

Infiltration raingarden

Constructing an infiltration raingarden at a lot scale

Acknowledgement – the information in this fact sheet has been adapted from the practice notes prepared by Storm Consulting for the Little Stringy Bark Creek Project. For more information on this project please visit the project website - <u>http://www.urbanstreams.unimelb.edu.au/</u>

What is an infiltration raingarden?

Building a raingarden is a simple way to help the environment and the health of our local waterways while providing a selfwatering garden for your backyard. An infiltration raingarden is essentially a depression in a garden which allows water to soak into the ground.

The raingarden is filled with a sandy loam soil and can have an underlying gravel trench. This gravel trench is particularly useful for clay soils as it allows more stormwater to be stored, allowing it to slowly infiltrate into the ground and be used by the plants as they need it.

An infiltration raingarden helps protect our streams and rivers by replenishing groundwater and reducing stormwater. An infiltration raingarden can be shaped to suit the surrounding area and can be curved, oval, circular or simply rectangular.

A rectangle shape is often the simplest and cheapest to construct. It can be landscaped to suit the surrounding garden and include special features such as rocks and feature plants.



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Figure 1. An infiltration raingarden

Infiltration raingardens are most effective in areas with sandy soils, however they should not be built too close to permanent structures (i.e. house, garage or shed) as the infiltration of water into the surrounding soils may affect building foundations.

Please note: A certified plumber must be used for stormwater connections and modifications.



Building your raingarden

Step 1- Getting Started

Location

While it is best to build your raingarden as close as possible to a water source such as a downpipe, rainwater tank overflow, paving or driveway, an infiltration raingarden should be positioned at least five metres away from any permanent structure (i.e. house, garage or shed). If you plan to build your raingarden within five metres of a permanent structure, it is recommended that a PVC liner be used on the vertical side of the trench closest to the structure. You should also avoid building an infiltration raingarden on a steep site, unless it is designed appropriately.

Size

Your raingarden can vary in size – but generally the larger the hard surface it is treating the larger the raingarden will need to be. If your raingarden is going to capture run-off from the roof via a downpipe, determine the area of your roof that drains to that downpipe. If your raingarden is only going to treat overflows from a rainwater tank then it can be significantly small. Table 1 will help you work out the correct size. The raingarden needs to be at least 1m wide.

Soil Type

Areas with high groundwater tables should be carefully considered. While it is unlikely that you will encounter high groundwater, if water appears in the trench during excavation you should either consider reducing the depth of the raingarden or consult a landscape designer.

	Area of raingarden required (m²)	
Impervious Area (m ²)	3000L tank connected to toilet, overflow to raingarden	Raingarden (with no tank)
10	1	1
50	1	2
100	1	4
150	2	5
200	3	5
250	4	6
300	-	7
350	-	9
400	-	11
450	-	13

Table 1. Raingarden size (m²) for various impervious areas and configurations

It takes longer for water to infiltrate in clay soils than sandy soils. If you have clay soils, ensure your raingarden is appropriately sized. If you're unsure or concerned about groundwater, you can dig a small hole to the same depth as your raingarden and leave it open for a few days to see if it fills with water. This is best done with an auger, however a small spade will also work.

If the hole fills with water then this is most likely groundwater. Groundwater levels can fluctuate, therefore, you may consider adjusting the depth of your raingarden so that the base is slightly above the groundwater level, or consider moving the raingarden to a higher location.

Handy Hint – Water infiltration into soils near permanent structures can cause the ground to shrink/swell which can cause cracking, subsidence or foundation failure. This can be avoided by locating your infiltration raingarden at least five meters away from any permanent structure or by using builder's plastic.





Underground Services

Be aware of any underground services (gas, electricity, water) that run near your house or under your garden as this may determine where you can build your trench. To locate services on your property, visit Dial Before You Dig, at <u>www.1100.com.au</u> or call 1100. If your property is serviced by a septic system, you may need a licensed plumber to determine its location. Infiltration trenches should not be built over or in close proximity to a septic system.

Materials and tools

Having all your equipment ready will make building the raingarden easier. The following tools are recommended for building a raingarden:

- Tape measure
- Shovels
- Rakes
- Spirit level
- Wood stakes
- String
- Small backhoe with caterpillar treads (optional)

Make sure you have your fill materials ready at hand before you begin construction. A materials list has been provided below in Table 2. Quantities shown are for a 2m infiltration raingarden. While item prices may vary depending on the materials you select, building a 2m raingarden is likely to cost between \$350 and \$450, plus the cost of a plumber.



Material	Quantity
7mm screenings	0.2 m ²
20mm drainage scoria	0.8m ³
Loamy sand (white, washed)	0.48m ³
Topsoil	0.12m ³
Plants (150mm pots)	12
Gravel mulch	0.1m ³
90mm diameter uPVC 90° bend <i>or</i> 2 x 45° bends	1
90mm diameter uPVC extension*	1
90mm diameter uPVC grated end cap	1
90mm diamter uPVC pipe**	1 l/m
20mm fine crushed rock***	0.05m ³
Large flat rocks (100-200mm diameter)***	1m ²
Builder's plastic (under rockwork near downpipe)***	1m ²

Table 2. Material list for building an infiltration raingarden. Please note quantities shown are for a 2m² raingarden

Note: *l/m= linear metres m²= square metres m³= cubic metres mm= millimetres* *Length subject to change depending on distance from house **Length subject to change based on

location of existing stormwater pipe ***Quantity will vary depended on chute length and downpipe arrangement

Figure 1. Rainwater tank with overflow to raingarden





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Stormwater reconnection

Your infiltration raingarden should be constructed with an overflow pipe so that any excess water can drain from the raingarden back to the stormwater pipe. While the overflow can be positioned anywhere within the raingarden, it is best to locate it as close as possible to the existing underground stormwater pipes. This will minimise the additional pipework needed to reconnect the overflow back into the drainage system. The overflow pipe needs to sit 100-200mm above the top of the surface of the raingarden (i.e.gravel mulch or soil), and be almost the same level as the adjacent ground surface. The overflow will pipe excess water from the raingarden back into the existing stormwater system. A licensed plumber will need to undertake the stormwater connection work to ensure that pipes are reconnecting into the property's stormwater and not another service such as the sewer.

Step 2 - Excavation and Pipe Infrastructure

- A licensed plumber should determine how and when to disconnect your downpipe to ensure that the area is not flooded during construction. A temporary diversion may be required.
- Make sure you have all your tools and equipment ready, including your fill materials.
- Once you have determined the location and size of your infiltration raingarden lay out the garden using stakes and string. This will help you dig your raingarden and ensure it looks good and is level.

Handy Hint: If you are building a raingarden into an existing lawn, digging time can be reduced by killing the grass first. Place black plastic over the lawn until the grass dies.



Figure 2. Infiltration raingarden excavation front view

- Excavate the trench and batters as depicted in figures 2 and 3 below. Generally your raingarden can be dug out using shovels and some manual labour. However, depending on the size of the raingarden and the soil type, an excavator may be required.
- Ensure that the base of the trench is level and free of loose material.
- To assist with directing the water from the downpipe into the trench, excavate a smaller depression (chute) between the pipe end and the trench. Alternatively, the downpipe can be extended to discharge water directly into the trench.
- If your trench is positioned less than five metres away from a permanent structure, you will need to line the vertical side of the trench closest to that structure with builder's plastic. To do this, place the builder's plastic on the vertical face. Ensure that each new piece of liner overlaps by 200mm. Seal the joins with duct tape.
- If the water from the downpipe is to flow over rocks, you may also place a PVC liner underneath the rockwork and at the interface between the rockwork and raingarden. This will minimise the risk of erosion.
- For the overflow, engage a plumber to install a vertical 90mm diameter overflow pipe outlet near the connection back into the existing stormwater pipes. The top of the overflow pipe outlet should be 100-200mm above the top or the surface of the raingarden (i.e gravel mulch or soil) and be almost the same level as the



ground surface.

- A temporary end cap on top of the overflow will prevent materials from dropping into the pipe while constructing your raingarden.
- Your plumber will then connect the raingarden overflow back into the existing stormwater system on the property.



Figure 3. Infiltration raingarden excavation side view

Did you know the legal Approved Point of Discharge (APD) is the point at which your property discharges to stormwater? This point is specified by council and should not be altered without council approval. It is also known as the Legal Point of Discharge (LPD).

Step 3 – Soil layers and rock work

Within the raingarden, there are different soil layers. The surface loamy sand layer provides a firm base for plants to grow in, and allows water to infiltrate into deeper layers at a controlled rate. The coarser particles of the deep layers have more space between the particles to allow more storage of water, and their surface allows biofilms to grow, which remove pollutants from the water.

Choosing the right type of soil for each layer is very important, to ensure that the raingarden will work properly;

- Drainage scoria add 20mm diameter drainage scoria to a depth of 300mm to 400mm in the base of your trench.
- Place 7mm diameter screenings over the top of the scoria to ensure that the sand does not migrate into the scoria layers.
- Sand layer place 300mm of sand or sandy loam over the screenings. Sandy loam consists of four parts sand (white washed) to one part loam topsoil. If needed, this mixture can be combined once added to the trench.
- Add 20mm finely crushed rock (FCR) to a depth of 50mm over the PVC lining in the chute.
- Place some large, flat, angular rocks in the chute area. Place smaller rocks in between the large rocks to fill any gaps. This will create a good interlock between the large and small rocks. It is very important to fill any gaps in the rockwork, as voids can lead to erosion problems. Alternatively, a flow spreading device can be fitted to the downpipe

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Shown below are examples of typical soils used for infiltration raingardens. These include drainage scoria (left), 7mm screenings (middle) and sand or sand loam (right).



Figure 4. Soils used for infiltration rangardens. From left to right: Scoria, screenings, loamy sand



Figure 5. Infiltration raingarden side view

Step 4- Pipe adjustments, plants and gravel mulch

Pipe adjustments

Your plumber will redirect the downpipe into the trench using pipe bends where required. Two 45 degree pipes connected together will provide a much gentler and more even flow of water and reduce the risk of erosion. A 90 degree elbow pipe will do as an alternative.

Plants

In general, plants that will grow well in a raingarden:

- can tolerate dry conditions and temporary wet periods .
- are perennial rather than annual
- have an extensive fibrous root system. •

A wide range of plants are suitable for raingardens and your local nursery will be able to guide you on what is right for your area.

There are also particular plants that are effective at removing pollutants from stormwater. These include:

- Carex appressa •
- Lomandra longifolia •
- Juncus flavidus
- Melaleuca ericifolia •
- Goodenia ovata





Figure 6. Raingarden plants. Top to bottom: Carex appressa, Lomandra longifolia, Carex appressa



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50-100% of your raingarden should be planted with the above species, up to 50% can be made up of plants that like a dry environment with periodic wet periods. It is important that the plants you select are suitable for the amount of sun and shade your raingarden receives. See the Plant List for a range of suitable raingarden plants It is important to plant densely with ground cover species to fill the raingarden. It is recommended that you use 6 plants per m². So for a 2m² raingarden, you will need 12 plants.

Tip – Did you know that you can plant trees in your raingarden? Melaleucas are an excellent native species choice and while the plants are establishing, if it doesn't rain, water your plants in compliance with your local water restrictions.





Figure 7. Established infiltration raingarden with Carex appressa

Gravel mulch (optional)

Gravel mulch is an optional additional layer you can add to your raingarden. Adding mulch provides a range of benefits, including weed control. However, it can prevent the spread of plants and as such; your raingarden may take longer to mature. Also, it is very important to ensure that you only use washed gravel mulch, as the fine dust on unwashed gravel mulch can clog pipes and the space between sand particles. Note - traditional wood chip mulch is not recommended to use within a raingarden. If you choose to add gravel mulch:

- Spread gravel mulch to a depth of 50mm around the base of the plants. .
- Once mulching and planting is complete, the temporary end cap from the overflow pipe can be replaced with a grated end cap.
- Water the plants, in compliance with your local water restrictions to complete the installation process.

Step 5 – register your raingarden

If you are within Melbourne Water's water management boundary you can register the raingardens constructed as part of the subdivision at www.melbournewater.com.au/raingardens and be part of the count towards building 10,000 raingardens to help our local waterways.

Looking after your raingarden

Once established, raingardens are low maintenance, especially when planted with native plant species. They don't need to be watered, mowed or fertilised. However, a few simple tips can help your raingarden mature and function well.

- 1. Cover your raingarden with gravel mulch to retain moisture.
- 2. If you have an overflow, ensure that it is never blocked.
- 3. Remove any sediment or build up from the downpipe.
- Weed regularly until plants have matured.
 Evenly distribute water flow into your garden to limit erosion from heavy rainfall. Strategically placed rocks may help with this.
- 6. Inspect your garden regularly replace plants and repair erosion when necessary
- 7. Protect your raingarden from pedestrian and vehicle access, as damage to plants and filter medium may significantly affect its ability to function.

