utilised as Catch-alls) to ensure drainage stone does not enter the chamber.

Where there are multiple inlet rows adjacent to each other or with additional chambers in-between, ensure the distance between inlet rows allows for a minimum of 150 mm spacing between all adjacent rows, or the

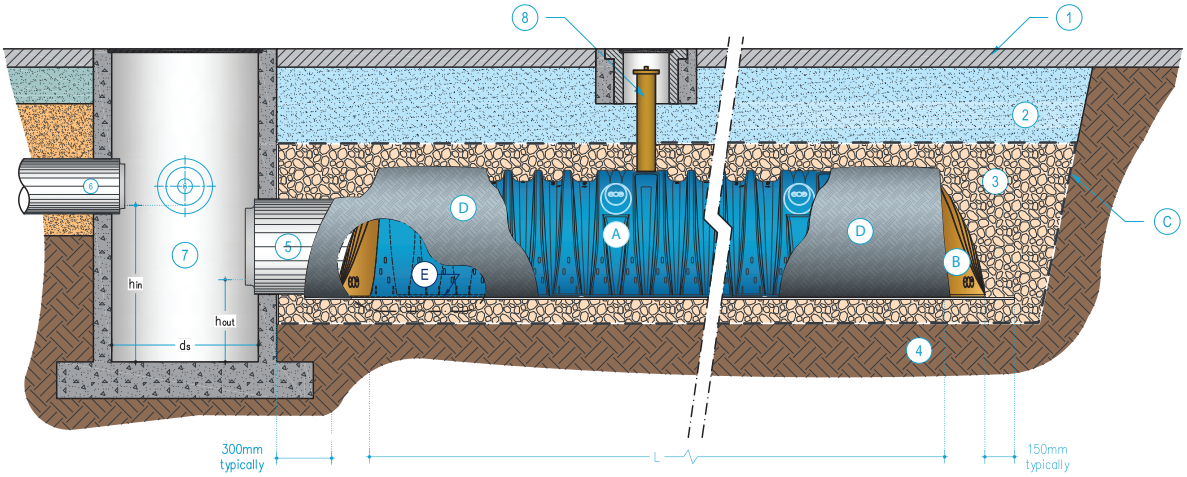

Figure 1

Legend:

A. ecoAID® EC1000 Chamber
B. ecoAID® EC1000 End Cap
C. bidim® A24 non-woven geotextile surround
D. bidim® Filter Wrap (over C-A-R)
E. 40kN Woven geotextile (along base of C-A-R)

1. Finished surface layer as specified by design engineer
2. Backfill material as specified by design engineer
3. 20-50 mm Ø drainage rock/RCC/scoria
4. Subgrade
5. 150 mm – 625 mm Ø (OD) inlet pipe
6. Connecting pipe network
7. Manhole inlet structure
8. 100 mm – 150 mm Ø optional inspection/ventilation pipe

** The rock component provides additional storage and it's porosity (typically 40%) is used when calculating the tanks overall storage capacity.*

** The ecoAID® system can be installed in a single or double layer configuration.*

** Please refer to our ecoAID® standard detail drawings for more information.*

Catch-All Row (Inlet Row)

Catch-All-Rows are simply rows of chambers with stormwater inlet pipes that have been laid upon a base filter (**WP40** 1.33 m wide (black) and cover filter (**Filterwrap**). The Catch-all row is a treatment device serviced via inspection/ cleaning ports or pits from the surface. Silt, sediment, gross pollutants and environmental contaminants etc are deposited by sedimentation or filtered from the surface water and are retained in this row, where they can periodically be cleaned out.

1. Before placing any chambers or end caps on the Catch-all row, roll out the **WP40** Catch-all base filter (black) on the stone bedding layer.

2. Position Catch-all row chambers and end caps (see Placing & End Caps section). Ensure that some of the **WP40** Catch-all base filter (black) extends either side of the chamber feet all the way along the row.

3. Cover this row with the grey **Filterwrap** Catch-all cover filter geotextile. Ensure that the three slots on each corrugation of the chamber are covered by this geotextile and it extends fully over each end cap.

4. Insert the lateral pipes and inspection port risers through a hole or cuts made in the Catch-all cover material (see next page for more detail).

Placing Chambers & End Caps

1 Once the start location of the inlet rows has been established, start building row(s) from individual chambers away from the inlet by overlapping the last corrugation of the chamber placed with the first corrugation of the next chamber. Follow the direction arrows on the top of the chambers regarding the orientation of each chamber and where chambers should overlap and lock into position.

A 150 mm gap is required between each row - this gap must be maintained during stone placement. Ensure that the row build does not exceed the reach of the machinery used to place the stone backfill, unless machines can reach from the excavation sides.

2 Place end caps at the start and end of each row. The end caps will slide into place under the first and last corrugation of each row. The chamber end will need to be lifted 50-100 mm when positioning the end cap. Ensure the end caps sit flat and their base is fully and evenly supported by drainage stone.

Lateral Pipes, Inspection Ports & Air Venting

Pipe ports are located on the top and sides of each chamber. Cut-out guides are provided for standard stormwater rated ø100 mm or ø150 mm inlet pipes and inspection port risers. Pipe connections should be performed by a licensed plumber.

1 Cut out appropriate pipe openings using either a hole saw or reciprocating (sabre) saw. Pipes usually terminate and rest on the pipe port (for top port inlets). They should not extend all the way down to the **WP40** Catch-all base filter due to cleaning and serviceability requirements.

2 Any gaps between the pipe and the top port can be filled with expanding Styrofoam. This helps keep the pipe in-place and vertical during placement of the drainage stone cover and fill material.

Lateral pipes for inflow equalisation and distribution may be specified by the design engineer - these are typically ø150mm PVC stormwater pipes.

3 Lateral pipes into the chamber side ports should extend at least 10 cm into the chamber.

Air venting from the storage is recommended on most systems with large stormwater inflows. Check the design for the location of air vents and details - these are typically ø50-100 mm PVC stormwater pipes.

4 Air vent pipes typically exit chambers from the top port, or from within the drainage stone cover layer. Pipes must be vented to the surface and atmosphere, this can be done via the storage inlet pit(s), or inspection ports with grated lids. The air vent pipe should be perforated with ø12-16 mm holes in a section of the pipe within the drainage gravel above the chambers. The total area of perforation should be equivalent to, or greater than the cross-sectional area of the air vent pipe.

5 The air vent pipe should be perforated with ø12-16 mm holes in a section of the pipe within the drainage gravel above the chambers. The total area of perforation should be equivalent to, or greater than the cross-sectional area of the air vent pipe.

Covering Chambers with Drainage Stone

1 Before placing any stone around the chambers, check that there is a 150 mm (or more) continuous gap between each row.

2 The >150 mm gap between rows must be maintained during stone placement around the chambers. Recycled house bricks or pipe conduit lengths can be used to maintain correct separation.

3 Place at least 100 mm of drainage stone between rows by sprinkling from an excavator or loader bucket to lock chambers in position.

4 Once the feet of the chambers are anchored on both sides, bulk rock can be placed using an excavator from outside the excavation, or by a loader ahead of the progressing rows/chambers being placed.

Never drop a full excavator or backhoe bucket load of stone between rows without a layer of rock on the other side of the row to counter the lateral force and prevent the chambers shifting.

5 Fill the excavation to the maximum storage height with the drainage stone. At least 150 mm of drainage stone, or more if specified, should be placed over chambers.

Where excavator reach or site access prevents stone placement from outside the chamber footprint, drainage stone and any additional fill can be placed with equipment working above the chambers provided the equipment axle weight and/or track ground pressure limitations for various minimum stone cover layer thickness in Tables 2 and 3 are strictly followed. Failure to follow these recommendations may result in construction damage to the units and voiding of Warranty.

Fully loaded trucks should not dump stone directly over the chamber footprint unless at least 900 mm of cover exits between the chamber crest and truck tyres.

Wrapping the Stone & Fill Layer Placement

1 Once the stone has been filled to the finished storage height, any **bidim® A24** geotextile material that was temporarily anchored on the surface or excavation batter can be folded back over the stone layer.

2 Additional geotextile should placed over the storage system, overlapping panels at least 300mm. It is important that the stone be completely covered with **bidim® A24** geotextile before placing any fill material over the storage.

This prevents fines and silt moving from the fill material above into the storage volume and reducing storage capacity and/or causing subsidence.

3 Place suitable fill or topsoil over the storage as required to the finished ground surface level. If paving, concrete, or asphalt is to be laid, fill with appropriate sub-base material to the underside of the wearing course layer. If compaction of these layers is required (for example, under a carpark or roadway), compaction should only be commenced when 300mm (minimum) of suitable soil cover is in place over the top of all chambers. Heavy compaction equipment is not recommended with less than 450mm minimum cover over the chambers without the design engineer's approval.

GEOFABRICS®

ENVIRONMENTAL

100% RECYCLABLE

The system is 100% recyclable and has been load tested with recycled crushed construction waste for the rock drainage media, potentially diverting many tonnes away from landfills.

AUSTRALIAN MANUFACTURED

ecoAID® is manufactured in Australia at a state-of-the-art ISO 9001 accredited manufacturing facility featuring low energy consumption and servo-hydraulic plant with energy savings between 20 and 80%.

LOW CARBON FOOTPRINT AND CARBON MILES

With ecoAID® being manufactured in Australia, the 'carbon miles' are lower than imported systems. The stacking and transportation efficiency makes ecoAID® chambers a sound environmental choice compared to oversize round pipe or concrete tanks in detention and infiltration applications.

LONG SERVICE LIFE

ecoAID® is manufactured using injection moulded UV stabilised virgin polypropylene ensuring it meets its 100 year+ in service design life. The storage is serviceable due to unimpeded access to the 'Catch-All-Row' for cleaning and maintenance from the ground surface level, so storage volume is not lost over time.

TECHNICAL SUPPORT

Geofabrics are able to provide technical support to design engineers, architects, developers and contractors. Our technical hub can provide information relating to application suitability, system sizing, design specifications and full CAD design suggestion drawings. Feel free to contact us directly using the details below, or visit our website where additional general and technical information is available.

GEOFABRICS.CO

MELBOURNE	SYDNEY	NEWCASTLE	COFFS HARBOUR	PERTH	ADELAIDE
(03) 8586 9111	(02) 8785 8800	(02) 4951 2688	(02) 6653 5706	(08) 6305 0561	(08) 8162 5855
BRISBANE	**TOWNSVILLE**	**BUNDABERG**	**GOLD COAST**	**HOBART**	**DARWIN**
(07) 3279 1588	(07) 4774 8222	(07) 4155 9968	(07) 5594 8600	(03) 6273 0511	0407 523 669