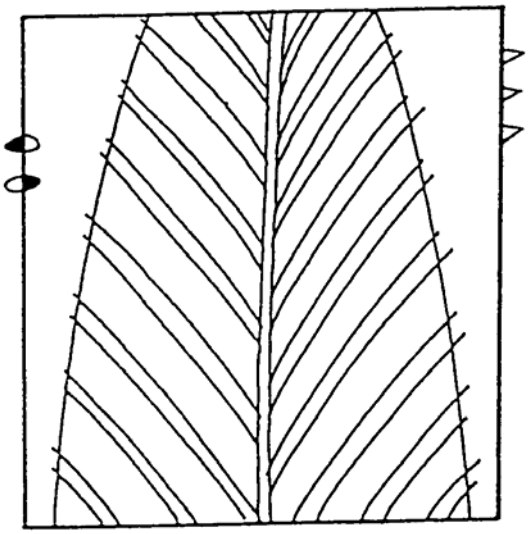
USING RAINWATER





Waitakere City Council
Te Taiao o Waitakere

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This chapter is part of the Waitakere City Council's Sustainable Home Guidelines. The complete set can be obtained through most libraries or from the Waitakere City Council, Private Bag 93109, Henderson, Waitakere City 0650, New Zealand, phone (09) 839 0400, email: info@waitakere.govt.nz.

The guidelines are also available on the council's web site: http://www.waitakere.govt.nz

Too little water? Too much water?

In Waitakere, rainwater is collected in dams, owned by Watercare Services Ltd. It is then treated, and pumped to individual households via the council-managed supply network. We collect rainwater from a relatively small area and distribute it over the entire urban area of the city.

The main reason for introducing a water-supply network was to provide a growing city with safe, clean drinking water to protect public health. Currently we are in a situation where demand threatens to exceed supply. As well as evaluating expensive alternatives (like a new dam) we need to question our wasteful use of drinking-quality water.

At the same time an extensive pipe network (the stormwater system) takes unwanted water away from our urban areas and disposes of it into our streams and harbours. This water is often contaminated, because it picks up pollutants from roads and housing and sediment from soil erosion.

Both water supply and stormwater systems cost a lot of money to maintain and will need costly upgrades. It is a good time look at our current practices and identify more sustainable ways of supplying our city with water.

Collecting water on-site for use in the home and garden is one way to reduce the pressure on the city supply. Some people will have access to stream or spring water, or be able to drill into an aquifer, but for most of us the only practical option is rainwater collection off our roof. Many Waitakere residents installed roof-water tanks during the supply crisis of 1993-4.

Did you know?

- Waitakere buys approximately 16 million cubic litres of drinking-quality water from Watercare Services Ltd each year to distribute to the community. The average total rainfall in the city is about 150 billion litres. It's not so much the availability of water that's a problem – it's just the capacity to collect, treat and distribute it.

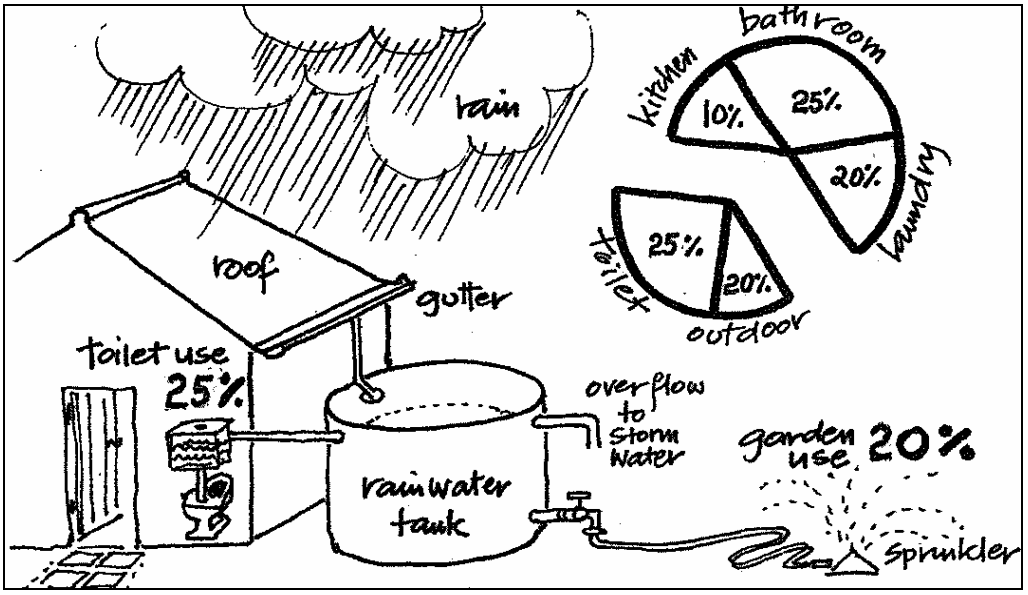
- Collecting and using your own rainwater will not only reduce the demand on the water supply, but also reduce the amount of stormwater that needs to be disposed of from your property. This can reduce flooding downstream and save money on pipes and erosion control.

- You only need about 5 litres of drinking-quality water for each person a day, for cooking, drinking and food preparation. The rest – about 150 litres per person in an average Waitakere household – is used for toilets, showering, washing, the garden, and other uses.

To drink or not to drink?

Many New Zealanders, especially in rural areas, rely on tank-water for all their uses. They take responsibility for ensuring their supply is safe by cleaning and maintaining their system, using filters or water treatment systems to control water quality. In urban areas the city supply was established to provide guaranteed clean and safe water to city dwellers.

The council recommends that you use the city supply, where available, for drinking water. You may, however be outside the supply area, or you may want to be totally self sufficient, or you may want to avoid the chlorine and fluoride used to treat the city supply. If so, there are ways of ensuring that your roofwater supply is safe. Good setup and maintenance of the collection and distribution system are generally more important than treatment methods. Remember that the responsibility of ensuring that your tank-water is safe lies with you.



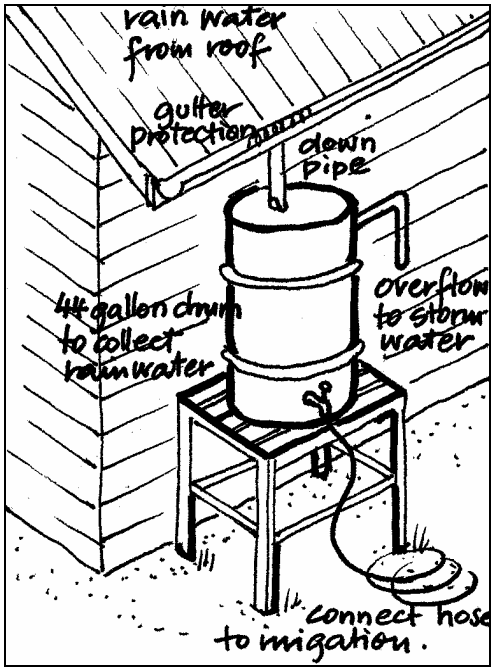
Rainwater collection and use

Roof-water collected in a water tank can most easily and cheaply be used for non-drinking purposes. About 25% of a home's water use is for toilet flushing, 20% for clothes-washing, and another 20% is used on the garden. By setting up a relatively cheap and simple collection system for these three uses alone, you can reduce your mains water consumption by up to 65%. At current water prices this is a saving of about $180 a year for a typical three-person household.

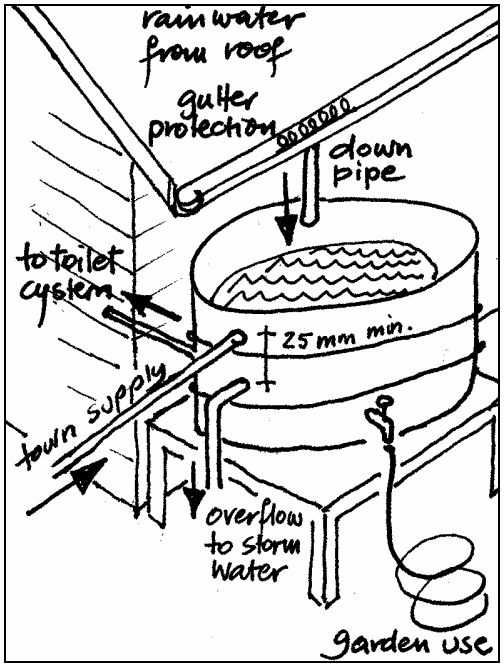
Collecting roof-water for non-drinking uses

Toilet, laundry, and outdoor use:

An easy water-saving option is to collect water for toilet, laundry, and outdoor use. The options vary from simple 200-litre drums under your downpipes for garden use, to complex systems involving pumps and filters. By raising the drums off the ground by about one metre (you can buy special stands or build one) the pressure head will be sufficient to operate a low-pressure gravity-fed irrigation system. This is also an excellent method of using the roof water from garages, garden sheds and other small buildings. Keep your system as simple as possible. The payback period may be up to six years, but would be much less if you use drums or water a large garden.



Using 200-litre drums to collect rainwater for garden use

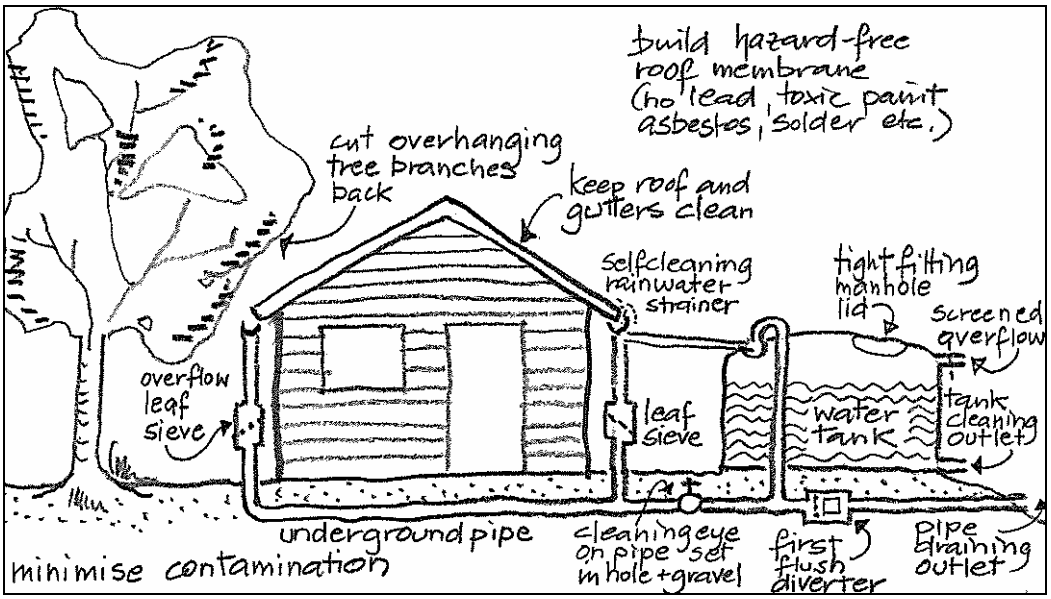


Using roofwater for toilet, laundry, and garden, with town supply backup and an air gap for backflow prevention

The wastewater from washing machines and showers can also be reused for toilet flushing. See the *Wastewater* section for more information.

All non-drinking uses:

If you want to use the city supply for drinking water only, but roof water for all other uses, connect the town supply to the shower, bath, handbasin, and kitchen, while using tank-water for all other uses. Label the outside taps as non-drinkable. You should still ensure that your tank water is reasonably clean.



Minimising contamination of drinking water
(adapted from Caring for Your Rain Water Supply - Southland District Council)

Ensuring that your tank-water is safe to drink

If you have no town supply, you need to take a common-sense approach to water quality for drinking purposes. There are many possible contaminants (natural and artificial) that can enter your tank water, but many thousands of New Zealanders drink untreated tank water with few problems. However, some people are more sensitive to contamination than others, especially infants, the elderly, and the sick.

There are many steps you can take to reduce the risk of contamination of roofwater. The following paragraphs outline different options. It is the responsibility of the individual to choose appropriate methods.

Roof, pipework and storage materials

- Collect drinking water only from non-toxic roof surfaces. The roof should not have lead, chromium or cadmium in its paint, nails, flashings or soldering. When connecting a new rainwater tank to an existing roof, check that the existing roof paint is lead-free and either replace all lead flashings or give them a good coat of paint and ensure that the paint film is maintained. Paints used for roofs should be labelled "suitable for potable water supply," as should pre-finished roofing materials. Also avoid bituminous or porous surfaces. The same applies to pipe and storage materials.
- Rainwater is slightly acidic because CO_2 from the air is dissolved in it. This means that it can react with and leach uncoated metallic roofs or copper spouting and pipework. Such roofs need to be pre-coated or painted. The inside surface of any copper spouting should be painted to reduce leaching also. Concrete tanks will reduce the acidity of the stored water and help prevent leaching of copper from pipework.
- If you're concerned about the suitability of PVC spouting and downpipes for water collection, see the discussion in the *Plastics* chapter.
- Keep the distance the water has to travel to a minimum to reduce the risk of degradation.
- Mount tanks out of direct sunlight to keep them as cool as possible.
- Underground lines to the water tank are more difficult to clean and maintain and should be avoided if possible, though this is usually not practical for large houses. Pipes should have a constant gradient if possible to avoid stagnant water forming.

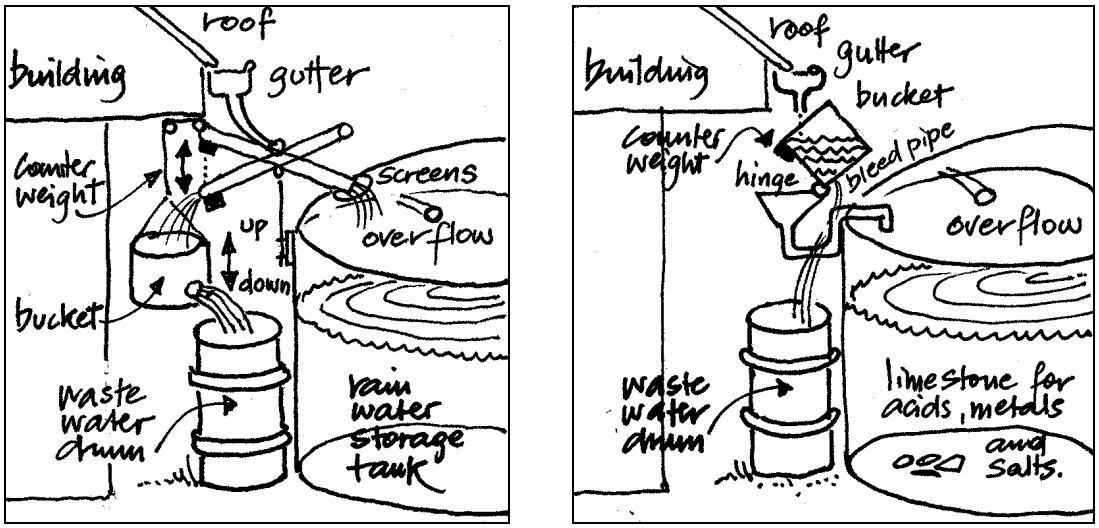
Organic matter and other contaminants

Plant matter, bird and animal droppings, dust, and dirt in the air will contaminate roof water. The following steps will reduce this risk:

- Make sure tree branches don't overhang the roof.

- Fit self-cleaning rainwater strainers to all downpipes connected to the tank, or at the inlet of the tank. These need to be maintained from time to time, so mount them where they're easily accessible.

First-flush-diversion devices will reduce contamination drastically, because they run to waste the first rinse of the roof when it starts raining.



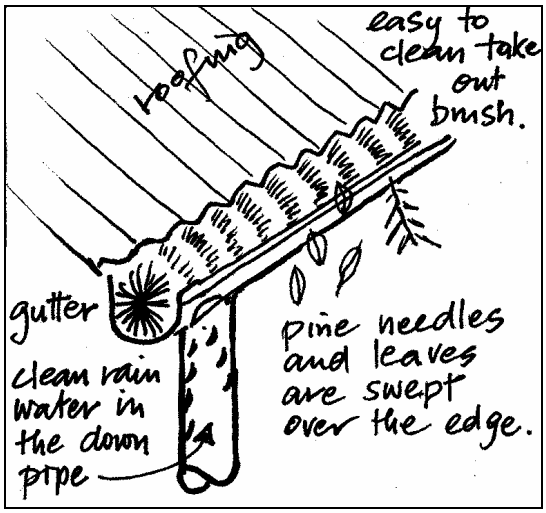
Two methods of first flush diversion (adapted from Permaculture - a Designers Manual)

You can also buy first-flush diverters from plumbing supply outlets. These can be mounted either above ground or underground. All types require some maintenance.

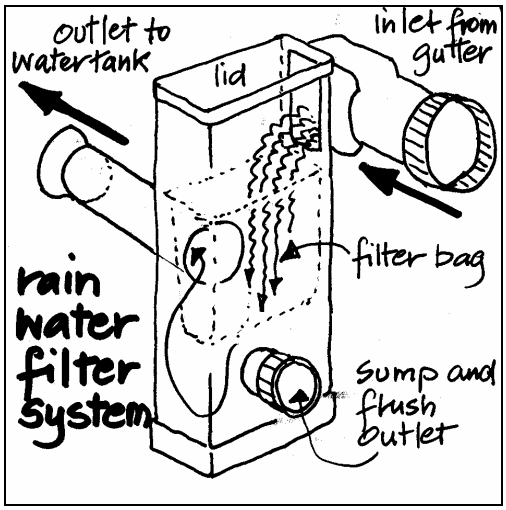
- The inlet from the downpipe to the water tank should be easily detachable, or diverters can be used in the downpipes. This ensures that you can discard the water when you clean or paint the roof, spouting, and pipes.
- Most contamination settles to the bottom of the tank, and the water at the bottom has lower oxygen content. So it's best to take the water from the top. You can buy or make a floating intake to ensure this.
- The overflow pipe should draw from the bottom of the tank, to help flush out the sludge which settles there.
- To prevent mosquitoes breeding in the tank and any "wet" pipes (pipes which remain full between rains), ensure all possible entry points, including the overflow pipe and any vents, have appropriate screening.
- Animal access to the roof can be reduced by maintaining a gap of at least two metres between tree branches and the roof, and by avoiding aerials that overhang the roof.
- If you live next to heavy industry, a busy road (or a metalled road treated with dust suppression chemicals), or an area where agricultural sprays are used, it is better not to collect your rainwater for drinking.

Cleaning the system

- The tank should be completely emptied and cleaned every one or two years. There should be a drain at the lowest point of the tank to make this easy. The outlet to the supply should be either floating or, if fixed, 150mm above the floor of the tank.
- The spouting should be cleaned every few months. Disconnect the inlet to the water-tank so the cleaning water will be flushed away – or you can get diverters that fit into the downpipe. It's a good idea to use a scrubbing brush or broom every so often to scrub the roof, and rinse down with clean water.
- Any underground feeder pipes should have a cleaning eye fitted. If a first-flush diverter isn't fitted, the pipes should be drained every few months to stop water being contaminated by decaying matter.
- Tanks and pipework can be disinfected with chlorine or hydrogen peroxide. Be careful because these substances can damage the environment and a wrong dosage can endanger health. Manual scrubbing of the tank is preferable. If you decide to disinfect you can contact Council for the correct doses by volume, or see the Ministry of Health booklet mentioned in the references.



Hedgehog gutter filter



Based on Rainworks restorer OV95

Filters and treatment

- Providing the water collection system is designed properly and cleaned and maintained regularly, untreated rainwater is generally safe for healthy people to drink. However, water for bottle-fed infants or the sick or elderly should be treated for micro-organisms. One safe method is to boil the water for 3 minutes. This will kill most bacteria but will not remove chemical or particulate pollutants.
- There are many effective filters and treatment systems available. They are not intended to replace the need for regular maintenance but to provide an additional safeguard if you are particularly concerned about water quality. The choice of filter depends on the individual situation. Different filters remove different sized particles, or different types of dissolved chemicals.
- If you live in a rural area where you suspect that Giardia might be a problem, you should choose a filter that will remove Giardia. Very few cases of Giardia have been reported in Waitakere, and even those could not conclusively be linked to tank supply.
- Filters and treatment systems do need to be maintained and fitted properly to be effective. The manufacturers' instructions should be followed and one option is to choose a supplier who will also service the system or at least let you know when cartridges need replacing. The Ministry of Health's Code 4602, *Household Water Supplies* has useful advice about common contaminants of roof, stream and bore water, and appropriate treatment techniques.
- If you are in doubt about your water quality, you can get your water tested by an approved water testing laboratory. This includes the sampling, a range of tests and advice. Details of laboratories are available in the EcoWater brochure "Quality Drinking Water from Your Rain Tank".

How much water will I get off my roof?

In the drier areas of Waitakere the roof of a 120-square-metre house will give you a little over 110,000 litres of water in a dry year. For a four-person household this is 75 litres per person per day (the recommended minimum is 90 litres, the average use is about 157 litres). In the Waitakere Ranges you can expect to collect nearly twice as much, but conserving water is still important, especially over the drier summer months. Households dependent on roofwater for all their needs generally use much less, because you can achieve significant savings with relatively easy changes to the way you use water (see the *Saving Water* chapter).

To work out how much water your own roof will collect in a year, find the average annual rainfall from the map on the next page. To allow for drier than usual years we calculate for only two thirds of these values, and then assume another 10% is lost to evaporation, spillage and first flush diversion:

Total Water (litres) =
Roof Area (m2) x 0.66 x 0.9 x Mean Annual Rainfall (mm)

This is a cautious estimate − most of the time you will have a lot more water.

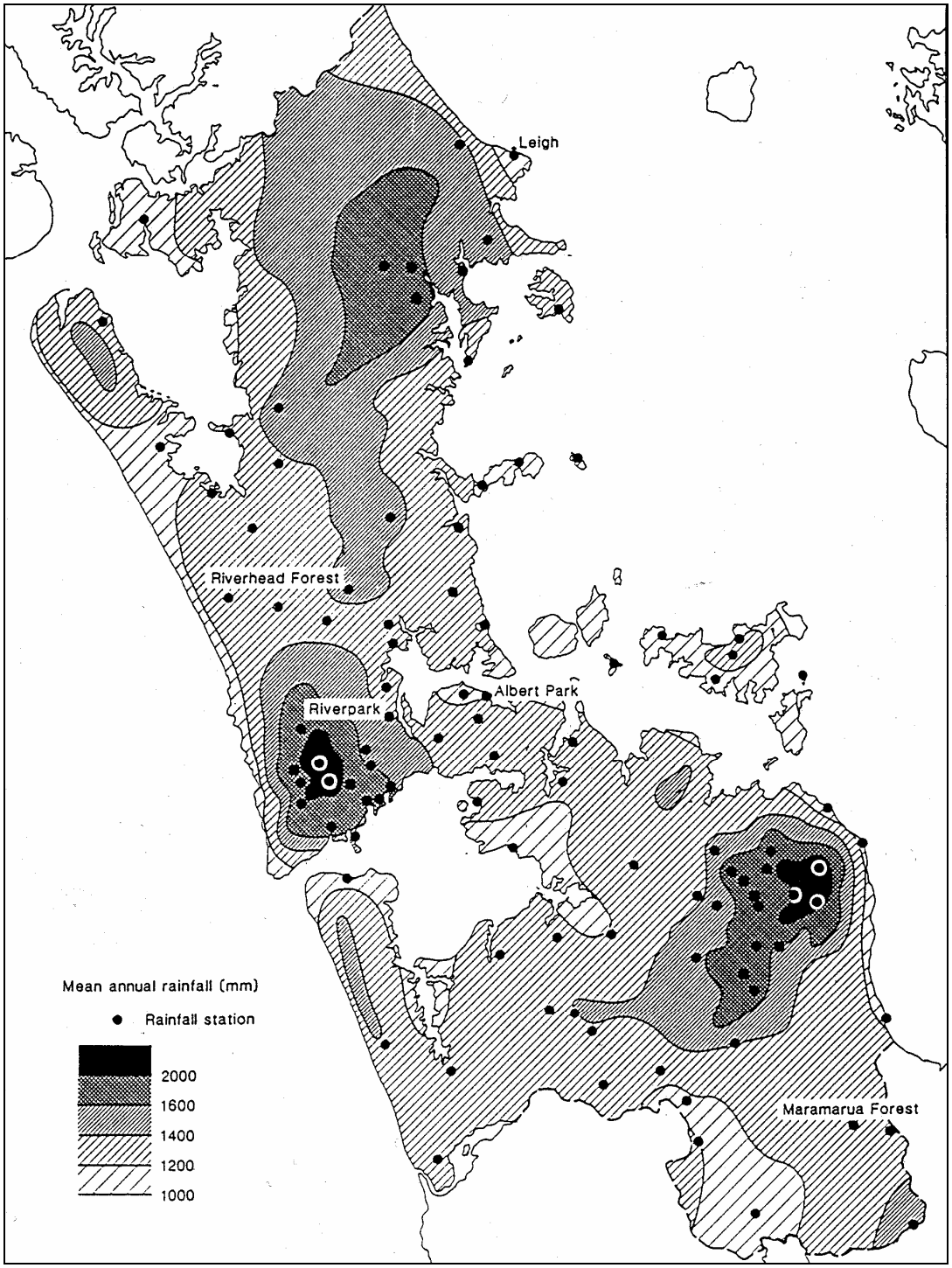
The size of your tank will determine how well you will last over a dry period. A smaller household should get by on a 25,000 litre (5,500 gallon) tank. A larger household will need two. You should probably allow for enough storage to last for 30 days.

You might also compare the cost of installing an extra tank with that of buying extra water by tanker in case you do run out. One option is to start with one tank and to retrofit a second one if it proves necessary.

Of course, if you are also connected to the town supply, you can top up your tank whenever necessary. If you are planning to use tank water for only some uses, the following table will give you an idea of average daily water usage. For outdoor and toilet use only, a tank of 3000 litres would be reasonable.

Outdoor Use	30 litres
Toilet	35 litres
Shower and Bath	50 litres
Laundry	29 litres
Dish-washing	13 litres
Total	**157 litres**

Typical water use per person per day



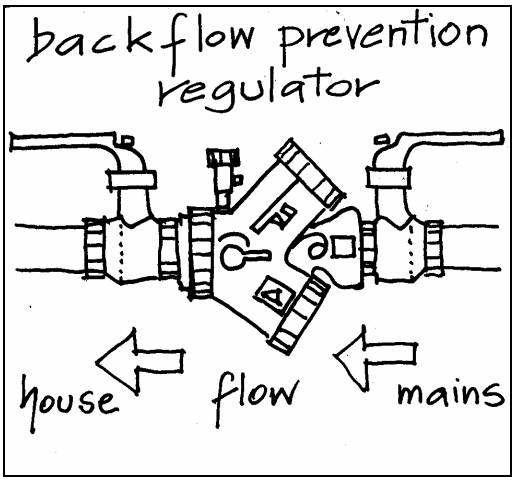
Mean annual rainfall in the greater Auckland area

Ensuring your water supply is safe and legal

Bad plumbing can threaten the health of your family – and even that of the whole community if contaminants escape back into the town supply. All plumbing of the potable water system must by law be done by a qualified plumber. It is a good idea to find a plumber who understands exactly what you want and who will be available to maintain and repair the system if needed.

Generally a pump is used to deliver the water from the tank to the house. Better still, you might be able to raise the tank enough to gravity-feed the water, especially if you are only using it for toilet flushing and garden irrigation.

You will need a 'minor plumbing and drainage consent' from the council for all plumbing, and you need to take special care if you use an alternative supply in combination with the town supply. In that case you will need to prevent the water from your own supply or system entering the town supply when there is a pressure drop in the town supply. This is called "backflow prevention." Some common situations that require backflow prevention are a tank that is topped up by the town supply or a toilet cistern that is connected to both roofwater and the town supply. There are several options for this and council and your plumber can give you further advice. You could for example install a double check valve at your boundary. This would need to be serviced once a year.



Double check backflow prevention at boundary

THE RULES

- All sanitary plumbing (this is most plumbing) requires a '**minor plumbing and drainage consent'** from the council.
- A $500 raintank rebate is available for rainwater tanks over 4,500L, with smaller rebates for smaller sizes.
- Conditions of rebates:
    - the raintank must be in an urban area.
    - the raintank must be connected for toilet and laundry use.
- A full water tank is very heavy, so it needs to be sited on stable ground and special care should be taken in a stability-sensitive area.
- You will need a **building consent** if your water tank:
    - exceeds 25,000 litres;
    - exceeds 2,000 litres and is supported more than 2 metres above the ground;
    - exceeds 500 litres and is supported more than 4 metres above the ground.
- A subsidised building consent is available to anybody installing a rainwater tank in Waitakere.

Other rainwater opportunities

Your roof is your best water collection device – it is reasonably clean and controllable, and the water can be fed to tanks and taps by gravity. However you can also harvest the rain that falls onto your garden, driveway and other outdoor surfaces.

Even though water from your driveway will contain contaminants from your car it is quite safe to use on your garden. Contamination can be reduced by ensuring your car does not drip oil and by avoiding other spills, such as paint or petrol. You can create water features such as small streams and ponds to divert the water to where it can be used to irrigate the garden. These features can be simple or quite elaborate (see the *Gardening with water* section).

Further information

Advice at the Waitakere City Council:

Phone the call centre (09) 839 0400
Ask for : Ecowater Advice
Eco-Design Advisor
Duty Planner

In print

Your Home Technical Manual, Australian Government. Comprehensive printed resource, much of it relevant to New Zealand.

*Household Water Supplies***,** New Zealand Ministry of Health, Code 4602.

"Quality Drinking Water from Your Raintank", Brochure available from the Waitakere City Council.

On the web

www.smarterhomes.org.nz is a mine of up-to-date and independent information. Designed for the general public, it's easy to use, has case studies, and includes features such as Homesmarts, a calculator you can use to find information relevant to your needs or simply to run a home-health check.

If there are questions you can't find answers to on Smarterhomes, www.level.org.nz goes into more depth and is aimed at the design and building industries, with drawings and links to Building Code compliance documents.

Eco-building Products and Services Directory, Building Biology and Ecology Institute, phone Auckland (09) 376 6767, Wellington 0800 223 272. This is updated regularly and can be obtained from the website www.ecoprojects.co.nz.

This chapter was last reviewed in December 2009

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