IRISH AGRÉMENT BOARD
CERTIFICATE NO. 96/0033
bioCycle™ Ltd,
Unit 107 Baldoyle Industrial Estate,
Dublin 13.
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bioCycle™ Wastewater Treatment System

Systèmes de traitement des eaux rèsiduaires
Abwasseraufbereitung

NSAI Agrément (Irish Agrément Board) is designated by Government to issue European Technical Approvals.

NSAI Agrément Certificates establish proof that the certified products are **'proper materials'** suitable for their intended use under Irish site conditions, and in accordance with the **Building Regulations 1997 to 2017**.

PRODUCT DESCRIPTION:
This Certificate relates to the bioCycle™ Wastewater Treatment System, which has been tested to IS EN 12566-3:2005 + A2:2013/NA:2011 *Small wastewater treatment systems for up to 50 PT – Part 3: Packaged and/or site assembled domestic wastewater treatment plants.*

This Certificate certifies compliance with the requirements of the Building Regulations 1997 to 2017.

USE:
The bioCycle™ Wastewater Treatment System is used for the treatment and disposal of wastewater. Wastewater is defined as the waste arising from toilets, bathrooms, showers, kitchens and appliances such as dishwashers and washing machines.

MANUFACTURE & MARKETING:
The product is manufactured and marketed by:

bioCycle™ Ltd,
Unit 107,
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1.1 ASSESSMENT

In the opinion of NSAI Agrément, the bioCycle™ Wastewater Treatment System, if used in accordance with this Certificate can meet the requirements of the Building Regulations 1997 to 2017, as indicated in Section 1.2 of this Irish Agrément Certificate.

1.2 BUILDING REGULATIONS 1997 to 2017

REQUIREMENTS:

Part D – Materials and Workmanship

D3 – The bioCycle™ system, as certified in this Certificate, is comprised of 'proper materials' fit for their intended use (see Part 4 of this Certificate).

D1 – The bioCycle™ system, as certified in this Certificate, meets the requirements of the building regulations for workmanship.

Part H – Drainage and Waste Water Disposal

H1 – Drainage Systems

The bioCycle™ system is easily integrated with all forms of existing or newly constructed drainage systems to meet these requirements.

H2 – Septic Tanks

The bioCycle™ system is a combined aerobic/anaerobic system and is suitable for application where mainline foul water drainage is not accessible. The system complies with the requirements of the Environmental Protection Agency's (EPS) Code of Practice 2009 *Wastewater Treatment and Disposal Systems Serving Single Houses.*

The quality of treated wastewater from the bioCycle™ system exceeds that of the effluent from a septic tank. The bioCycle™ system can be used in domestic situations where septic tank systems are not acceptable, where sites do not comply with the recommendations of IS EN 12566-1:2000 NA:2011 *Small wastewater treatment systems for up to 50 PT – Part 1: Prefabricated septic tanks*, and/or where septic tank systems have been known to fail.

2.1 PRODUCT DESCRIPTION

The bioCycle™ Wastewater Treatment System comprises a four stage process, contained in a 2.28m diameter outer tank and a 0.95m diameter inner tank, each subdivided into two sections giving four chambers. The wastewater flows by gravity through each chamber in succession. The function of each stage is described below.

1) Reception and primary treatment (Chamber A)

Settlement of solids resulting in about 20-30% BOD_5 load reduction occurs in Chamber A. Inorganic materials such as grit and sand will also be removed by settlement. Floatable substances such as fat and grease may be retained and any floatables that arise in the clarification stage will be returned to this chamber. Substantial reduction in the volume of settled sludge occurs by anaerobic digestion and this is assisted by adding some of the activated sludge from the next stage (aeration) of the treatment process. It is normal for a thick crust or scum to form on the surface of this chamber.

2) Aeration (Chamber B)

The discharge from Chamber A flows by gravity to Chamber B where the organic content is almost totally degraded by a culture of bacteria within a process known as submerged aerated biological filtration. Oxygen, to support the degradation processes, is introduced by a small air pump and the bacteria are supported on a purpose-designed submerged plastic medium

3) Clarification (Chamber C)

The discharge from the aeration stage drains to the clarification stage (Chamber C), where separation by settlement of the biological solids, generated in the previous stage, occurs. The settled solids are mainly returned to the primary treatment stage (Chamber A).

4) Pump (Chamber D)

The clarified wastewater drains to the sump and from there it is pumped to the disposal location. Disinfection of clarified wastewater is available as an option.

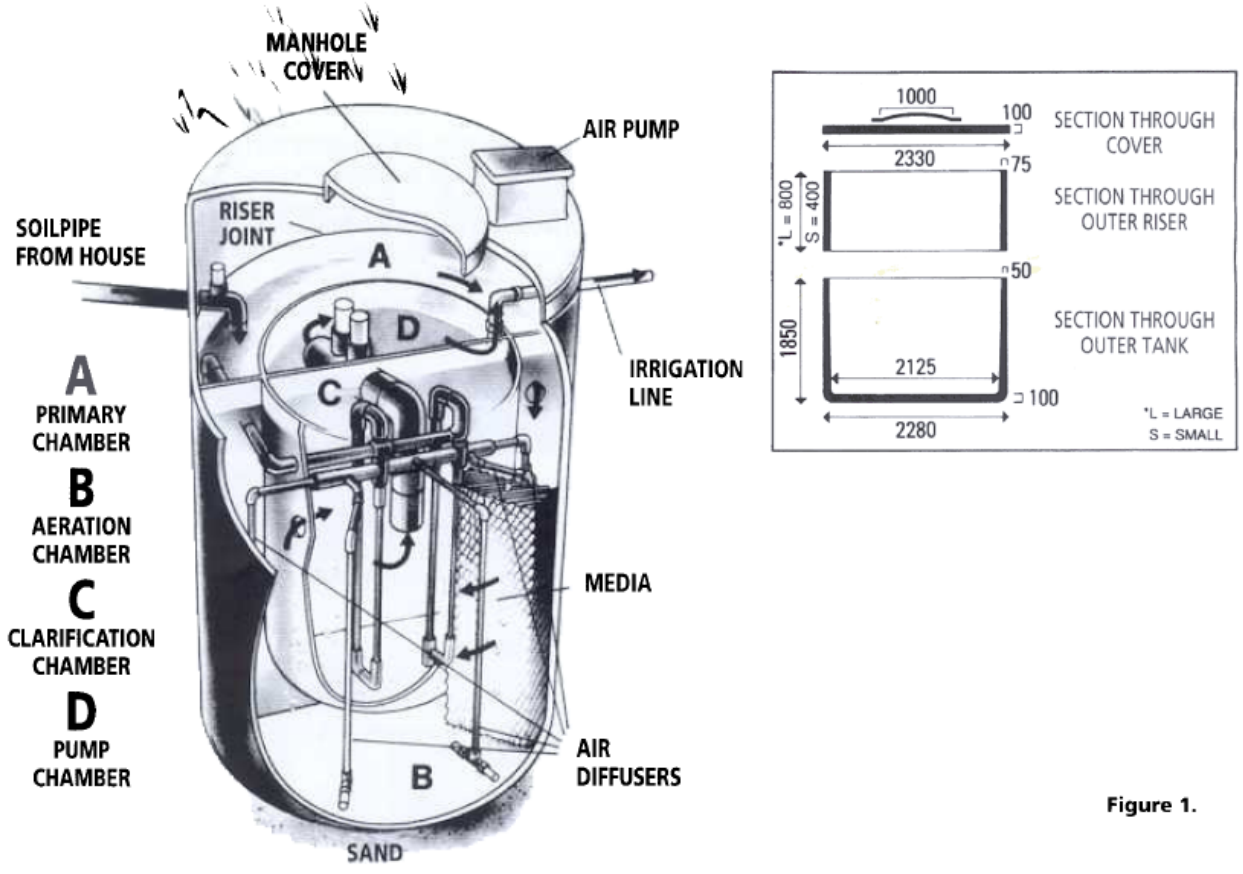


Figure 1.

5) Safety alarms

Within the bioCycle™ system, three alarms are installed as warning devices. An alarm plate (audio/visual) is supplied to be installed within the house. This alarm plate is similar to an ordinary light switch with two coloured lights. A switch provides for the alarm to sound and to be switched to the 'mute' position when heard. The alarm panel is incorporated into an ELCB unit which is designed as an extra safeguard in the event of an electrical fault. The three lights indicate:

i) The high WATER level alarm – designed to sound if the water level in the irrigation/disinfectant chamber reaches a certain level. This indicates that the submersible pump is malfunctioning.
ii) The AIR pressure alarm – designed to sound if the blower ceases to operate, or if the diaphragm ruptures.
iii) The POWER supply alarm will activate in the event of a power failure to the system.

2.2 MANUFACTURE

The outer tank, tank riser section and lid are designed and constructed from steel fibre reinforced concrete. The inner tank and manhole cover are designed and constructed from glass reinforced plastic in accordance with IS EN 13121-3:2008 + A1:2010 *GRP tanks and vessels for use above ground – Part 3: Design and workmanship*. Each system design is assembled and fitted at the manufacturer's works with the air diffuser system, pump, plastic support media, system internals and pipework. Treated wastewater disposal (irrigation) pipework and electrical connections are completed on site.

2.3 DELIVERY, STORAGE AND MARKING

The tanks are completed ready for delivery at the manufacturer's works. Offloading must be carefully supervised using chains, steel cables or lifting bars rated in excess of 5 tonnes and should conform with the requirements of the Safety in Industry Act 1980. The manufacturer's instructions must be followed to avoid damage to the tanks during offloading and placing in the excavation. A crane or other suitable lifting equipment must be employed.

The tanks are supplied with full installation instructions and are labelled on the outside to indicate the NSAI Agrément certificate mark incorporating the number of this Certificate.

2.4 INSTALLATION

2.4.1 General

The bioCycle™ Wastewater Treatment System must be installed in accordance with manufacturer's instructions as laid down in the bioCycle™ Installation Requirements document.

The excavation must be of sufficient depth and width to allow for safe and easy emplacement of the tank. Generally a hole of 3m x 3m in plan area is satisfactory. The depth will be determined by the invert level of the drain from the premises to be served by the bioCycle™ Wastewater Treatment System. The bottom of the excavation should be dry and level, with no sharp rocks or large stones protruding. In the case of soft or unstable soils it may be necessary to put in place a levelled layer of compacted hardcore (about 200mm) or a concrete pad (about 150mm thick).

Fig. 2
Typical Section of BioCycle System and Sub-Surface Irrigation Area.

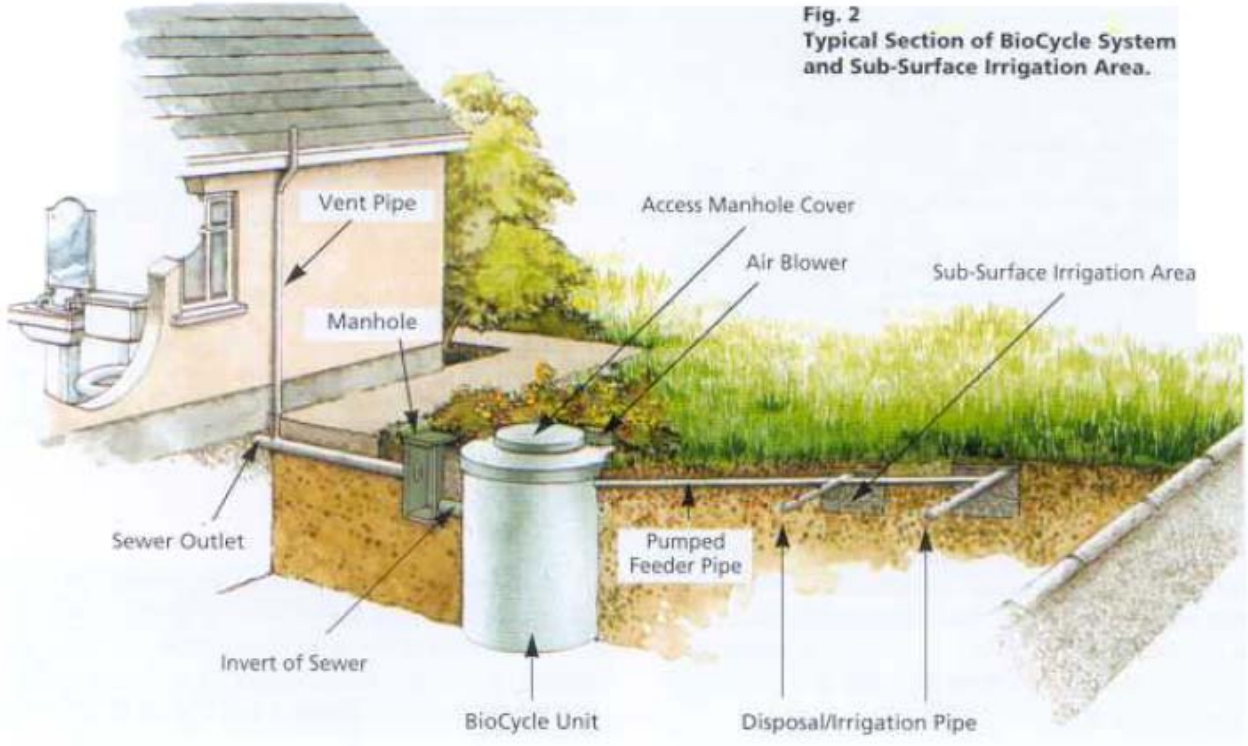
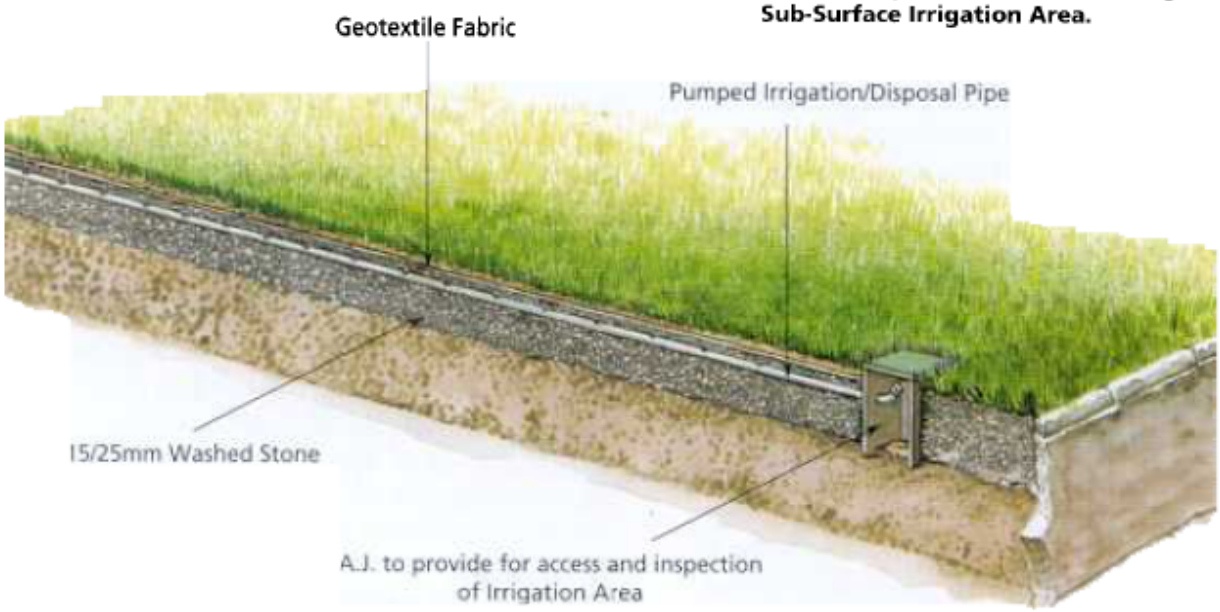


Fig. 3
Typical longitudinal section through Sub-Surface Irrigation Area.



Care must be taken to ensure that the tank is truly vertical when it is lowered onto the bottom of the excavation. If it is not, it must be raised and the bottom of the excavation re-levelled until it is absolutely level. The tank inlet port must be in line with the drain from the premises being served.

A 6 core SWA electrical sable should be run out to the excavation from the main supply board in the dwelling in accordance with regulations published by the Electro Technical Council of Ireland (ETCI). See the bioCycle™ Installation Requirements document for details of the wiring diagrams.

The excavation should be backfilled to the inlet invert level with materials such as sand or gravel. Materials from the excavation may be used provided rocks and large stones are excluded. Builders rubble should not be used. The backfill should be carefully consolidated around the tank. At all stages of installation, care should be taken to avoid accidental entry of foreign matter (clay, stones, rubble scrap) into the tank interior. The cover should be kept in place at all times, except when work is taking place in the interior.

The lifting holes must be sealed with the plugs provided and the surfaces sealed with epoxy resin.

2.4.2 Location

The tank should be located so that there is a safe and clear access for installation and maintenance. The tank should not be located in any area where vehicles could traverse or damage it. Table 1 gives the required minimum setback distances from the unit and irrigation area to various features on the site.

At least 1m of overburden must be present between the highest level of the water table or fissured bedrock and the invert level of the irrigation system. A raised bank of topsoil, i.e. a constructed irrigation area, may be required to achieve this.

Feature	Minimum Separation Distance (m)	
	bioCycle™ Unit	Irrigation Area
Dwelling Served	3(1)	5
Adjacent Dwelling	5(1)	5
Walls	3(1)	1
Roads	3(1)	1
Site Boundaries	1	1
Drinking Water Sources	10	20-100(2)
Water Course	3	3

(1) The depth of the excavation to accommodate the treatment system must be taken into consideration when determining this distance as it will be governed by the invert depth of the soil pipe where it reaches the treatment system. The separation distance should be such that the excavation does not undermine adjacent buildings, roads or walls. This distance should not be less than 1.5 times the depth of the excavation.

(2) This separation distance should not be less than 20m except in the case of very free draining soils or gravels, where a minimum distance of 40m should be maintained. The irrigation area should be down gradient of any nearby well. Where it is not possible to locate the irrigation area down gradient of any well, including those on neighbouring properties, a separation distance of at least 100m must be maintained.

Table 1: Required Minimum Setback Distances for the Location of the bioCycle™ Unit and Irrigation Area

2.4.3 Treated Wastewater Disposal

The extent of the treated wastewater disposal area will be based on the results of the percolation test detailed in the bioCycle™ Development Assessment Schedule. This is generally in accordance with that detail in BS 6297:2007 + A1:2008 *Code of practice for the design and installation of drainage fields for use in wastewater treatment*. The physical properties of the soil, the general characteristics of the site and hydraulic loading onto the system must also be taken into account. This information is supplied to bioCycle™ as part of the Site Assessment Report Form. The quality of treated wastewater from the system is also an important consideration in designed the irrigation disposal area.

The guidelines given in Table 2 apply to both surface and sub-surface irrigation systems. For sites where the measured percolation value is less than 30 sec/mm or greater than 270 sec/mm, bioCycle™ should be consulted regarding the design of the irrigation system.

Different configurations of irrigation areas are acceptable. This also applies to sites where split irrigation areas are needed to obtain the recommended total area.

Treated wastewater is pumped from the bioCycle™ unit through 32mm diameter polypropylene/PVC pipes to the disposal area. The methods of disposal include:

a) Sub-surface Irrigation – Treated wastewater is disposed of under pressure through perforated 32mm diameter polypropylene/PVC pipe along the length of the sub-surface trench;
   or
b) Surface Irrigation – Treated wastewater is disposed under pressures from spray nozzles on 150mm risers fixed at 0.5m intervals through 32mm diameter polypropylene/PVC pipe. The surface irrigation system should be located in a maintained landscaped area;
   or
c) Discharge to Surface Water – Treated wastewater can be discharged directly or via a filter bed to receiving waters. A license to discharge waters will be required from the local authority to comply with the Water Pollution Acts (1977 – 2007) if this option is selected.

In order to allow for location, access and inspection of the irrigation area, an A.J. should be located at the end of each irrigation trench or filter bed.

Details of the construction of the different irrigation disposal areas are given in the bioCycle™ Installation Requirements Manual.

2.5 COMMISSIONING

Commissioning will be carried out by bioCycle™ service technicians after installation is complete and all services are connected.

Population Served	Percolation Value (seconds per mm)							
	30–60	60–90	90–120	120–150	150–180	180–210	210–240	240–270
4	15	20	30	40	45	55	65	75
6	20	30	45	55	70	80	95	110
8	25	40	60	75	90	110	125	150

Table 2: General Guidance for the Sizing of Irrigation Area (linear metres of pipe)

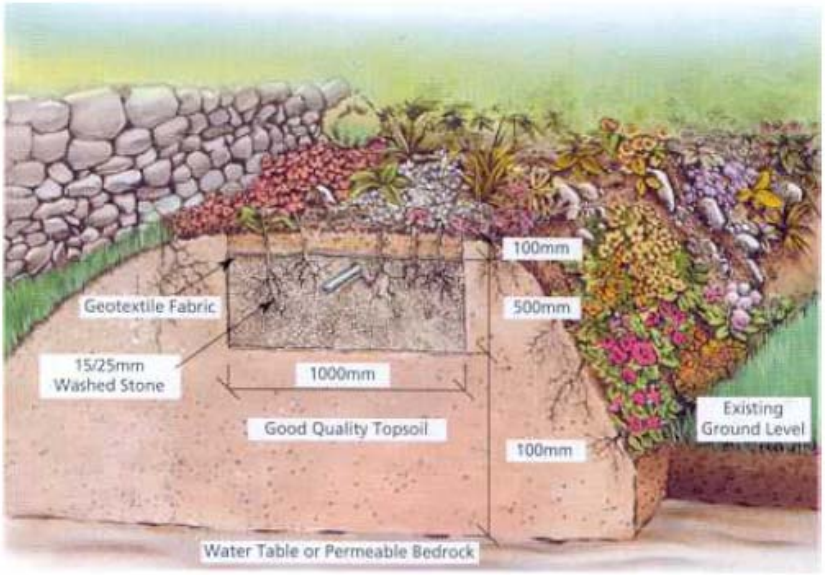


Fig. 4.
Construction of Sub-surface Irrigation System for Site with High Water Table.

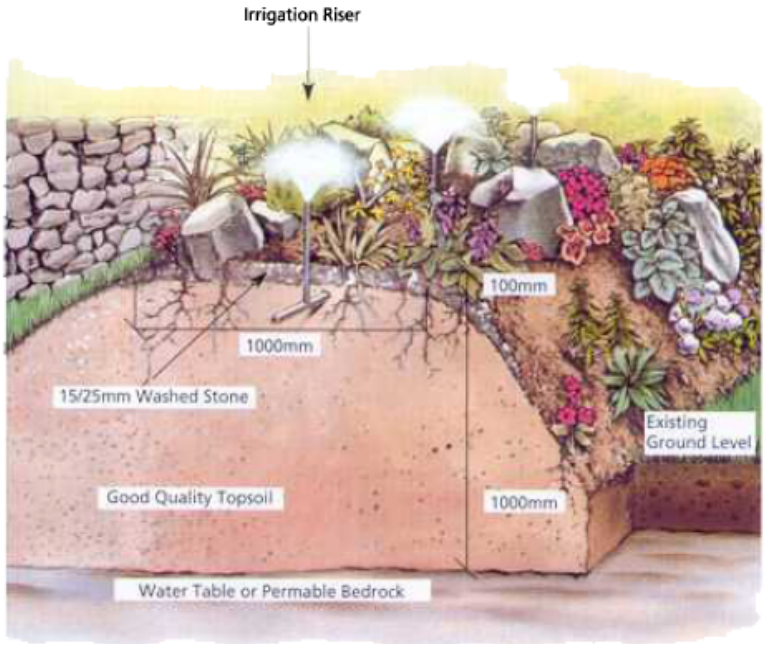


Fig. 5
Construction of Surface Irrigation System for Site with High Water Table.

Fig. 6
Typical layout 'A' for the location of BioCycle Unit and Sub-Surface Irrigation Area.

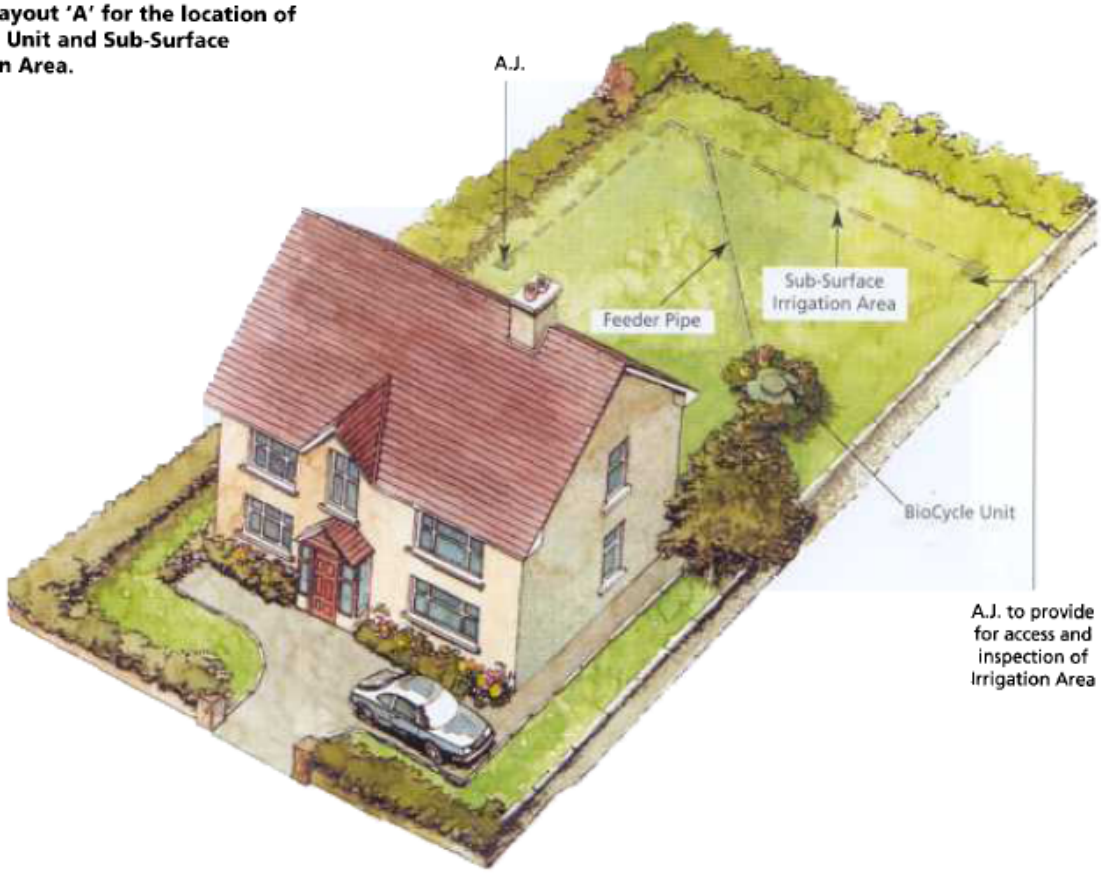
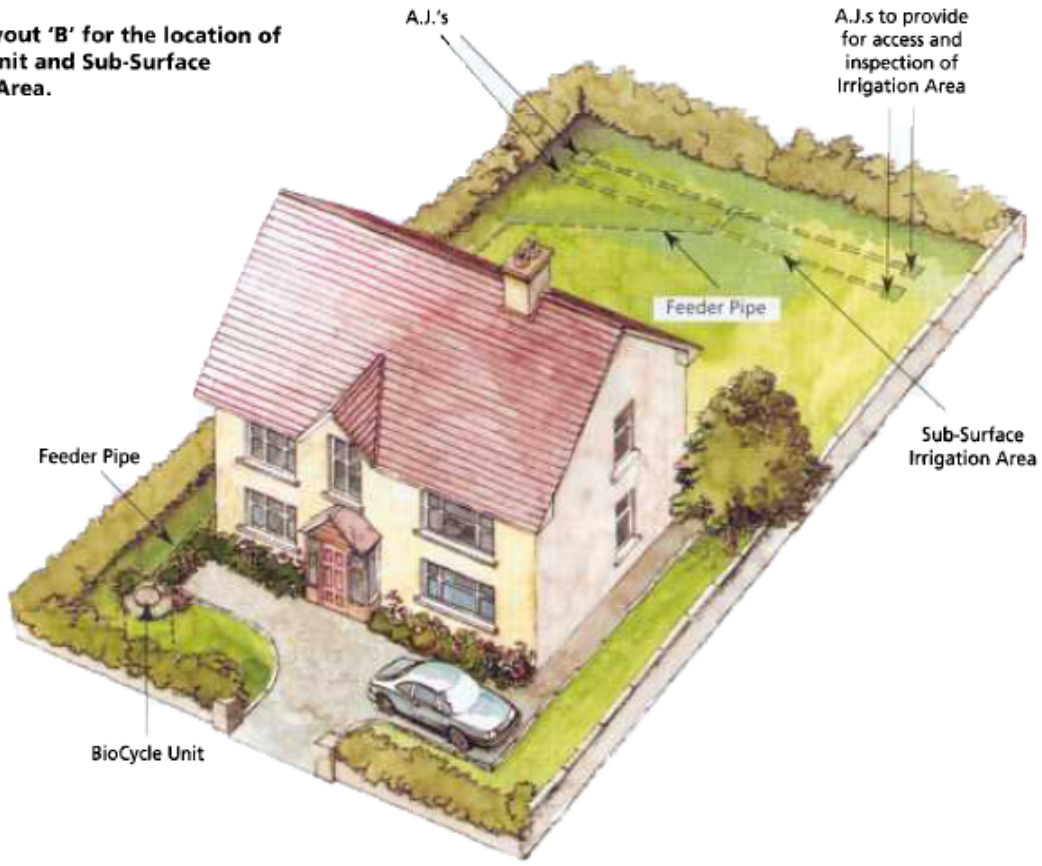


Fig. 7
Typical Layout 'B' for the location of BioCycle Unit and Sub-Surface Irrigation Area.



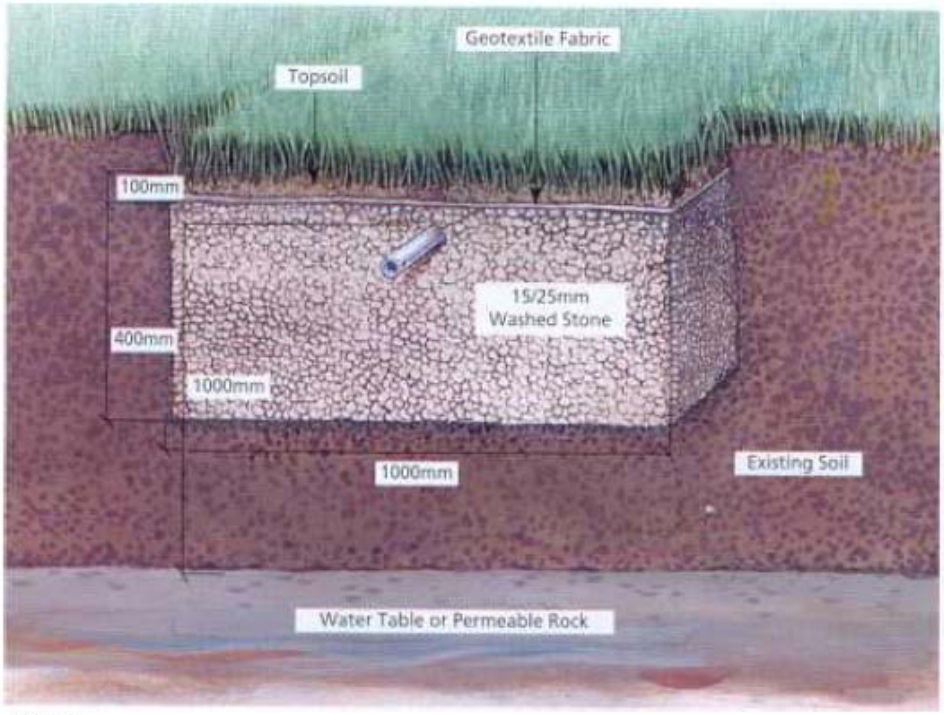


Fig. 8
Detail for construction of Sub-Surface Irrigation Trench System.

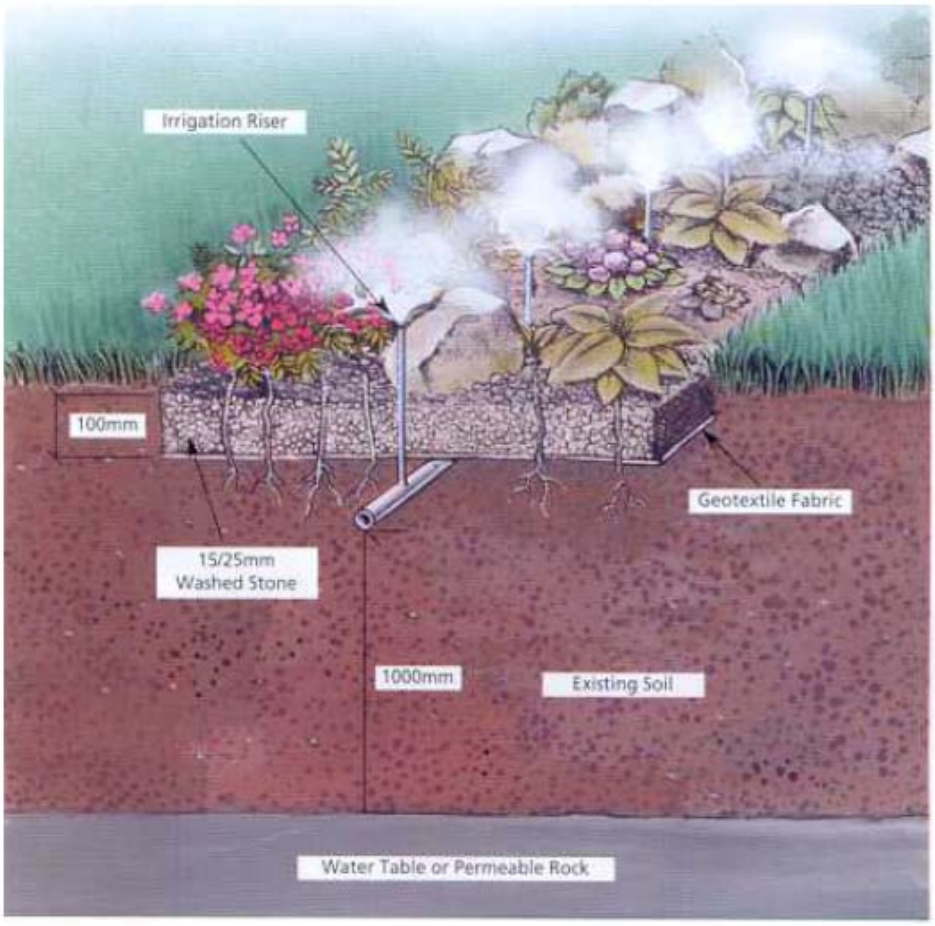
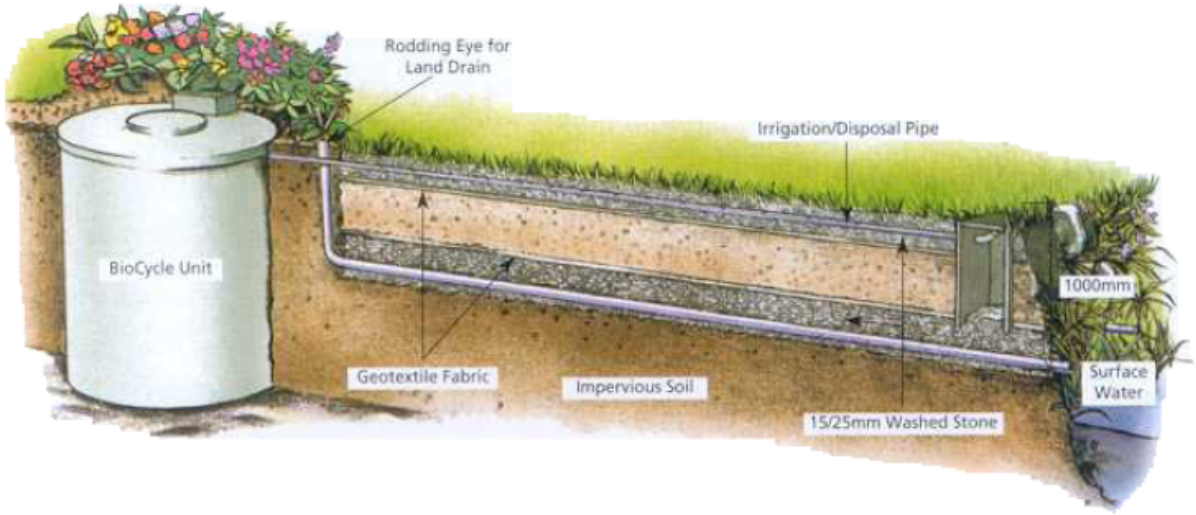


Fig. 9
Detail for construction of Surface Irrigation Area

Fig. 10
Construction of drained irrigation area for site with impervious soil and where access to water course is available.



Part Three / Design Data 3

3.1 GENERAL

The bioCycle™ Wastewater Treatment System has been designed to treat domestic wastewater arising from up to 8 persons. A single system may therefore be used to treat wastewater from two or three households, provided the total population served does not exceed 8 persons. It is suitable for installation at sites where a septic tank and percolation system does not afford an environmentally safe and acceptable means of disposing of domestic wastewater. Such sites include those where the water table is high and where soil types do not afford good percolation.

Where the disinfection option is employed, it may be used at sites where bacteriological contamination of ground water must also be avoided. To ensure optimum efficiency, the drainage of the premises served must be checked to ensure that storm water from roofs and paved surfaces does not discharge to the system.

The system is designed and installed generally in accordance with BS 6297:2007 + A1:2008 *Code of practice for the design and installation of drainage fields for use in wastewater treatment*. Due to the effluent treatment achieved, the bioCycle™ Wastewater Treatment System can be installed close to habitable buildings, as indicated in Section 2.4.2, subject to any special requirements of the particular site.

The system intentionally does not have an overflow disposal outlet. There is a minimum spare volumetric capacity of 2600 litres so that in the event of a pump malfunction it will continue to accept up to two to three days discharge from the premises. The monitoring system (see Section 3.2.5) will have alerted the owner to the malfunction and this will normally be corrected before overflow occurs. Where surface irrigation is employed, the system is designed so that any overflow will be automatically disinfected, thus minimising the risk of any health hazard.

Fig. 11
Construction of Access/Inspection A.J. at end of Irrigation Trench.

3.2 DESIGN BASIS

Population served: 8 persons
Hydraulic load: 180 litres/person/day
Hydraulic load maximum: 250 litres/hour
Organic loads: 0.05 kg BOD_5/person/day

Capacities:

Reception and primary treatment:	2100 litres
Aeration chamber:	2100 litres
Clarification chamber:	500 litres
Pump sump:	500 litres
Freeboard, minimum:	2600 litres

3.2.1 Pumps

The design and installation of air and irrigation pumps are in compliance with 'The National Rules for Electrical Installations' published by the Electro-Technical Council of Ireland, ETCI.

(a) Irrigation Pumps

Irrigation pumps are of standard submersible type and are selected to suit site conditions within the range:
130 litres/minute/5m head
to
130 litres/minute/8m head

Enclosures are to IP68 in accordance with IEC Publication 529:1989 *Degrees of protection provided by enclosures*. All irrigation pumps use single phase 220 – 240 volt 50 Hz motors with thermal overload protection.

(b) Air Pump

The air pump is designed for continuous service and provides long-term maintenance free operation. Enclosures are to IP54 in accordance with IEC 529:1989.

3.2.2 Support Media

The media used is an inert plastic material, the structure of which contributes to the stability of the process and ensures maximum contact with the wastewater, thus promoting a healthy biomass.

Design surface: 15 m^2 per person
Installed surface area: 120 m^2

3.2.3 Disinfection

Disinfection of wastewater is available as an option. A solid formulation, 70% active, of calcium hypochlorite [$Ca(OCl)^2$] tablets is used. They are retained in a controlled release chamber so that under and over dosing does not occur. Replenishment is normally required twice per year and will be carried out by bioCycle™ Ltd as part of the mandatory inspection and maintenance contract for each installation.

3.2.4 Wastewater Quality

pH	6.5 – 7.5
Biochemical Oxygen Demand*	<20 mg/l
Suspended Solids*	<30 mg/l
Ammonia*	<10 mg/l N
Nitrate	5 – 10 mg/l N
Total Phosphorous	< 5 mg/l P
E.Coli (disinfection option)	<30 MPN per 100 ml
The concentrations of ammonia and nitrate depend on the length of time the system has been in use. The pH, BOD, suspended solids and phosphorous concentrations would normally be attained within a few weeks of commissioning.	

Table 3: Treated Wastewater Characteristics

3.2.5 Monitoring System

Each bioCycle™ Wastewater Treatment System is supplied with a monitoring system to alert the owner to malfunctions. The tank is fitted with a liquid level detector which will warn of a pump malfunction. A pressure detector will warn of an air blower malfunction. In addition, a power supply alarm will activate in the event of a power failure of the bioCycle™ unit. These detectors are connected to a fault indicator display unit, prominently located in the dwelling served. An audio alarm is included in the display unit.

3.2.6 Pipework

Pipework used for the fabrication of the aeration system, sludge return and top level skimmer is in accordance with BS 3505:1986 *Specification for unplasticized polyvinyl chloride (PVC-U) pressure pipes for cold potable water*, and relevant parts of IS EN ISO 1452-1:2009 *Plastic piping systems for water supply and for buried and above ground drainage and sewerage under pressure – Unplasticized polyvinyl chloride (PVC-U) – General*.

4.1 ENVIRONMENTAL ASSESSMENT

The treated wastewater from a number of working installations has been monitored for 2 years. The test results show that values stated for the parameters listed in Table 3 are consistently achievable over a range of operating conditions.

4.2 STRENGTH

The design and testing of the plant has been assessed as satisfactory. The tanks have adequate resistance to handling stresses and the loads applied by ground pressure and internal liquid loads.

The cover is designed for occasional pedestrian traffic. It must not be subject to traffic from vehicles or livestock.

4.3 WATER PENETRATION

The plant and tank with its pipe connections when correctly installed will not allow seepage either into or from the surrounding soil.

4.4 DURABILITY

The system (excepting pumps) when installed, used and maintained in accordance with the requirements of this Certificate, will have a life in excess of 30 years.

4.5 CLEANING AND MAINTENANCE

All bioCycle™ units require twice yearly maintenance. The Certificate holder operates a maintenance system to clean the tank components, check system operation and replenish chlorine tablets where appropriate. As part of routine maintenance the owner will be notified of any desludging requirements which should be carried out in accordance with manufacturer's instructions. At maximum the frequency of desludging will be once per annum. All maintenance inspections are recorded and notified to the local authority by bioCycle™ Ltd.

4.6 SAFETY

4.6.1 Safety of Personnel

The bioCycle™ plant is installed below ground level and all covers are securely fixed to prevent unauthorised access. Ventilation is provided through the soil pipe and, where necessary, via the manhole cover.

4.6.2 Safety of System

The bioCycle™ Wastewater Treatment System has three alarms and provides for an air space or free board capacity that is capable of accepting not less than an additional 2600 litres should the irrigation pump fails. This gives two to three days capacity in the average household, prior to the system overflowing.

4.7 TESTS AND ASSESSMENTS WERE CARRIED OUT TO DETERMINE THE FOLLOWING:

- Watertightness;
- Strength of cover and frame assemblies;
- Strength integrity and fibre content of concrete tanks;
- Hydrostatic assessment of the design of complete tanks for internal and external pressure loading;
- Quality of treated wastewater.

4.8 OTHER INVESTIGATIONS

(i) Existing data on product properties in relation to fire, toxicity, environmental impact and the effect on mechanical strength/stability and durability were assessed.

(ii) The manufacturing process was examined including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.

(iii) Site visits were conducted to assess the practicability of installation and the history of performance in use of the product.

(iv) A user survey and visits to established sites were conducted to evaluate performance in use.

(v) No failures of the product in use have been reported to NSAI Agrément.

4.9 CE MARKING

The manufacturer has taken responsibility of CE marking the bioCycle™ Wastewater Treatment System in accordance with harmonised European Standard IS EN 12566-3:2005 + A2:2013. An asterisk (*) appearing in this Certificate indicates that data shown is an essential characteristic of the product and declared in the manufacturers Declaration of Performance (DoP). Reference should be made to the latest version of the manufacturer's DoP for current information on any essential characteristics declared by the manufacturer.

Figure 12: Installed Biocycle Unit

Part Five / Conditions of Certification 5

5.1 National Standards Authority of Ireland ("NSAI") following consultation with NSAI Agrément has assessed the performance and method of installation of the product/process and the quality of the materials used in its manufacture and certifies the product/process to be fit for the use for which it is certified provided that it is manufactured, installed, used and maintained in accordance with the descriptions and specifications set out in this Certificate and in accordance with the manufacturer's instructions and usual trade practice. This Certificate shall remain valid for five years from date of issue so long as:

(a) the specification of the product is unchanged.

(b) the Building Regulations 1997 to 2017 and any other regulation or standard applicable to the product/process, its use or installation remains unchanged.

(c) the product continues to be assessed for the quality of its manufacture and marking by NSAI.

(d) no new information becomes available which in the opinion of the NSAI, would preclude the granting of the Certificate.

(e) the product or process continues to be manufactured, installed, used and maintained in accordance with the description, specifications and safety recommendations set out in this certificate.

(f) the registration and/or surveillance fees due to NSAI are paid.

5.2 The NSAI Agrément mark and certification number may only be used on or in relation to product/processes in respect of which a valid Certificate exists. If the Certificate becomes invalid the Certificate holder must not use the NSAI Agrément mark and certification number and must remove them from the products already marked.

5.3 In granting Certification, the NSAI makes no representation as to;

(a) the absence or presence of patent rights subsisting in the product/process; or

(b) the legal right of the Certificate holder to market, install or maintain the product/process; or

(c) whether individual products have been manufactured or installed by the Certificate holder in accordance with the descriptions and specifications set out in this Certificate.

5.4 This Certificate does not comprise installation instructions and does not replace the manufacturer's directions or any professional or trade advice relating to use and installation which may be appropriate.

5.5 Any recommendations contained in this Certificate relating to the safe use of the certified product/process are preconditions to the validity of the Certificate. However the NSAI does not certify that the manufacture or installation of the certified product or process in accordance with the descriptions and specifications set out in this Certificate will satisfy the requirements of the Safety, Health and Welfare at Work Act 2005, or of any other current or future common law duty

of care owed by the manufacturer or by the Certificate holder.

5.6 The NSAI is not responsible to any person or body for loss or damage including personal injury arising as a direct or indirect result of the use of this product or process.

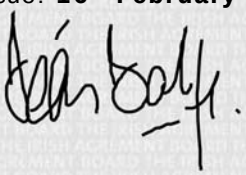
5.7 Where reference is made in this Certificate to any Act of the Oireachtas, Regulation made thereunder, Statutory Instrument, Code of Practice, National Standards, manufacturer's instructions, or similar publication, it shall be construed as reference to such publication in the form in which it is in force at the date of this Certification.

NSAI Agrément

This Certificate No. **96/0033** is accordingly granted by the NSAI to **bioCycle™ Ltd** on behalf of NSAI Agrément.

Date of Issue: **16th February 1996**

Signed



Seán Balfe
Director of NSAI Agrément

Readers may check that the status of this Certificate has not changed by contacting NSAI Agrément , NSAI, 1 Swift Square, Northwood, Santry, Dublin 9, Ireland. Telephone: (01) 807 3800. Fax: (01) 807 3842. www.nsai.ie

Revisions: 4th January 2018

- References to Building Regulations and standards updated, product specification updated to reflect manufacturer's DoP.