INSTRUCTION SHEET

Building an infiltration raingarden

healthy waterways
Raingardens

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 self-watering garden for your backyard.

An infiltration raingarden is a gravel filled trench designed to receive stormwater directly from a diverted downpipe or runoff from surrounding hard surfaces such as a driveway or paving. It features layers of soil for filtration, gravel for drainage, and plants that can tolerate both extreme wet and dry conditions.

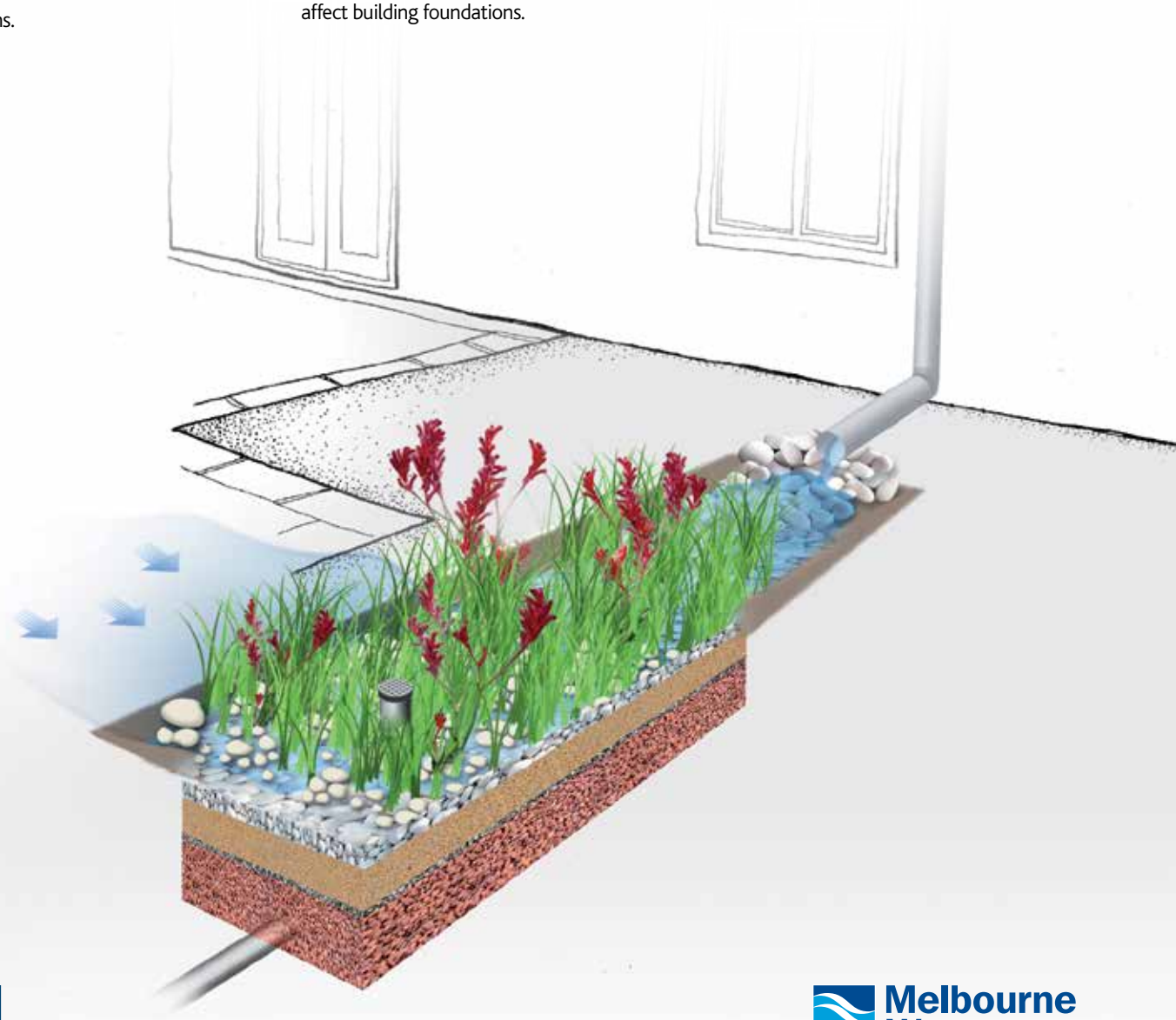
An infiltration raingarden helps protect our streams and rivers by replenishing groundwater and reducing stormwater.

An infiltration raingarden can be any shape, though a rectangle shape is the simplest.

Most effective in areas with sandy soils, an infiltration raingarden 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.

Did you know you can build different types of raingardens? For more information visit melbournewater.com.au/raingardens



State Government Victoria

Melbourne Water

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 appropriatley.

Soil type

Areas with high groundwater tables should be carefully considered. While it is unlikely that you will encounter high groundwater tables, if water appears in the trench during excavation you should either consider reducing the depth of the raingarden or consult a landscape designer. It takes longer for water to infiltrate in clay soils in comparison to sandy soils. If you have clay soils, ensure your raingarden is appropriately sized. See table 2.

If your unsure or concerned about groundwater, it may be an idea to 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 trowel or small spade will work just as well.

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.

You can check your soil type by doing the following test:

1. Dig a hole – 100mm diameter x 350mm deep.
2. Place 90mm diameter PVC pipe of at least 300mm long into the hole.
3. Pour 1.3 litres of water into the pipe
4. Observe how quickly the water infiltrates the soil.
5. Repeat this test a few times until the infiltration rate is consistent.

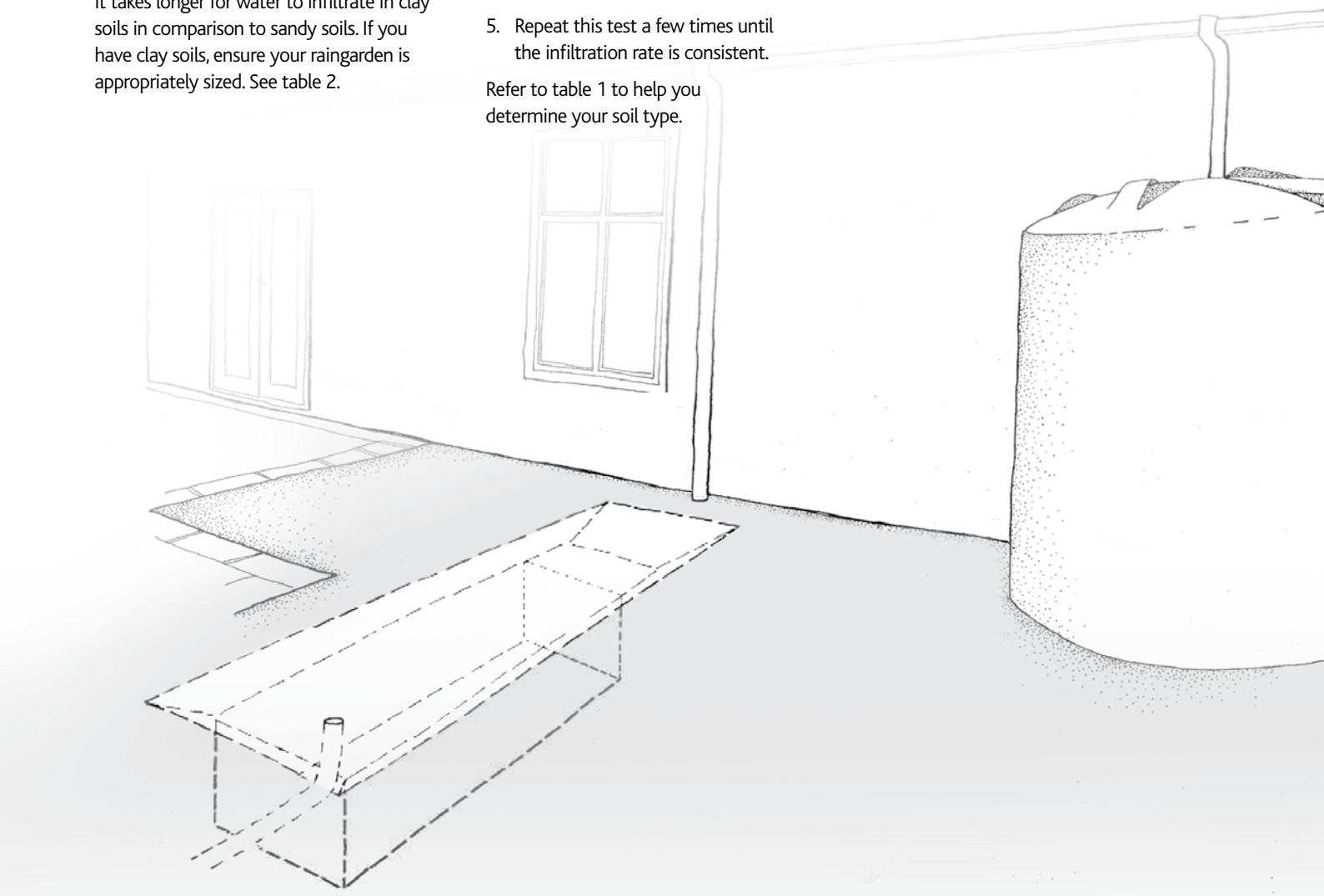
Refer to table 1 to help you determine your soil type.

Note: For effective testing, the soil needs to be saturated. If you are conducting this test during dry conditions, it is best to wet the soil prior to testing.

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 a PVC liner.

Table 1 – Soil infiltration

SOIL TYPE	APPROX. PERMEABILITY RATE (MM/HR)	INFILTRATION TEST TIME TAKEN (HRS)
SAND	180	<1 HOUR
LOAM	36	1 – 5 HOURS
MEDIUM CLAY	3.6	5 – 50 HOURS
HEAVY CLAY	0.36	>50 HOURS



Stormwater reconnection

Your infiltration raingarden should be constructed with an overflow pipe so that any excess water can drain from the raingarden.

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 50-200mm above the top of the mulch and 100mm below 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.

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 raingarden. If your property is serviced by a septic system, you may need a licensed plumber to determine its location. Raingardens should not be built over or in close proximity to a septic system.

Size

You need to make sure that your raingarden is large enough to manage the amount of stormwater it will receive. 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. Generally, the size of an infiltration raingarden should be approximately 2-4 % of the area from which the run-off will be captured. The minimum width of the trench needs to be 1m. Table 2 will help you work out the correct size.

Materials

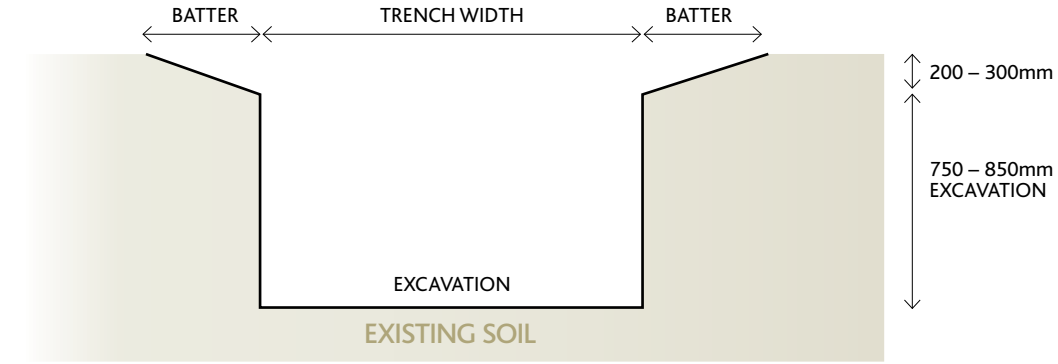
See *Materials List* for information about what you need to build a raingarden.

TABLE 2 – RAINGARDEN SIZING CHART

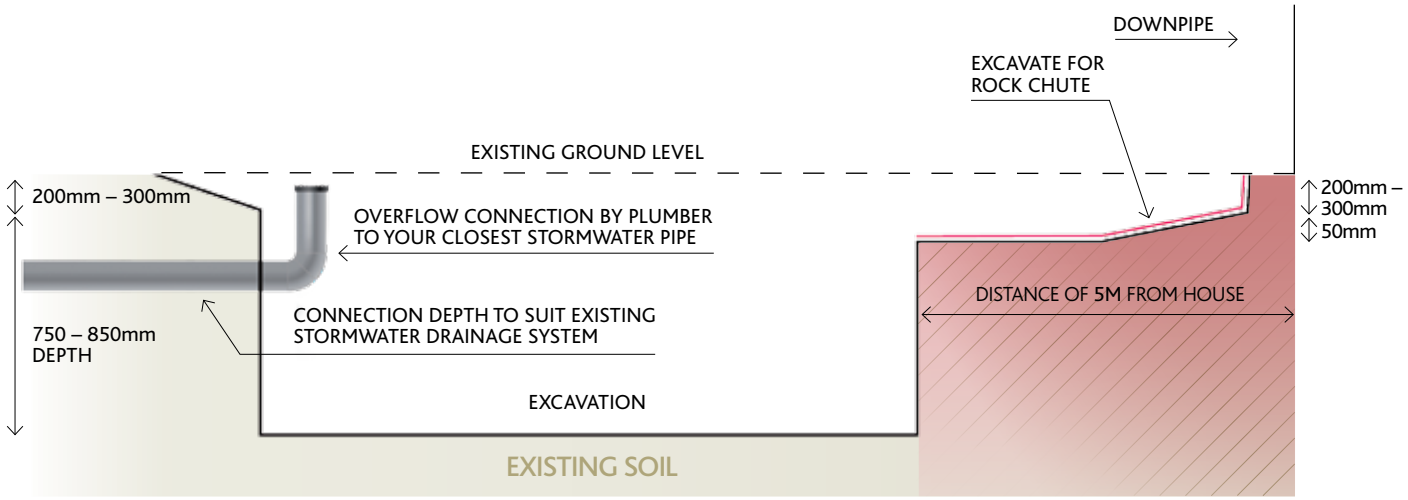
	SANDY SOIL (100MM/HR)	MEDIUM CLAY (3.6MM/HR)
ROOF AREA (M^2)	OPTIMAL INFILTRATION RAINGARDEN SIZE (M^2)	
50	2	2
100	3	4
150	4	6
200	6	8
250	7	10
300	9	12

Note:

1. *The above values are based on an average rainfall in Melbourne (600mm/year)*
2. *It is important to note that the above sizing chart is optimal to meet the best practice stormwater objectives, though if you have limited space then reduce the size of your raingarden to suit your needs. Remember raingardens of all sizes can contribute to healthy waterways.*



FRONT VIEW



SIDE VIEW

Building your raingarden

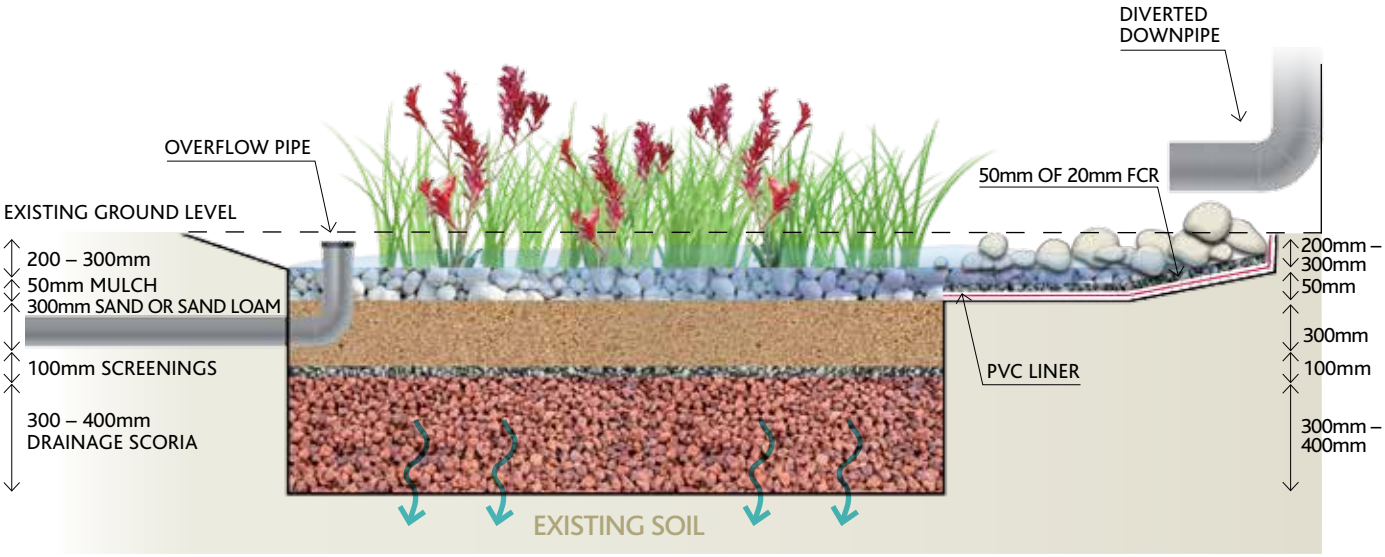
Step 2 – excavation and pipe infrastructure

- A licensed plumber should determine how and when to divert your downpipe to ensure that the area is not flooded during construction. A temporary diversion may be required.
- Once you have determined the location and size of your infiltration raingarden, excavate the trench and batters as depicted in the diagram on the previous page.
- Ensure that the base of the trench is 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 a PVC liner. To do this, place the PVC liner on the vertical face. Ensure that each new piece of liner overlaps by 200mm. Seal the joins with PVC 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 50-200mm from the top level of the mulch and 100mm below the ground level surrounding the infiltration raingarden.
- 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.

Handy Hint – Ensure you firmly pat down each layer of soil when building your raingarden to help reduce the layers from sinking.

Step 3 – soil layers and rock work

- Drainage scoria – add 20mm drainage scoria to a depth of 300mm to 400mm in the base of your trench.
- Place 7mm 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.



SIDE VIEW

Step 4 – pipe adjustments, plants and 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 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*.

50% of your raingarden should be planted with the above species, the other 50% can be made up of plants that like a dry environment with periodic wet periods. See the Plant List for a range of suitable raingarden plants.

It is important that the plants you select are suitable for the amount of sun and shade your raingarden receives. For more information refer to the Plant List.

Regardless of the type of plants you select, it is important to plant densely to fill the raingarden. It is recommended that you use 6 plants per m². So for a 2m² raingarden, you will need 12 plants.

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.

Did you know you can plant trees in your raingarden? Melaleucas are an excellent native species choice.

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.
4. Weed regularly until plants have matured.
5. 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.

Note – If it doesn't rain, water your raingarden until your plants have established in compliance with your local water restrictions.

Materials List - what you need to build your raingarden

The following table details the materials required to create a 2m² infiltration raingarden. While item prices may vary depending on the materials you select, building a 2m² raingarden is likely to cost between $350 and $450 (plus the cost of a plumber).

QUANTITY	MATERIAL
0.2m²	7mm screenings
0.8m³	20mm drainage scoria
0.48m³	Sand (white washed)
0.12m³	Topsoil
12	Plants (150mm pots)
0.1m³	Gravel mulch
1	90mm diameter uPVC 90 degree bend or 2x45 degree bends
1	90mm diameter uPVC extension*
1	90mm diameter uPVC grated end cap
1 l/m	90mm diameter uPVC pipe**
0.05m³	20mm Fine Crushed Rock***
1m²	Large Flat rocks (100-200mm diameter)***
1m²	PVC liner (under rockwork near downpipe)***

l/m = lineal 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.*

Soils used for infiltration raingardens

Scoria

Screenings

Sand

Plant List – the best plants for your raingarden

The following plants will grow well in raingardens in and around greater Melbourne.

BOTANICAL NAME	COMMON NAME	CONDITIONS	SIZE (H x W) (cm)
Anigozanthos species	Kangaroo Paw	Full sun	30-90 x 100-120
Blechnum nudum	Fishbone Water-fern	Full sun to partial shade	50-100 x 40-80
Calocephalus lacteus	Milky Beauty-Heads	Full sun to partial shade	15-30 x 10-30
Carex appressa	Tall Sedge	Full sun to partial shade	80-100 x 120
Carpobrotus modestus	Pigface	Full sun	20cm high and spreading
Chrysocephalum apiculatum	Common Everlasting	Full sun	30-90 x 10-30
Derwentia perfoliata	Digger's Speedwell	Full sun to partial shade	20-40 x 30-60
Dianella species	–	Full sun to partial shade	60-120 x 40-150
Ficinia nodosa	Knobby Club-Rush	Full sun	50-150 x 60-200
Juncas amabilis	Hollow Rush	Full sun to partial shade	20-120 x 20-50
Juncas flavidus	Yellow Rush	Full sun to partial shade	40-120 x 20-100
Leucaphyta brownii	Cushion Bush	Full sun, salt tolerant	100 x 200
Lomandra species	–	Full sun to partial shade	60-120 x 50-100
Melaleuca ericifolia	Swamp Paperback	Full sun to partial shade	4m high x 3m wide
Myoporum parvifolium	Creeping Boobialla	Full sun	20-30 x 300
Patersonia occidentalis	Native Iris	Sun to partial shade	20-40 x 30-60
Pratia perdunculata	Matter Pratia	Partial shade	50-150 x 1.8-5
Wahlenbergia communis	Tufted Bluebell	Full sun	15-50 x 15

Melbourne Water
990 La Trobe Street
Docklands VIC 3008

PO Box 4342
Melbourne Victoria 3001

Telephone 131 722
melbournewater.com.au/raingardens

ISBN 978-1-921603-91-4 (print)

ISBN 978-1-921603-92-1 (web)

Version 5, December 2013

Melbourne Water