

A Householder's Guide To Sustainable Drainage (SuDS)

Managing rainfall more
naturally in South Dublin



Comhairle Contae
Átha Cliath Theas
South Dublin County Council

Foreward

Whenever it rains all the water that runs of the surface has to go somewhere. Continual development and addition of patios and driveways to our homes increases the amount of water that enters local sewers, drains and watercourses. This additional runoff increases the effects of flooding, which is compounded by climate change as the big rainfall storms are becoming ever more frequent.

Integrating SuDS features such as rain gardens into your home can help catch rainwater, allowing you to play an active part in making South Dublin more climate resilient. Green roofs, rain gardens and rain planters can be a haven for wildlife, providing essential habitat for

butterflies, bees and birds; whilst also being an attractive feature for you to enjoy. Other SuDS features will aide with providing irrigation or removing pollution.

This 'easy to use' guidance provides useful advice when thinking about what types of SuDS features might be appropriate in your home setting and outlines key considerations before you start.

This guide draws upon the author's 25 years of practical experience in the application of SuDS. The authors would like to acknowledge the contributions from South Dublin County Council's Environment, Water and Climate Change Department.



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Disclaimer

This publication is designed to be a useful guide for property owners who want to install SuDS within the curtilage of their properties. It is available with the understanding that neither the authors nor South Dublin County Council is thereby engaged in rendering specific design advice or any other professional service. While every effort has been made to ensure the accuracy and completeness of the publication, no warranty or fitness is provided or implied, and the authors and South Dublin County Council shall have neither liability nor responsibility to any person or entity with respect to any loss or damage arising from its use.

What are SuDS?

Sustainable Drainage Systems (SuDS) are a new way that we can manage rainfall in our landscape and community.

Rainfall that used to be collected in gully pots and pipes under the ground can now be managed more naturally in the landscape to mimic the way water behaves in nature.

Learning from nature

Sustainable Drainage Systems (SuDS) deal with rainwater in a different way to conventional drainage by mimicking the way nature manages rainfall.

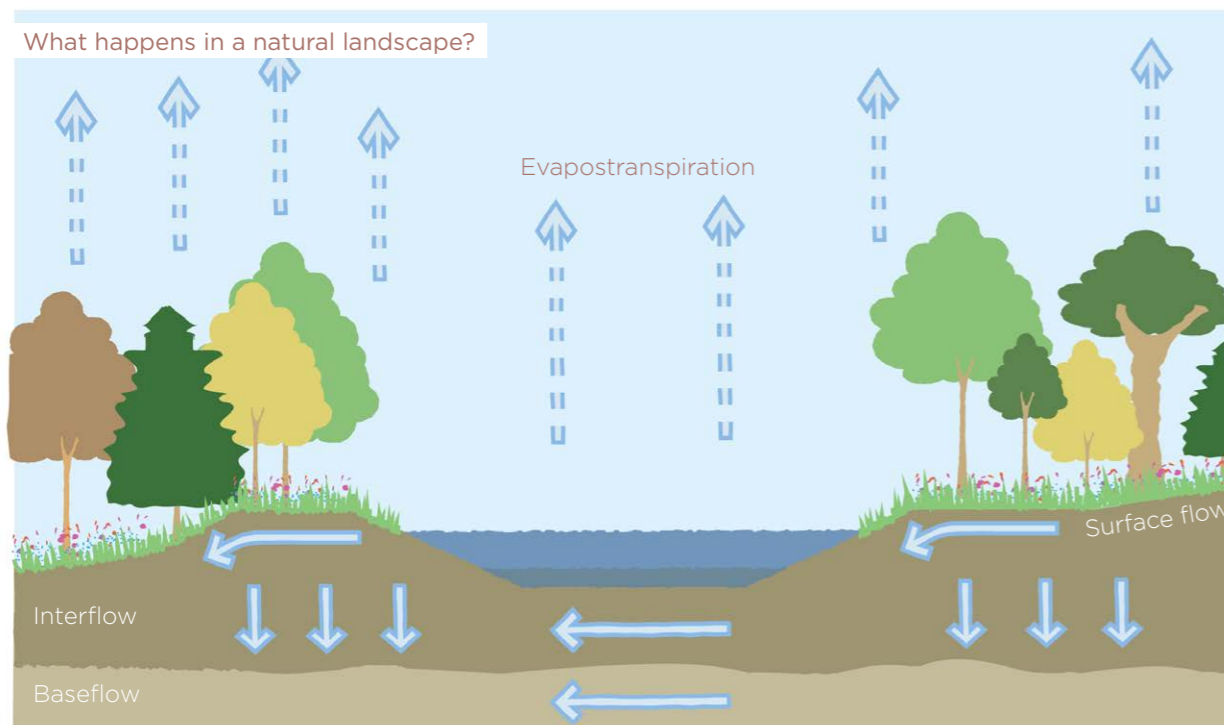
SuDS take inspiration from natural features and processes like the uptake of water by plants, soil infiltration, pools, ponds, marshes, wetlands, springs, streams and rivers.

SuDS work by holding rainwater back, treating pollution and releasing it slowly without overwhelming the watercourse or sewer system into which it flows.

These short videos explain in simple terms what SuDS are all about.

[‘Ever wondered where the rain goes?’](#)

[‘SuDS - Lets get nibbling’](#)



Why does South Dublin need SuDS?

It is becoming ever more apparent that the way that we have been used to dealing with rainfall has been building up problems both now and for future generations. Collecting rainfall in pipes and channels and quickly discharging into the drainage system has the following impacts:

- Quickly carrying rainwater away from where it falls can increase the risk of flooding elsewhere in our communities and neighbourhoods.
- Limited pipe capacity of historic drainage networks can cause local flooding as rainfall has nowhere to go.
- Pollution from roofs, roads and car parks is washed into the sewer when it rains, contaminating our local streams and rivers and adversely affecting wildlife.
- Wildlife is often trapped and killed by conventional drainage structures.

As traditional piped drainage systems serves much of the development across South Dublin, it is difficult to revert the issues that have built up using strategic infrastructure.

However, householders and property owners can help by installing SuDS around the home.

By using SuDS we can capture and clean rainfall, releasing it slowly into the drainage network, helping to alleviate many of the issues that we currently face.



People are connected with natural water cycle



Clean water flow supports wildlife



Reduce the effects of flooding from drains and rivers



Create more climate resilience



Introducing SuDS to your home/property

Living with SuDS will be a new experience for many of us because we are used to rainfall once it is collected in a gutter pipe being out of sight and therefore out of mind.

The most common concern, particularly of parents, is how we live with open water in the landscape.

Thankfully, SuDS provides safe places where we can enjoy the delights water brings to our lives.

Instead of rain disappearing down a hole in the ground, it will flow at or near the surface, from one SuDS feature to the next, creating beautiful places for people and opportunities for wildlife.

Don't worry!

- SuDS features should contain clean water at shallow depths when it rains and raingardens for example should be dry most of the time.
- The water should be visible to everyone and, if unsupervised toddlers are likely, have a low 'toddler-proof fence' around that older children and adults can step over easily.

Important!

Any SuDS works carried out on a property can only be carried out with the express consent of the property owner.



Images: Our communities will be part of a cleaner, healthier and safer water environment.

SuDS Techniques

The simplest way to store water in the landscape is to use shallow depressions in the ground such as raingardens, that mimic the natural temporary pools, ponds and wetlands that used to be so common in the Irish countryside. There are a range of SuDS Techniques which are suitable for application around the home and as part of residential developments.

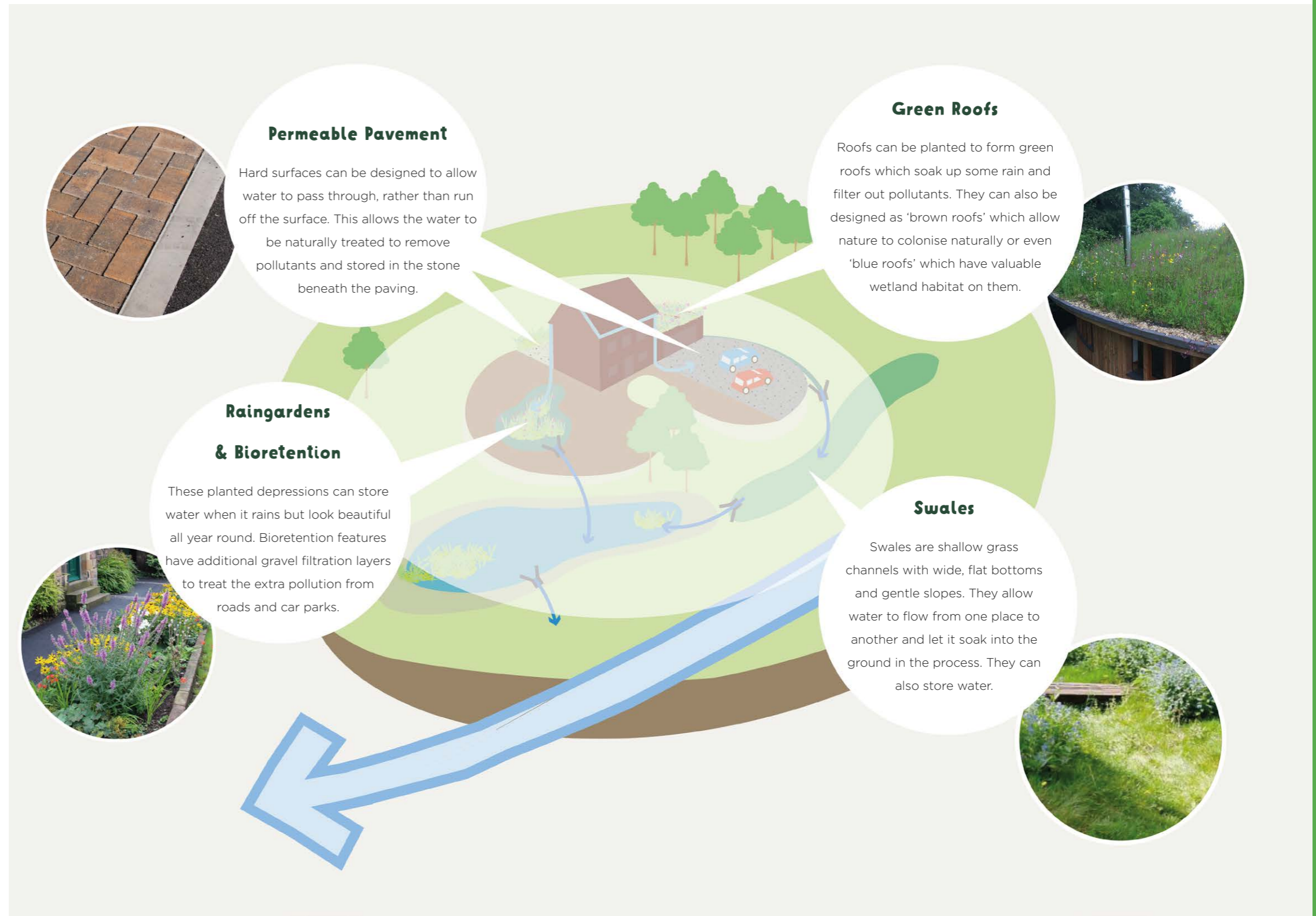


Image: This graphic illustrates how some of the SuDS Techniques can be designed into your home or property.

Water butt (Rain harvesting)

Rain harvesting systems come in a variety of forms, ranging from simple water butts, to larger more complex systems (with underground tank collection systems, filters, throttles, valves and pump). Rainwater from roofs can be stored and used for:

- Garden watering (water butt)
- Car washing (water butt)
- Toilet flushing (requires specialist plumbing and it is advised to speak with a specialist supplier)

[How to build a Rain Barrel](#)



Image: water butt used for harvesting rainwater

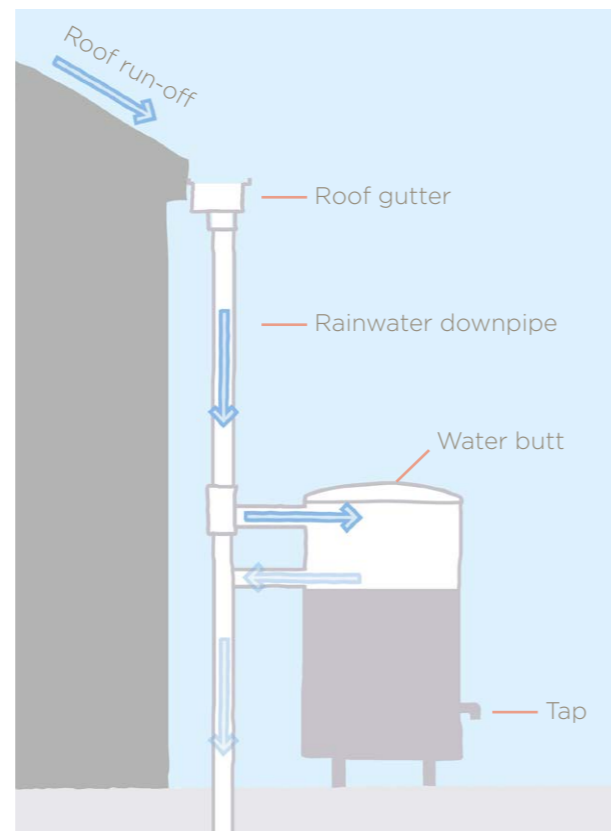


Image: typical water butt arrangement

Raingarden Planters

A raingarden planter box serves a couple of purposes. It acts like a small raingarden. It also makes the area around a downspout more attractive. One, the other, or both are great reasons to create a downspout container garden with the right native plants.

The container should have drainage holes in the bottom and on the sides or near the top for overflow. Next comes a layer of gravel and on top of that goes a soil mix designed for a rain garden, usually with some sand in it. It's better to use plants suitable for a lot of rainwater.

[Downspout Garden Planters - Plant A Rain Gutter Container Garden](#)

Here are some ideas for constructing a downspout garden with these essentials in mind:

- Use an old wine barrel to create a planter. It allows plenty of room for gravel and drainage soil.
- Build a container of your own design using scrap wood.
- You can also get creative and grow veggies in a downspout planting bed. Just be sure to provide adequate drainage for this type of garden.

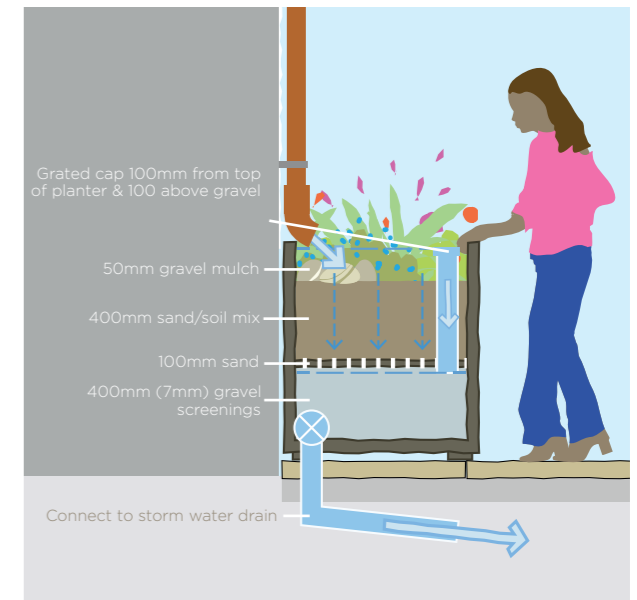


Image: typical raingarden planter profile



Images: examples of raingarden planters

De-paving

It is clear that paved front gardens are contributing to surface water flooding,

Paving slabs can be lifted which opens up the ground and allows rainfall to slowly soak into the ground.

You don't have to remove all of the paving and proportion can be retained so that you can still park your car!

Case Study

At this residential property two strips of paving were removed to reintroduce an area for gardening.



The underlying materials were removed to a depth of 400mm below the existing ground level.

The strip located between the car tyres was filled with broken up slabs and pea gravel.

The other strip was filled with 100mm of pea gravel and then filled to existing surface with topsoil.

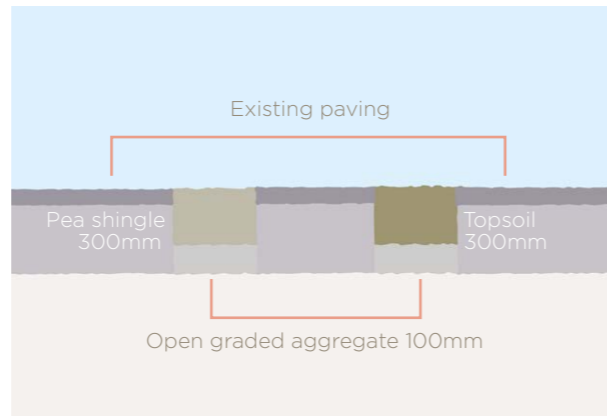


Image: De-paving construction detail



Image: example of de-paving

Important!

Be careful when lifting heavy paving slabs - use the right tools and protective clothing such as steel toe-capped footwear, protective glasses and gloves.

Green roof

A green roof is a roof onto which vegetation is grown, or habitats for wildlife are established.



Image: green roof installed on a gently sloping roof

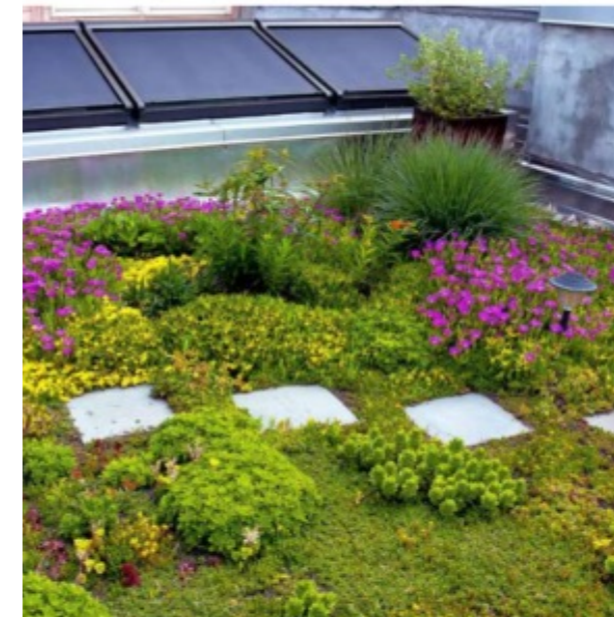


Image: green roof can provide a garden aesthetic to be enjoyed throughout the year



Image: creative and attractive use of pebbles

A combination of planting and a drainage layer below is found covering some new buildings as a Green Roof although the idea is very old having been used in Northern Europe as a turf roof in many countries including Ireland.

Useful Signposts

[Advice on Green Roofs](#)

[DIY Green Roof with Flowering Alpine Plants and Sedums](#)

[How to fit a green roof to a garden shed](#)

['We need to talk about Green Roofs'](#)

Important!

You need to check that the roof is structurally sound and can carry the weight of the green roof. A structural designer will be able to advise you on this.

Raingarden

Raingardens were inspired by the natural depressions in American woodlands that filled with water during rain but dried out in a matter of hours as water soaked into the ground.

Raingardens have become common in other parts of the world as they give home owners the chance to create an attractive garden feature that reduces the impact of runoff on surrounding streams and local piped drainage networks, benefiting the local community, whilst creating an attractive space in the garden.

Raingardens are usually used where water can soak naturally into the ground but can be under-drained where soil is not free draining to create a similar garden feature. The raingarden can be gardened by the home-owner or resident group (if it forms part of a shared space) and can take on any character as long as water soaks into the ground and there is an overflow when the depression is full.

Useful Signposts

[Information about raingardens](#)

[‘How to Make a Simple Rain Garden to Solve Storm Water Problems’](#)

[‘Designing Rain Gardens: A Practical Guide’](#)

Important!

Where soils are not free draining there should be a connection back to the drain.



Images: downpipe is directed through water butt and then onwards to the raingarden .

You can also take the opportunity to integrate some informal play features into your rain garden such as stepping stones.



Image: playful features within a raingarden

Swales and rill channels

Grass channels with flat bottoms, gentle side slopes and a slight fall along its length are called Swales. The vegetation in the bottom of the swale, which is often grass, but can be wildflower or wetland habitat.

Swales also allow water to soak into the ground. This character can be enhanced by putting a filter drain (stone filled trench), below the top soil layer to create a dry swale.

They are a very useful SuDS technique, where space is available, and can fit easily into most green spaces.

You can also create hard landscape channels which can be planted, which work in the same way as a swale but are more appropriate in areas with more hard surfaces.



Image: example of a planted rill channel



Image: a typical roadside swale

Permeable & grass pavement



Image: permeable paving

A SuDS feature called Permeable Pavement is used where there is a need for a hard surface that can be trafficked by car or foot. The technique is a variation on the old gravel drive that allowed rain to soak into the stone layer below the surface and then into the ground.

Most commonly in Ireland this uses concrete block pavement with gaps between the blocks that are filled with grit to allow water to percolate into crushed stone underneath. Other surfaces can be used such as gravel in a plastic grid or resin bound aggregate. The water is cleaned naturally and can either soak into the ground or flow laterally through the base of the pavement to other SuDS features (or connect to the local drainage network).

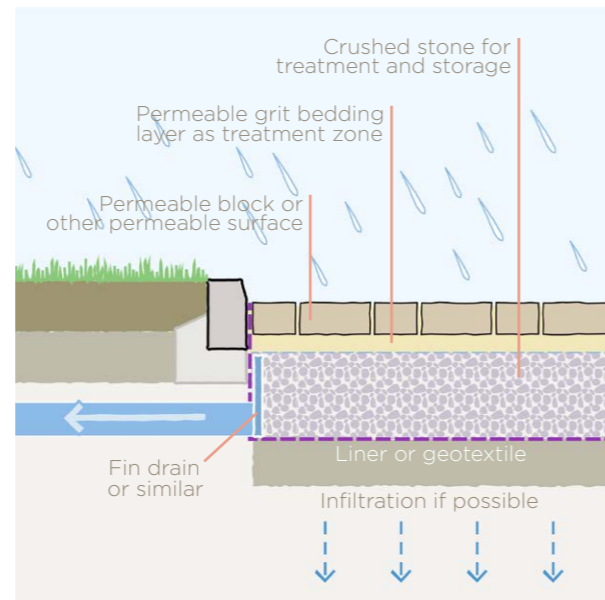


Image: typical construction profile of permeable pavement

Pavement providing for vehicle and pedestrian movements that allows for infiltration of runoff through the surface. The sub-base is porous to allow for conveyance of runoff through it.

Other surfaces can be used such as gravel in a plastic grid or resin bound aggregate.

Useful Signpost

[‘Design & Construction of Concrete Block Permeable Pavements’](#)

Important!

Ensure that the pavement has sufficient depth where it is intended to be used by cars and occasional delivery and removal vehicles.

Case study

This small courtyard rear garden was subject to regular water logging.



Image: water logged courtyard

The top 200mm of soil was removed and a layer of geotextile was placed on the prepared surface with 100mm open graded stone covered with a layer of 6mm grit which had a light compaction with a whacker plate.



Images: stages of construction

The blocks that were used were not permeable (they did not have nibs around the edges to create a space on

each joint). Joint spaces were created with plastic spacers to allow rainfall to pass through the grit filled joints into the stone layer below.

Water in the stone was allowed to soak slowly into the ground.

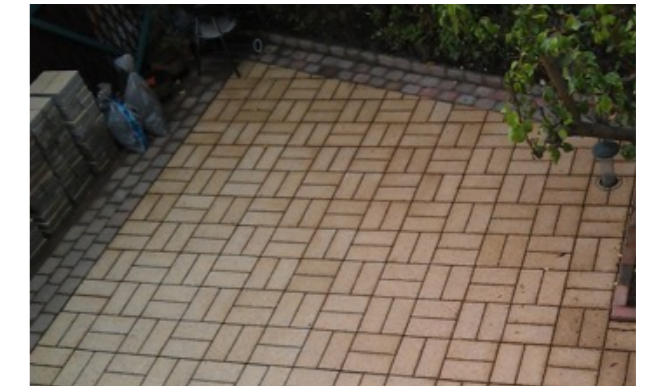


Image: water soaking through the grit filled joints into stone layer below

Grass pavement

As with the concrete block permeable pavement, grass grid or grasscrete can provide a porous surface with a more natural grass finish.

The grass grid or grasscrete is generally laid onto the soil, and provides sufficient structural support that can be trafficked by cars.



Image: permeable grass grid used on a driveway

Infiltration

Many of the SuDS features listed have the potential to release the rainfall that they capture into the ground. This process is called infiltration.

The following sections outline the key things to consider when designing a rain garden using infiltration in proximity to your home.

Other products are available that can be reasonably easily installed. These are commonly referred to as soakaways (where all of the runoff is taken to one small area / structure to be infiltrated). It is recommended that soakaways are located at least 5m from building foundation and 3m from your boundary fence.

The usual approach is to pipe rainwater to a buried plastic 'crate' which is wrapped in a fabric (geotextile).

Note : all infiltration / soakaways rely upon ground conditions which allow rainfall to soak into the ground.

Useful Signposts

[*Irish Housebuild: Percolation Tests*](#)

[*'Soakaways: What are They & How to Build Them'*](#)

[*BRE Digest 365 -Soakaway Design standards*](#)



Image: soakaway being installed



Designing your own raingarden

Hopefully, this guide has inspired you to build your very own raingarden - but where do you start?

Below is some useful step-by-step advice to talk you through the process.

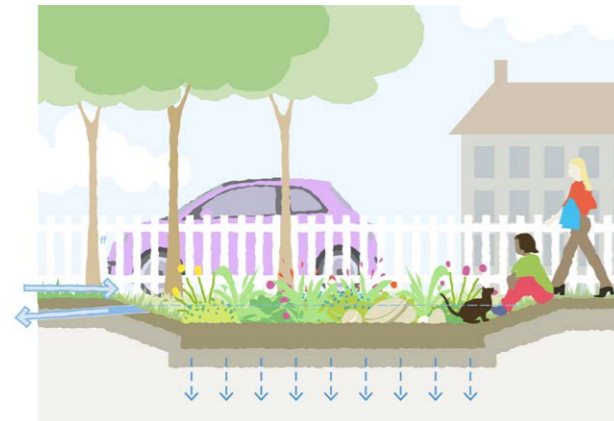
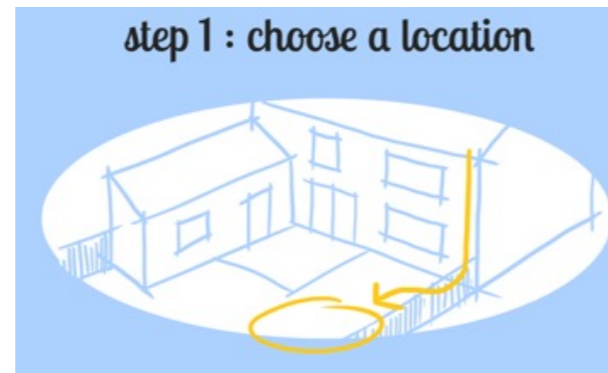


Image: typical raingarden profile



Image: suggested raingarden planting



Pick a place where you can get water from a roof or driveway to your raingarden and where, if it overflows, the water can return to the surface water sewer or a natural watercourse and not into your house or a neighbour's property.

The location should have enough space for your raingarden and you may want to think about how the raingarden will affect the design and functionality of your existing garden.

It is recommended that rain gardens are situated at least 3m (10 feet) from any building and if your property is situated in an area with chalk or other material that could be adversely affected by localised increases in the flow of ground water you should contact your local authority Building Control Officer for advice.

If the rain garden is situated on clay, then separation distance is less of an issue, but be sure to provide an overflow.



Dig a hole around 500-600mm square and around 250-300mm deep. Make a note of how deep it is.

Have a few buckets or containers with water in then fill the hole in one go.

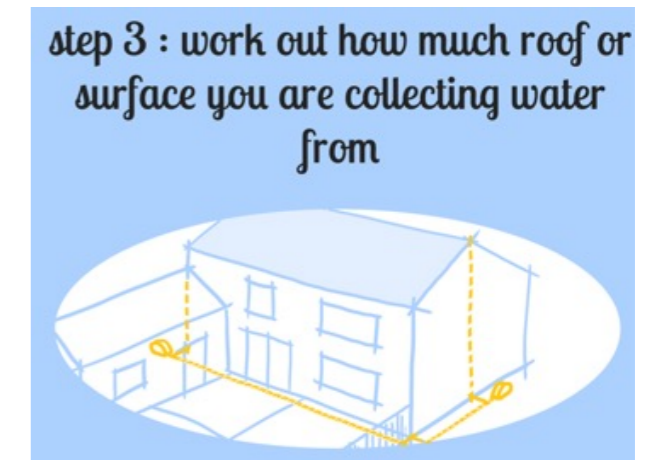
Wait for the water to soak away.

Fill the hole again in one go and then time how long the water takes to soak away - it could take minutes and often hours.

Divide the depth (in mm) of water when you filled it by the number of hours it took to drain down to find your infiltration rate. For example 300mm depth of water draining down in 2.5 hours = 120mm per hour infiltration ($300 \div 2.5 = 120$).

If your garden infiltrates at a rate of 50mm per hour or more, it is ideal for a raingarden.

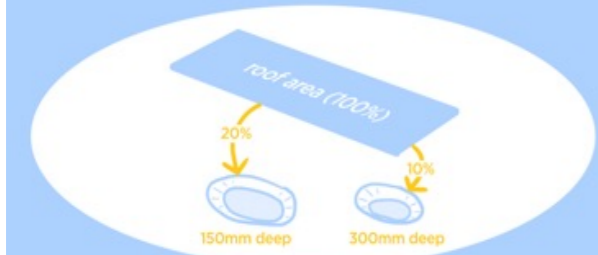
Slower than 50mm per hour? You can still build a raingarden but you may want to include a device to allow it to drain down slowly so that you don't have a 'bog garden'!



Work out which downpipes you can disconnect and divert or which areas of hard surfacing you can direct to your proposed raingarden location.

Roughly work out how many square metres each roof or hard surface you can connect to the raingarden is. Do this by measuring how wide and long the roof or area is in plan (not measuring the diagonal length of the roof) and multiply them together. You can measure this on the ground - no need to climb up on the roof! For example, one slope of a typical terrace roof may be around 5m x 6m. Therefore the roof area is 30m ($5 \times 6 = 30$).

step 4 : work out the size of your raingarden



Work out which downpipes you can disconnect and divert or which areas of hard surfacing you can direct to your proposed raingarden location.

Roughly work out how many square metres each roof or hard surface you can connect to the raingarden is. Do this by measuring how wide and long the roof or area is in plan (not measuring the diagonal length of the roof) and multiply them together. You can measure this on the ground - no need to climb up on the roof! For example, one slope of a typical terrace roof may be around 5m x 6m. Therefore the roof area is 30m² (5 x 6 = 30).



Image: recently planted tree and rain garden redesigned around the underground services

step 5 : design your raingarden



The ideal size for your raingarden will depend upon how deep you want it to be:

A 150mm deep raingarden would ideally be around 20% of the area of the roof or hard surface feeding it. For our 30m² roof example earlier, this would be 6m² (or around 3m long and 2m wide).

A 300mm deep raingarden would be around 10% of the area of the surface feeding it - 3m² for our example roof.

There is no harm in your raingarden being bigger if you have the space - it will work even harder to reduce flooding - and if you don't have enough space to achieve the recommended area for your roof or hard surface, don't let it put you off as anything is better than nothing!

Now you know how big it needs to be you can decide on the overall shape and character of your raingarden and the types of plants you would like to grow in it. Raingardens are actually dry much of the time and so most garden plants are suitable - we recommend not using silver-leaved plants as these tend not to like being soaked for periods of time.

A raingarden can be dug into the ground or formed in a raised bed - or somewhere

between the two. Having a slightly raised raingarden can reduce the amount of digging you need to do and can make overflowing back to the sewer easier because you have some height to make the water flow downhill to where you want it.

You can use a pipe or surface channel to take overflow from the raingarden to a stream or the surface water sewer - the easiest might be back to where the rainwater pipe used to run underground or to a nearby yard gully.

If you had an infiltration rate below 50mm per hour it is advisable to think about a way of allowing the raingarden to drain down slowly. A pipe with a cap on the end, with a 15mm hole drilled in the cap, buried in the base of the raingarden with gravel protecting the hole from blocking and the other end connected back to the surface water sewer or to a stream will do this and still help reduce flooding.



Image: an unlined raingarden within 5m of a building

Important!

Installing an unlined rain garden or permeable pavement within 5m of a building foundation - check if soils such as chalk or running sands are present. This will not be the case for the vast majority of South Dublin.

SuDS Upkeep

Like your roof gutters and lawn, SuDS will require some upkeep (maintenance) from time to time to ensure that they continue to perform and look well.

The type of upkeep for most SuDS features is the same as the types of activities that you are most likely already undertaking in your garden.

The table below identifies the types of maintenance activities that you would normally expect.

Suggested Maintenance Schedule

Suds Technique	Task	Frequency
Water Butt	Check/clean Inlets/Outlets	Annually
Raingarden Planter	Watering	Weekly during dry periods
	Weeding, Litter Picking, Pruning/Trimming, Check/clean outlets	3-monthly
<i>Following Establishment Period (Year 3 onwards)</i>	Weeding, Litter Picking, Pruning/Trimming, Check/clean outlets	6-monthly
	Re-planting	Annually or as required
De-paving	Weeding, Litter Picking	Annually or as required
Green Roof	Watering	Weekly during dry periods
	Weeding, Litter Picking, Check/clean outlets	3-monthly
<i>Following Establishment Period (Year 3 onwards)</i>	Weeding, Litter Picking, Check/clean outlets	6-monthly
	Re-planting	Annually or as required

Important! Make sure that you undertake a Risk Assessment on your roof beforehand to ensure your own safety.

Suds Technique	Task	Frequency
Raingarden	Watering	Weekly during dry periods
	Weeding, Litter Picking, Pruning/Trimming, Check/clean outlets	3-monthly
<i>Following Establishment Period (Year 3 onwards)</i>	Weeding, Litter Picking, Pruning/Trimming, Check/clean outlets	6-monthly
	Re-planting	Annually or as required
Swales	Litter Picking, Check/clean outlets	3-monthly
	Mowing (grass)	Monthly during summer months
<i>Following Establishment Period (Year 3 onwards)</i>	Mowing (wildflower meadow)	Annually in September
	Wildflower meadow: Strim to 100mm	3-year rotation
Rill Channels	Watering	Weekly during dry periods
	Weeding, Litter Picking, Pruning/Trimming, Check/clean outlets	3-monthly
<i>Following Establishment Period (Year 3 onwards)</i>	Weeding, Litter Picking, Pruning/Trimming, Check/clean outlets	6-monthly
	Re-planting	Annually or as required
Permeable & grass pavement	Weeding, Litter Picking, Sweeping	Monthly
<i>Following Establishment Period (Year 3 onwards)</i>	Weeding, Litter Picking, Sweeping	6-monthly
	Sweep & Suction brushing	Annually or as required
Infiltration	Check/clean Inlets/Outlets	Annually or as required

Glossary

Attenuation storage	Volume used to store runoff during extreme rainfall events attenuating flows by limiting flow rates out of it. Comes into use once the inflow is greater than the controlled outflow.
Biodiversity	The diversity of plant and animal life in a particular habitat.
Climate change	Climate change refers to any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer).
Conventional drainage	The traditional method of draining surface water using gully pots and subsurface pipes.
Conveyance	Movement of water from one location to another.
Diffuse pollution	Pollution arising from land-use activities (urban and rural) that are dispersed across a catchment, and do not arise as a 'point' pollution load at a single identifiable location
Evapotranspiration	Evapotranspiration is the sum of evaporation and plant transpiration from the surface to the atmosphere.
Greenfield runoff	The runoff that would occur in its undeveloped and undisturbed state.
Infiltration (to the ground)	The passage of rainfall runoff into the ground.
Interception storage / losses	The capture of the first 5mm of rainfall from the majority of rainfall events which is prevented from leaving the site as runoff.
Porosity	The percentage of a material, substance or structure that is occupied by voids, whether isolated or connected.
Return period	An estimate of the likelihood of an event. For example a 1 in 100 year return period has a 1% likelihood of occurrence within any particular year. Also referred to as Annual Exceedance Probability (AEP)
Source control	The control of rainfall runoff at or near its source.





Comhairle Contae
Átha Cliath Theas
South Dublin County Council