# Part C: Healthy communities

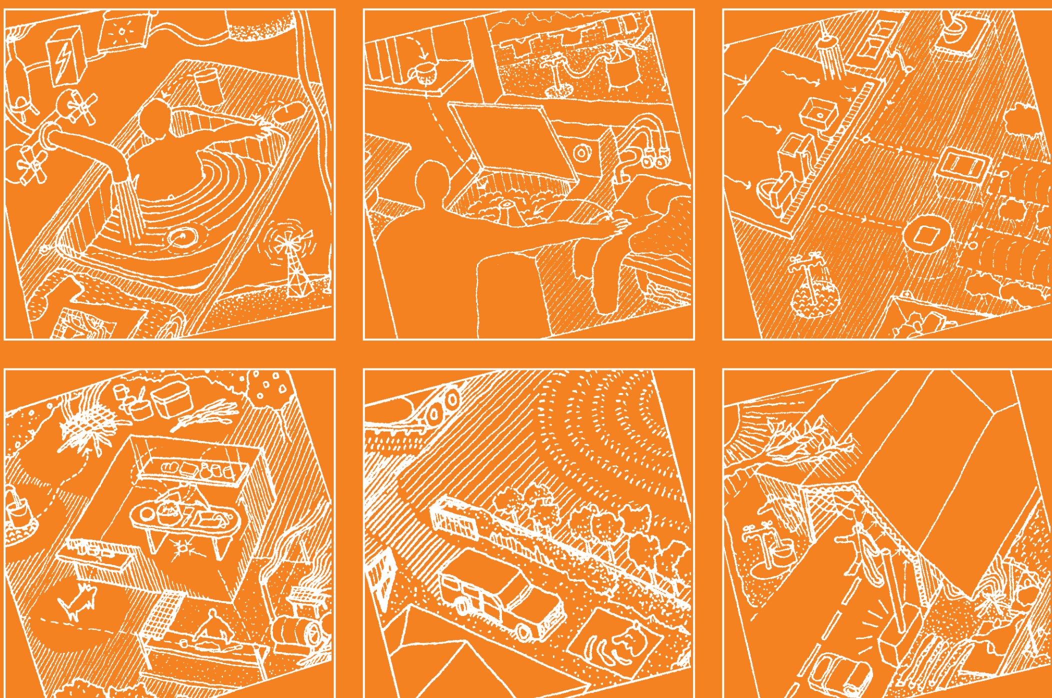
Individual houses depend on the availability and function of community infrastructure such as water, waste water disposal and power supply. If these essential services are not functioning properly, the health hardware in the house will be compromised.

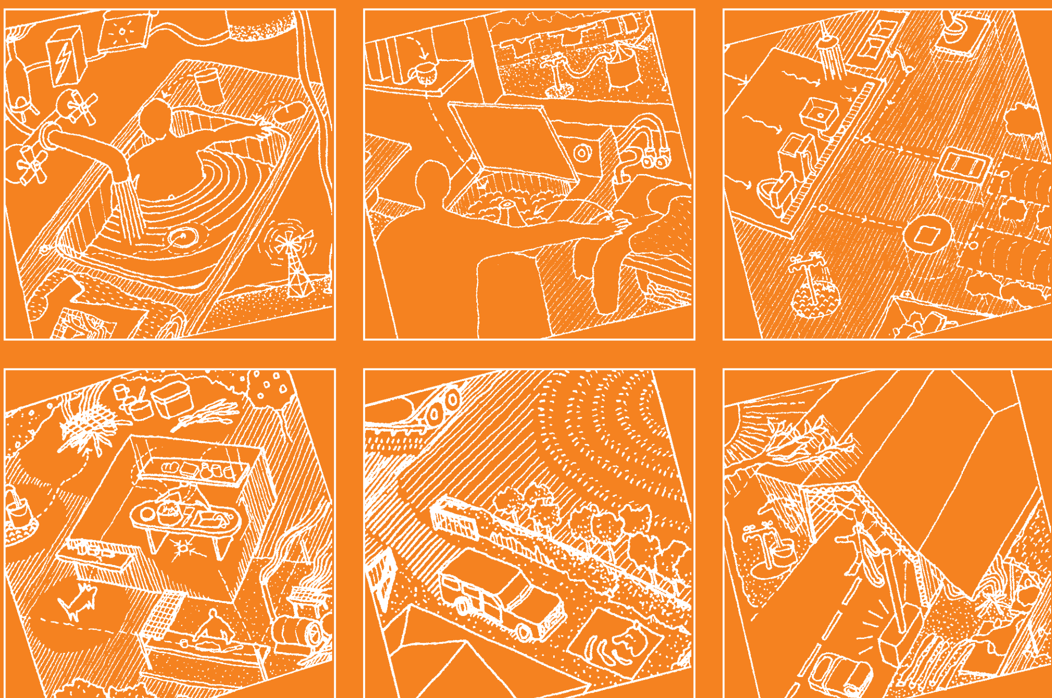
The layout of the community, combined with environmental factors, can have a major impact on the overall health of the community. This section of the guide discusses the relationship between community planning, infrastructure, houses and health

When undertaking housing projects, the housing manager and other council staff, as well as consultants, builders and housing maintenance workers need to take into account what services are available; whether the services are adequate for the proposed housing; what constraints the services place on house and yard design; and how the proposed housing will affect the current and future planned capacity of community infrastructure. Works need to be planned and prioritised, in consultation with the community, to ensure a safe and healthy environment can be sustained for the entire community.

A good source of information about community services is the *Environmental Health Handbook*, written and published by the Menzies School of Health Research in 2000.

# C1 Water





# C1 Water

*Relates to Healthy Living Practices:*

- *washing people*
- *washing clothes and bedding*
- *removing waste water safely*
- *improving nutrition: the ability to store, prepare and cook food*
- *reducing the health impacts of dust*
- *controlling the temperature of the living environment*

An adequate supply of water is a key resource for ensuring good health and at least six Healthy Living Practices depend directly on a reliable supply of water. However, in many rural and regional communities, it is difficult to guarantee a reliable supply of water and strategies to reduce water use need to be incorporated in every aspect of community, house and yard design. In some communities, strategies will also be required to supply potable water to the kitchen (see B4.1 Quality of drinking water).

Providing a water supply to any household involves collecting, storing, treating and distributing the water throughout the community. Important parts of the community water supply include:

- **source**: where the water is collected; a bore, dam, lake, river or roof that the water is taken from
- **storage**: a dam or tank that holds the water after it comes from the source and before it is used
- **treatment**: the use of chemicals (such as chlorine) or other processes, to remove contaminants and pathogens (bacteria or virus) from the water to make it safe to drink and suitable to use in the house
- **reticulation**: a system of pipes and valves that carries the water through the community to each house.

## C1.1 Water quality and treatment systems

Many rural and remote communities experience poor quality water. This is becoming an increasing problem as communities grow and good water sources are exhausted or contaminated as a result of development.

The quality of water may vary depending on use. Within the house and yard:

- less than 10 per cent of the water is used for drinking or cooking. This small amount of water needs to be of a high quality that is fit for people to drink (potable).
- twenty-five per cent of the water is used for washing people. Ideally, this water should also be potable because it comes into direct contact with people

- the remaining 65 per cent of the water is used in laundries and to flush toilets, run air conditioners, water gardens and wash clothes. This does not need to be potable water.

Water may be unsafe for drinking if it contains:

- disease-causing micro-organisms (pathogens), which cause a range of viral, diarrhoeal or gastric illnesses in people
- biological contaminants like algae
- chemical contaminants such as high concentrations of mineral salts, heavy metals, radio-active materials or other chemicals that are dangerous to people's health.

Water sources can easily become biologically contaminated through contact with animals, people or waste. Community water supplies are usually disinfected as a precaution against the risk of biological contamination. The most common form of disinfection is chlorination because it is cheap and effective. Other options include ultra violet light sterilisation and micro-filtration.

Treatment systems to remove chemical contaminants are required if test results identify a level of contaminants that is dangerous to people's health or will affect the function of taps, pipes and other health hardware. Chemical treatment processes range from filters, to more complex technologies such as desalination.

If water cannot be treated to a standard that is safe to drink, other sources of potable water will be needed. This might include a dual reticulation system in the community to supply a small amount of potable water to some parts of the house. Non-potable water would still be directed to the toilet, laundry and yard. Rainwater tanks at houses can also provide a supply of drinking water but may require a filter or first flush device.

The quality of a water source can change over time and the function of the treatment system might deteriorate, therefore the water system in a community must be regularly monitored. Water samples should be tested to check that the water is safe. Community members can test water using standard testing kits to take water samples from a number of points throughout the community supply, including the outlet on the tank and the taps at the furthest ends of the supply lines. These samples are then sent immediately to a laboratory for testing. However, the difficulties of testing in remote communities make implementing a risk management strategy a high priority. Support materials such as the Community Water Planner (NHMRC 2005) can assist in developing a risk management plan, and further materials should be developed for appropriate interpretation in communities.

Test results will provide information about the chemicals in the water and whether coliforms and/or E.coli are present. Coliforms are an indicator that the water may contain viruses or bacteria that will make people sick. The test results should state whether or not the water meets the Australian Drinking Water Guidelines.[12]

The information provided about the chemical properties of community water should be considered when specifying plumbing fixtures and other health hardware.

12 The *Australian Drinking Water Guidelines* 1996 were developed by the National Health and Medical Research and Council and are widely accepted as a drinking water standard in Australia.

Examples of chemical properties that affect health hardware include:

- dissolved salts in water form deposits on the heating element in a hot water system, which will eventually stop the element from working
- dissolved salts in water form deposits around taps that may corrode the tap seat and cause permanent damage to taps, which could result in major leaks
- dissolved salts in water build up on evaporative cooler pads and reduce the production of cool air
- dissolved chemicals may cause the water to be acidic or alkaline, which may react with the metals used in plumbing fittings; acidic waters, in particular low pH, can cause aggressive corrosion in metal plumbing fittings and it may be better to use plastic fittings in these conditions.

See B1.2 Hot water, B1.3 Taps, and B8.4 Active cooling of houses, for further information about the effects of corrosive water on health hardware.

## Design and specification

*For new housing projects, ensure that:*

- there is enough water available for the increased demand arising from the new works and if not, that strategies are put in place to guarantee enough water to support the Healthy Living Practices in all houses in the community, by increasing:
  - the water supply through installation of additional bores, rainwater tanks and river pumps
  - the water storage capacity by installing additional tanks or dams
  - the treatment plant capacity
- the capacity of the reticulation system by enlarging or extending supply mains to new areas
- the specified materials for water pipes and fittings are suited to the water quality and environmental conditions, such as using plastic[13] components where there is 'aggressive' or acidic water or soils that corrode metal components and, if using plastic pipes, ensure they are drinking water grade plastic
- all components of the hot water system are specified to suit the water quality
- non-return valves are specified for external taps to prevent water contamination, for example, by dogs or from cleaning fish because, if the water pressure drops in the community, contaminated water can be sucked into the mains line.

*Consider:*

- whether it is more cost effective to have two water distribution systems, one providing potable water to the kitchen and ideally to the bathroom, and the other providing untreated water to the rest of the house

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13 Plastic is used here to distinguish a range of polybutyl and PVC pipe materials from metal pipes, usually copper.

- connecting rainwater tanks or a micro-treatment system at the house to ensure a supply of potable water (see B4.1 'Quality of drinking water').

*If involved in planning a community water supply system, consider:*

- the quality of water available from all existing sources, the expected life of those sources and risks to the water quality
- the expected growth of the community
- the operating costs of treatment options and the complexity of operating and maintaining the treatment system
- strategies to reduce demand, particularly on potable water supplies, such as providing different quality water for different uses within houses and/or across the community, and installing rainwater tanks or household treatment systems for providing potable water to households or to relieve pressure on potable supplies.

## Quality control

*During construction and before making the final payment, check that:*

- plumbing materials have been provided as specified
- only drinking water grade pipes and fittings are used for the drinking water supply and if using agricultural or drainage grade pipes or fittings, limit these to external areas
- non-metal pipes are protected from direct sunlight because prolonged exposure to ultra violet light may break down the plastics and are protected from vermin attack
- rainwater tanks are correctly installed, see 'Design and specification' in B4.1 'Quality of drinking water' for information about installing rainwater tanks.

## Maintenance

*As part of cyclical maintenance:*

- regularly take water samples as per NHMRC Australian Drinking Water guidelines and send them to a laboratory for testing
- review the test results and take action to improve water quality
- ensure the water treatment plant operators have been properly trained, and follow all steps in the operation and maintenance manual
- if rainwater is used to provide a source of potable water to houses, ensure the tanks are regularly maintained and that the water quality in the tanks is monitored, see B4.1 'Quality of drinking water'.
- follow a prepared risk management plan based on maintaining water supply integrity, using the Community Water Planner available at www.nhmrc.gov.au

## Standards and references

National Health and Medical Research Council 2004, *Australian Drinking Water Guidelines* available at http://www.nhmrc.gov.au/publications/synopses/eh19syn.htm

Centre for Appropriate Technology 2002 'Rainwater harvesting', Bush Tech Brief #4, *Our Place*, 17, Winter 2002 Alice Springs, http://www.icat.org.au/documents/btb4.pdf

# C1.2 Water quantity and demand management

Throughout Australia, cities, towns and communities are confronting the reality of water shortages. In some communities, water shortages are seasonal or caused by drought. Others, however, face dire water shortages that threaten the viability and long term sustainability of the community. Wherever there is a shortage of water, it is necessary to look at ways to manage the use of, or demand for, water. This is called 'demand management'.

In communities where water use is high, children are often blamed for wasting water by leaving taps running. This is not confirmed by water use data collected during Housing for Health projects over a 10-year period and involving over 4,000 houses.

Housing for Health teams do, however, regularly find dripping taps, leaking hot water system pressure relief valves, and leaking toilet cisterns, see B1.3 'Taps'. A dripping tap can waste 600 litres of water a day, therefore poorly maintained plumbing fittings are a significant cause of water wastage in communities.

From existing survey data, the following calculation indicates the impact of apparently insignificant water wastage.

*Example of water wastage caused by tap failure*

| | |
|---|---|
| **Number of taps** in a house (shower x 2, basin x 2, laundry tub x 2, washing machine x 2, yard x 2, toilet cistern stop tap and cistern valve, hot water relief valve, hot water stop valve, maybe a hot water system cold water relief valve, maybe bath taps x 2 kitchen sink x 2, isolation valve) | **20**<br>taps |
| Approximately **25% of taps fail** at testing, see B1.3 Taps | **5**<br>failed taps |
| If only half of these failures result in **water leaks**, the other failures could be due to handle faults or taps jammed but not leaking | **2.5**<br>leaking taps per house |
| If each of these taps has a moderate **leak of 600 litres per day** | **1500**<br>leaking litres per day per house |
| **Water wastage every day** from approximately 3,600 houses surveyed (before fix work was commenced) | **5,400,000**<br>wasted litres of cold and hot water per day |

The problem of leaking taps is easy to fix. An effective plumbing maintenance program to repair leaks in pipes and replace washers in taps is the first and most important demand management strategy that can be implemented. Using water meters on community supply tanks, and at each house, is a simple way to detect leaks early and to measure water use and demand in the community. Repairs can then be targeted to leaks that are detected through the monitoring program. A regular program to reseat taps and replace washers can also prevent leaks. Reducing the pressure in the supply system can also lessen leaks in pipes and taps.

The combination of good housing design, specification and maintenance has a significant impact on water usage. For example, a well designed house will reduce the amount of time that active cooling is needed and this can reduce the water consumption of an evaporative cooling system.

Providing water efficient appliances such as low flow plumbing fixtures and water efficient washing machines will also save water. Before installing low flow plumbing fixtures, check how the water quality might affect them. Although appliances such as washing machines may not be provided by the housing organisation, it may be cost effective to provide or subsidise high quality, water efficient washing machines rather than building additional water infrastructure.

Community programs that educate residents about water use and ways to save water, such as the Waterwise program in Queensland can assist in managing demand. Charging for water, particularly for excessive water use, has also been used as a strategy to reduce water use.

Rainwater tanks have been proposed elsewhere in this guide as a means of providing potable water to houses. In communities where potable water is readily available, rainwater tanks can be used for watering gardens or for evaporative air conditioners as a way to reduce demand on the potable water supply.

## Design and specifications

When planning housing projects, consider:

- installing water meters to houses
- using water efficient plumbing fittings and appliances
- providing large capacity rainwater tanks to all houses, supplying garden taps and/or an evaporative cooling system
- treating grey water from the laundry and bathroom, and then using it in underground irrigation systems
- planting drought tolerant grasses, shrubs and trees, particularly plants that grow in the local area.

If involved in planning a community water supply system or demand management program, consider:

- the expected growth of a community and develop strategies to meet the demand for water from proposed developments without exhausting the available water sources
- installing water meters on mains supply pipes and all buildings, located in an accessible location above ground, and monitor meter readings to target urgent plumbing maintenance
- implementing a local, regular plumbing maintenance program and charging for excessive water use

- providing rainwater tanks to all buildings in the community
- installing sub-surface tanks or developing swales and small dams to collect stormwater run-off in the community
- installing a second reticulation system in the community to provide recycled water to landscape areas and toilets.

## Quality control

*During construction and before making the final payment, check that:*

- water meters have been installed and are easy to find
- if specified, water efficient plumbing fittings and appliances are fitted
- pipes are secure and there is no water hammer (constant movement of unsecured pipes) that could break pipe joints and cause leaks in the wall cavity
- rainwater tanks are correctly installed, see 'Design and specification' in B4.1 'Quality of drinking water' for information about installing rainwater tanks
- if specified, grey water fixtures are connected to a treatment system before discharge to an underground irrigation system
- there are no water leaks.

## Maintenance

*As part of cyclical maintenance:*

- record meter readings and identify leaks in houses or the pipe work between houses in the reticulation system
- check all taps, spouts and shower roses, including yard taps and pressure relief valves, for leaks
- check pipes for water hammer and in-ground leaks and repair or replace
- reseat taps and replace washers in taps every two to three years depending on water quality
- check toilet cisterns for leaks and repair, if necessary
- flush out grey water irrigation systems
- clean the pads in evaporative coolers
- clean 'first flush' diverters and insect screens on rainwater tanks.

## Standards and references

Department of Water 2006, *Report for the Minister for Water Resources on Water Services in Discrete Indigenous Communities*. Department of Water, Perth

Remote Area Developments Group 2000, *National Assessment of the Colilert field test kit in remote Aboriginal Communities in Australia*. Murdoch University, Perth

Anda, M and Ryan, J 1998, *Saving water for healthy communities: a workbook for Aboriginal communities*, Remote Area Developments Group, Murdoch University, Perth, pp 11

Khalife, MA, Dharmappa, HB & Sivakumara, M 1998, "An Evaluation of Septic Tank Performance in a Remote Australian Village Provides Insight for Optimizing Onsite Treatment Systems", *Journal of Water Environment Research*, Edition 4, Volume 10, USA, Water Environment Federation, pp 33-36

Pholeros, P 1997, Energy and Water Use Required for Health in Housing on the Anangu Pitjantjatjara Lands North West of South Australia, for UPK Nganampa Health Council Inc., Alice Springs, p 13.

Pholeros, P, Rainow, S and Torzillo, P 1993, *Housing for Health, Towards a Healthy Living Environment for Aboriginal Australia*, Healthabitat, Newport Beach, pp 39-45.

## C1.3 Rainwater, stormwater and recycled water for landscaping

Large quantities of water are used around houses for landscaping, food gardens and other activities. This can account for up to half of the water used by a community. There are examples throughout this guide of how the use of yard areas and outside areas around the house support the nine Healthy Living Practices. However, as water shortages increase, it can be hard to justify using potable water for gardens and landscaping. Rainwater, stormwater and recycled water are under-utilised water sources that could be used externally as part of a total water management strategy.

Regardless of the water used for external use, it is strongly recommended that native plants and other drought tolerant species be used to reduce water consumption and encourage water conservation in the community.

### Rainwater tanks

Rainwater can be collected directly from roofs and stored in tanks on houses and community buildings and can be a good source of drinking water in communities where the water quality is poor, see B4.1 'Quality of drinking water'. Rainwater can be also used for gardens and outside areas to supplement the water supply in communities where potable water is readily available. It will usually be cheaper to install and maintain rainwater tanks than to expand the capacity of the community water supply system. Planning considerations include how much tank capacity can be afforded and how many tanks can be accommodated on the site.

### Stormwater

Rainwater can also be 'harvested' from roads and open areas around the community, instead of being wasted by washing away in drains. This water is often called 'stormwater'; it is not suitable for drinking as it picks up pollutants from the ground, but it is a useful resource for landscaping. Stormwater can be collected at ground level in small dams or directed via drains and swales to gardens and landscaped areas. It can also be collected from roads and other hard surfaces into underground tanks, however this is a less cost effective way of storing stormwater.

## Recycled water

Recycled water is water that has been used once in a house and is then treated so the any solids and contaminants are removed and it can be used again. Water has been recycled for many years in many overseas countries, and in some places the water is treated to drinking quality. The use of recycled water is quite limited in Australia, but it is becoming more common as demand for water increases and water treatment technologies improve.

To date, the use of recycled water in many rural and remote communities has been limited to using the effluent from treatment ponds on woodlots or cattle pasture. However, in communities where water shortages are an issue, using treated waste water in underground irrigation systems to irrigate trees and landscaping throughout the community may be a viable option. Water from the treatment ponds cannot be used for above ground sprinklers, but there are treatment options that allow use of water in underground irrigation for trees, landscaping and food crops.

At a household level, water can be recycled in the following ways:

- effluent from on-site sewerage systems can be run directly to underground irrigation systems in the yard area
- ground covers and small shrubs can be planted between septic trenches as wind and dust breaks; they will also assist in the function of the septic trenches (do not use plants with invasive root systems)
- after separation treatment to extract fat and oils, water from the laundry, shower and bath can be drained to yard areas in underground irrigation systems (check with state or territory and council regulations)
- the water that is wasted from yard taps, hot water overflow and evaporative air conditioners can be specifically directed to yard planting in gravel drains or underground drains
- water from gutters and downpipes can also be piped to planted areas in the yard or collected in swales to be absorbed slowly by yard planting.

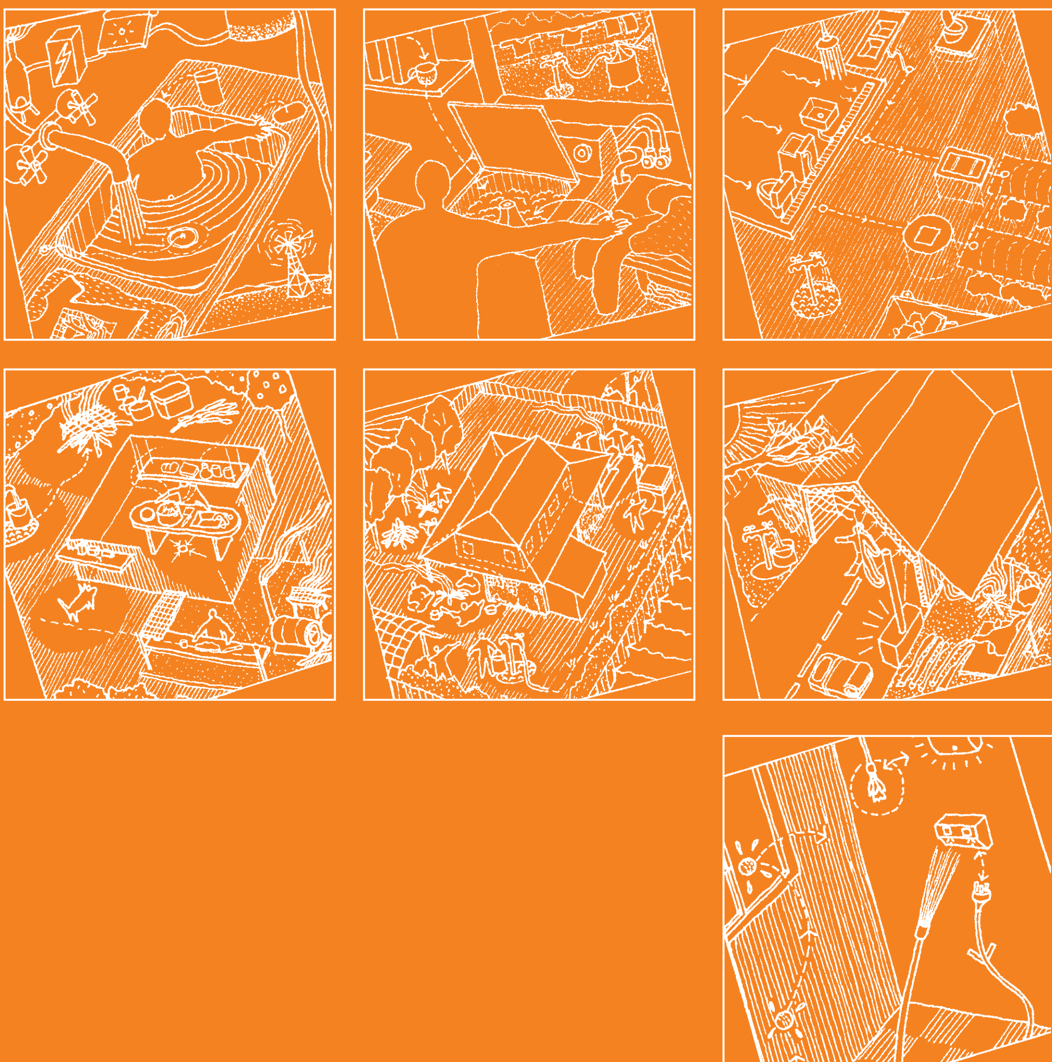
## Standards and references

Natural Resource Management Ministerial Council and Environment Protection and Heritage Council. 2006, National Guidelines for Water Recycling: *Managing Health and Environmental Risks*. National Water Quality Management Strategy: Australian Health Ministers' Conference

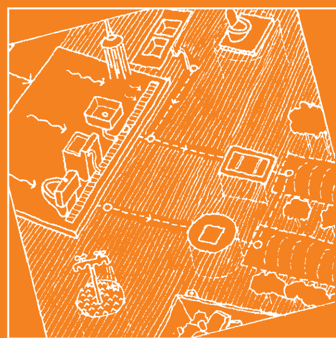
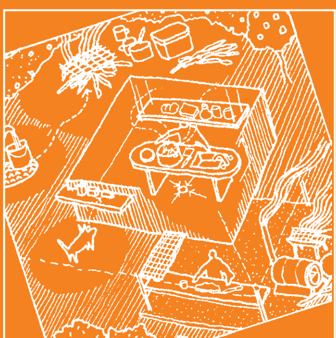
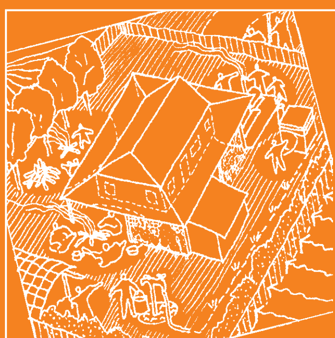
Centre for Appropriate Technology Inc. 'Operation Desert Stormwater Harvesting', Bush Tech Brief #3, *Our Place*, 17, Winter 2002, Alice Springs, http://www.icat.org.au/documents/ op17.pdf

Anda, M & Ryan, J 1998, Saving water for healthy communities: a workbook for Aboriginal communities, Remote Area Developments Group, Murdoch University, Perth.

# C2 Energy





# C2 Energy

*Relates to safety and the following Healthy Living Practices:*

- *washing people*
- *washing clothes and bedding*
- *removing waste water safely*
- *improving nutrition: the ability to store, prepare and cook food*
- *reducing the effects of crowding*
- *controlling the temperature of the living environment*
- *reducing hazards that cause trauma*

Energy is essential to many of the Healthy Living Practices and is required for most community activities.

Energy such as electricity, gas or solid fuel (wood or coal) may be expensive whereas renewable energy sources such as solar, wind, hydro or wood may provide a cheaper alternative if available and if there is the ability to invest in the capital equipment required to convert these energy sources into a useable form. Many communities have little choice or control over the supply and cost of various energy sources.

The energy needs of a community need to be considered as a whole in order to deliver affordable services to residents. This requires consideration of the energy options for different items of health hardware and the most efficient fuel source available. It may be more cost-effective to install solar hot water systems and energy efficient appliances in housing, or a reticulated gas system to the whole community, particularly if an electrical power generation system is subsidised by the state or territory government and the capital cost of the installation is equivalent to the subsidy.

The relative advantage of selecting electrical devices with reduced power consumption can be assessed by consulting: http://www.energyallstars.gov.au/, which includes an energy rating for the following appliances:

- Electric stoves, ovens
- Refrigerators
- Freezers
- Ceiling fans
- Electric hot water services
- Boosted solar hot water services
- Heat pump hot water services
- Refrigerated air conditioners
- Reverse cycle air conditioners (in heating and cooling modes)

- Evaporative air conditioners
- Electric fan heaters
- Radiators
- Washing machines
- Fluorescent lamps
- Incandescent lamps
- TV sets
- Water pumps
- Appliances such as toasters

This section includes a brief discussion about the systems that generate electricity for communities and about gas supply systems. For information about solar hot water heating, see B1.2 Hot water. Other types of energy systems are beyond the scope of this guide.

## C2.1 Electricity

Most remote and regional communities have little control over the power generation and electrical supply systems available to them. Essential services providers and funding providers usually decide which type of system to use depending on the capital cost of the system and the size and location of the community. The table below sets out the power generation systems commonly found in communities across Australia.

Maintenance arrangements also vary. In most large communities, the power system is operated and maintained by an external authority. Smaller communities and outstations may own and operate stand-alone systems. Increased loads on the power system due to renovations or construction of new houses, or providing more health hardware in houses such as additional heating and cooling systems, will increase costs.

New power generation systems or system upgrades should take into account the likely development of the community over the next five to ten years. As well as the development of new housing and infrastructure, any other planned community buildings and businesses should be considered.

The majority of hot water systems (51 per cent) in surveyed houses use an electric power supply and a further 40 per cent use solar systems, most of which have electric boosters. Most surveyed houses have electric cooking appliances (72 per cent).

*Overview of common community power systems*

| **Community description** | Regional, any size, close to mains infrastructure | Large to medium size community, not close to mains infrastructure | Small remote community | Very small remote community |
|---|---|---|---|---|
| **Power system** | Connection to mains grid | Power house with two or more diesel generators | Power house with one or two diesel generators | Renewable energy system or diesel-renewable hybrid power generation system[a] |
| **Cost to consumer** | Power is usually cheaper than other sources because it is the same unit price is charged to all grid customers<br><br>Off-peak low tariff rates may be available for hot water | Power will be more expensive than mains power unless diesel fuel is subsidised | Power usually very expensive unless diesel fuel is subsidised | Power may be cheaper than from diesel power house because of fuel savings, initial capital outlay could attract a rebate |
| **Reliability** | Reliable | Usually reliable because back-up generator is available to supply power when one fails | Not so reliable because no back-up when generator fails and have to wait for mechanics or parts | Usually reliable because multiple components can pick up load when one part not working. Have to wait for specialists to fix problems |
| **Maintenance** | No maintenance responsibility for community | Often operated by external agency. If community does maintain they may need maintenance contract with a diesel mechanic and electrician | Often operated by community, which requires a maintenance contract with a diesel mechanic and electrician | May be operated by external agency or community. Can require specialist expertise for maintenance |
| **Growth** | No limits to growth in community | Growth limited by capacity of generators<br><br>Ongoing capital cost as community grows | Growth limited by capacity of generator<br><br>Ongoing capital cost as community grows | Growth limited by capacity of generators, batteries and renewable components<br><br>High capital cost as community grows |

a A renewable energy generation system consists of batteries for storing power and renewable energy solar panels, wind generators or micro-hydro generators. Diesel-renewable hybrid power systems incorporate a diesel generator which runs in conjunction with the renewable energy input.

## Design and specification

*For new housing projects, ensure that:*

- the houses are designed to be energy efficient, including passive design strategies to make them warmer or cooler and use of energy efficient appliances, particularly cooking and hot water systems
- the power generation system has the capacity to meet the load requirements of the proposed new buildings and associated infrastructure
- power is available to the proposed housing sites
- house designs take into account any load restrictions that may apply and use 'no-volt' relay switches for air conditioners and other appliances to manage loads.

*If involved in planning a new or upgraded power generation and supply system, consider:*

- projected growth and development of the community and areas identified by residents for this development
- the power requirements of proposed infrastructure and economic development initiatives in the community
- the financial capacity of residents to pay for electricity or whether government subsidies are available to make the power more affordable
- metering options such as 'pay as you go' card meters that may make paying for power manageable for residents
- emerging technologies that allow residents to easily view their house's power consumption
- the financial and technical capacity of the community to operate and maintain the system, including access to fuel, spare parts and technical experts.

## Quality control

*Before making the final payment for new houses, check:*

- that power is available to all houses
- the power supply installation in the street and the house connection has been tested and certified by the power provider or manager of the generation system, as well as an electrician.

## Maintenance

Electrical safety is not limited to the house environment. Community power stations, power lines, transformers and pole fuses all play a part in ensuring the electrical safety of a community. It is essential for the safety of community members that power houses are kept secure from unauthorised access and that the generators, power lines, power poles, pole fuses and other parts of the electrical generation and distribution system are maintained in good condition.

*Ensure:*

- a maintenance contract is in place for the power generation system and that the electrical supply system is regularly maintained and kept to a safe standard.

## Survey data

| High use electrical energy appliances | Percentage of houses | Total houses surveyed | Change since 2003* |
|---|---:|---:|---:|
| Electricity available | 95% | 3,661 | |
| Electric powered hot water system | 51% | 3,653 | |
| Solar powered hot water system (most systems have electric boosters that use high amount of electricity) | 40% | 3,653 | |
| Heat pump hot water system (uses small amount of electricity) | 0% | 3,653 | |
| Electric cooktop installed | 72% | 3,631 | ‹ |
| Reverse cycle refrigerated air non-ducted cooling system | 10% | 3,662 | |
| Reverse cycle refrigerated air ducted cooling system | 4% | 3,662 | |
| Plug in electric heaters | 5% | 3,660 | |
| Incandescent lights | 50% | 1,699 | |

* See ‘Changes in the conditions of houses’ on page 18 for an explanation of the symbols used in this column.

## Standards and references

Centre for Appropriate Technology ‘Renewable energy in remote communities’, Bush Tech Brief #2, *Our Place*, 17, Winter 2002 Alice Springs, http://www.icat.org.au/documents/op17.pdf

# C2.2 Gas

Gas is used in some communities as an affordable alternative fuel for cooking and heating, or to reduce the load demand on the electrical power generation system.

The most commonly available form of gas supply in rural and remote communities is bottled gas. However, bottled gas may be no cheaper than electricity due to high delivery costs. The initial capital cost of a large gas bottle can also be too expensive for households on a low income. It is important to investigate these costs and the logistics of delivery and installation of bottles before specifying bottled gas or gas powered appliances.

Some communities have opted to reduce costs and avoid the constant maintenance associated with replacing gas bottles by installing a large centralised gas cylinder and running underground gas reticulation throughout the community. When used in this way, gas may be more cost effective than electricity for cooking, heating and producing hot water.

Before specifying any sort of gas system it is important to confirm that residents are happy to use gas in houses. It may be necessary to implement a program to familiarise residents with using gas to cook food and heat their home.

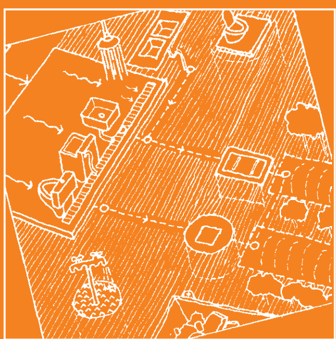
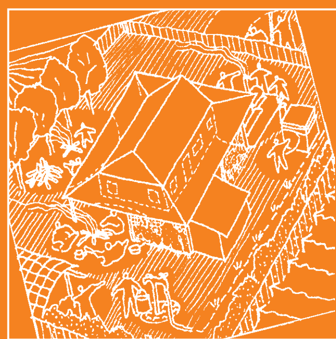
## Survey data

| Gas availability and use | Percentage of houses | Total houses surveyed |
|---|---:|---:|
| Bottled gas available | 22% | 3,661 |
| Mains gas piped to the house | 3% | 3,661 |
| Gas powered hot water system | 6% | 3,653 |
| Gas cooktop installed | 19% | 3,631 |
| Gas heating not ducted | 5% | 3,660 |
| Ducted gas heating | 0% | 3,660 |

## Standards and references

Centre for Appropriate Technology Inc. 'The use of gas for cooking', Bush Tech Brief #32, *Our Place*, 28, Winter 2002, Alice Springs, http://www.icat.org.au/documents/ op28.pdf

# C3 Waste water

# C3 Waste water

*Relates to Healthy Living Practices:*

- *removing waste water safely*
- *reducing the negative effects of animals, insects and vermin*
- *reducing the impacts of over-crowding*

Waste water or sewage contains germs, also known as pathogens that can be very harmful to people's health. Systems that remove waste water from the house, treat it and dispose of it safely are critical items of environmental health infrastructure in any community.

Increasingly, waste water in rural and remote communities is being treated and disposed of in off-site sewerage schemes that collect both the grey and black water from houses and treat and dispose of the waste water in a centralised facility. The advantage of an off-site system is that all waste water is removed from yards and living areas and handled at one place away from people, and the operation and maintenance happens in one place rather than in every yard in the community. A disadvantage is that the system can be more expensive to operate than onsite systems such as septic tanks.

There are three stages in the process of managing waste water. All three stages need to be considered when designing a sewerage system for the community and all three have some impact on decisions made during a housing project. These stages are described below.

## Stage 1 – Collection

Waste water is collected from the immediate living area and removed to a treatment facility in drain pipes. Initially this is done via the house drains, see B3.2 House drains. If the waste water is being treated off-site, the house drains will discharge to a communal sewer pipe, which is usually near one of the property boundaries.

## Step 2 – Drainage

The most common sewer drains in communities are deep sewers. Fifty four percent of surveyed houses had deep sewer drains. These are large diameter pipes with a slight fall. The household waste water flows through the pipes by gravity to the treatment ponds. In most communities, pumps are required at some points to pump the waste water back up to a higher point so that it will start flowing by gravity again. The pumps require power and maintenance. 'Vacuum sewers' have been developed to reduce the need for pumps; however, they require specialised maintenance and it is usually more cost effective to use pumps in remote communities, because they are easier to maintain or replace.

Another form of sewer drain is the 'small bore' sewer, which forms part of a common effluent disposal (CED) system. This consists of smaller, shallower pipes with a steeper fall. A small bore sewer may also require pumps to assist the gravity flow and can be subject to blockages if the on-site treatment tanks have failed. If connecting to a small bore sewer, it will be necessary to provide a primary treatment tank, that is, a septic tank, at the house.

## Stage 3 – Treatment

Waste water needs to be treated before it can be safely disposed of into the environment or recycled for use in the community. The level of treatment depends on how and where the effluent is disposed.

The first level of treatment ('primary' treatment) removes solids and some bacteriological pollutants. Septic tanks provide primary treatment to waste water. Effluent that has only received primary treatment poses a significant threat to people's health, and is of such a poor quality that it must not be disposed of into the environment, except in underground trenches.

The next level of treatment of waste water is called 'secondary' treatment. During secondary treatment more of the pollutants that are harmful to health are removed, as well as some of the pollutants that are harmful to the environment. The treatment ponds in most sewerage systems treat waste water to a secondary level so that it can be discharged to the sea, a river, an evaporation pond, or some other licensed disposal point. A licence is required for any effluent discharge, and the license conditions will require a minimum quality of treatment to be achieved. Secondary treated effluent may be re-used for irrigation in sub-surface systems, but should not be sprayed or used for food crops or on playing fields. It may be suitable for use on a woodlot or community wind break or for growing pasture for stock.

The effectiveness of the treatment pond in treating effluent will depend on how long the water stays in the ponds. If there are multiple water leaks from faulty taps or toilet cisterns in the houses, there will be more water flowing through the treatment ponds, which lessens the treatment time and reduces the quality of the treated effluent. Some communities have made substantial improvements to the performance of their sewage ponds by fixing all leaking taps in the community. If stormwater pipes are connected to sewerage systems, the ponds will not work effectively whenever it rains due to the additional water load.

'Tertiary' treatment is a higher level of waste water treatment after which the effluent can be recycled in the community. However, tertiary treated effluent is not safe to drink unless the treatment system is specifically designed to produce potable water. Package treatment systems usually provide tertiary level treatment, and mechanical and chemical treatment systems can be added to treatment ponds to achieve tertiary level treatment. Although it is expensive to treat waste water to a tertiary level it may, in some situations, it can be more cost effective than developing additional water sources. In environmentally sensitive areas, government agencies may require tertiary treatment before effluent can be discharged to the environment.

## Design and specification

*For new housing projects:*

- confirm the type of sewerage system currently available in the community and any future planned upgrades, design the house drains to suit the circumstances
- check the location and height of the nearest sewer pipe, and confirm there is enough fall to get the waste water from the house to the main sewer connection point and avoid using pumps wherever possible

- ensure the overflow points in the main sewer line and overflow relief gullies in the yard are lower than the floor of the house, and that all house drains are located so that any emergency sewer overflow will not flood the house or outside living areas, will not pond in the yard and will not overflow near paths and door ways
- if permitted by the local council, consider first treating grey water from the laundry and/or bathroom and then connecting these drains directly to a sub-surface irrigation system, as this will assist in saving water and in reducing the load on the treatment ponds
- find out the level of waste water treatment available/planned for the community and, if appropriate, provide a second system of supply pipes in the yard and house that could be used for recycled water.

## Quality control

*During construction and before making the final payment, check that:*

- all house drains have been inspected before backfilling and are legally connected to the disposal system
- the local council or essential services operator has inspected, tested and approved the connection to the sewer
- 'as built' drawings are completed, showing the location of house drains and the connection to the sewer
- stormwater pipes are not connected or discharged to the house drains or mains sewer.

## Maintenance

*As part of cyclical maintenance:*

- repair leaking taps to reduce the load on the waste water disposal system
- check and maintain house drains
- ensure that downpipes and stormwater drains are not connected to the sewer, and disconnect or re-direct any drains that are connected
- pump out septic tanks that form part of a CED system
- service and maintain pumps and valves in the sewer to avoid failure
- maintain the treatment ponds
- fix broken or blocked stormwater pipes that are flowing into local land application areas.

## Survey data

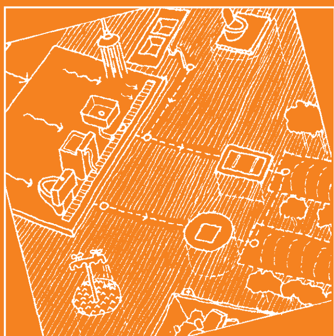
| Waste water systems and detail | Percentage of houses | Total houses surveyed | Change since 2003* |
|---|---|---|---|
| **Type of waste water system** | | | |
| No waste water system | 3% | 3,658 | |
| Deep sewer system | 54% | 3,658 | ‹‹ |
| Houses using septic systems of any type | | | |
| **Septic tank and common effluent system 28%** | | | |
| Septic tank and soakage trenches 14% + | 42% | 3,658 | ++ |
| Aerobic waste water package treatment system | 1% | 3,658 | |
| All drainage around the house OK (this question records if drainage failures are obvious in the yard area around the house) | 73% | 3,660 | |
| **Dry system toilets** | | | |
| Dry toilet | 5% | 1,961 | |
| In-ground pit toilet | 2% | 1,961 | |
| Contained composting toilet | 3% | 1,961 | |
| **Details of the waste systems** | | | |
| Grease trap | 8% | 3,632 | |
| Septic tank not able to be located | 5% | 1,089 | |
| Pump out truck had access to septic tank | 91% | 1,089 | |
| Septic tank lid protected from damage | 60% | 1,089 | |
| Septic tank lid not protected from damage | 33% | 974 | |
| No soakage trench (CED (common effluent disposal) system) | 58% | 1,303 | |
| Functional soakage trench | 31% | 1,303 | |
| Non-functional soakage trench | 12% | 1,188 | |

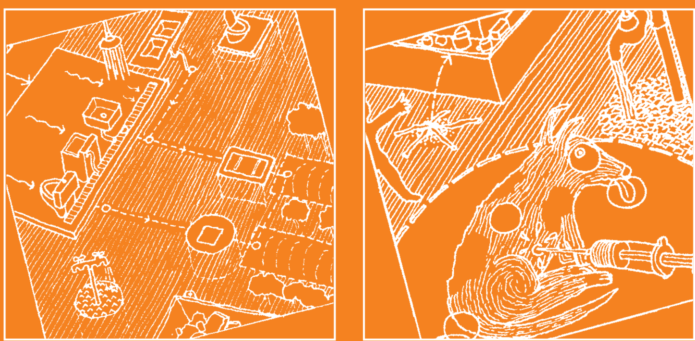
* See 'Changes in the conditions of houses' on page 18 for an explanation of the symbols used in this column.

## Standards and references

Marshall, G 2004 *Monitoring of septic tanks on Central Australia remote Aboriginal communities*, NT Department of Health and Community Services in conjunction with the Centre for Sustainable Arid Towns, Alice Springs

# C4 Household rubbish disposal





# C4 Household rubbish disposal

*Relates to Healthy Living Practices*

- *removing waste water safely*
- *reducing the negative effects of animals, insects and vermin*

Most communities have a system of collecting rubbish from households and disposing of it at a common point. This may range from an automated truck and wheelie bins through to collection of rubbish by a local team using a utility vehicle. Rubbish tips are usually subject to state/territory licensing regulations, although in some very small communities the tip could be a basic hole in the ground that is unfenced. Communities near regional centres may have recycling systems; other communities sort food scraps that will easily rot or decompose from other rubbish; and some communities have community wide composting programs.

When undertaking housing projects it is important to find out what rubbish collection systems are available in the community and to provide bins and bin storage areas that are suited to that system.

## Design and specification

*For new housing projects, ensure that:*

- every new house is provided with at least one large outdoor bin, and more bins are provided if the community has sorting, recycling or composting programs
- there is an area where the bin can be stored that is accessible from the kitchen and can be easily accessed for emptying
- a post or chain or other mechanism is provided to secure the bin in an upright position and prevent it being knocked over by dogs and other animals
- for combined multiple dwellings, there is a designated garbage bin storage area.

## Quality control

During housing construction and before making the final payment, check that:

- bins are provided and secured.

## Maintenance

As part of cyclical maintenance:

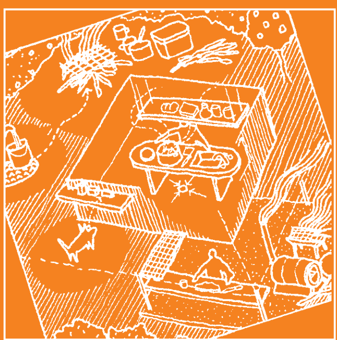
- empty bins at least once a week, and maybe more often
- replace broken or missing bins
- consider developing waste minimisation programs, such as recycling or composting.

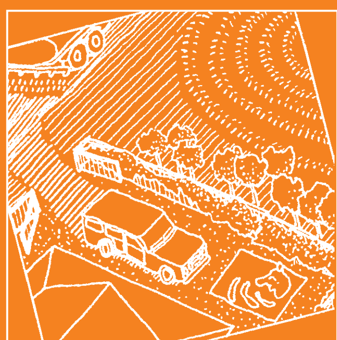
## Survey data

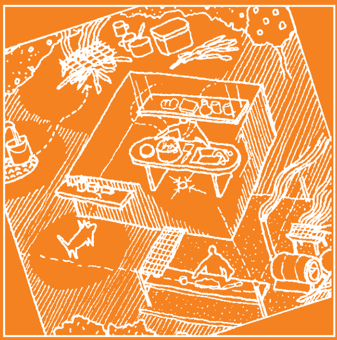
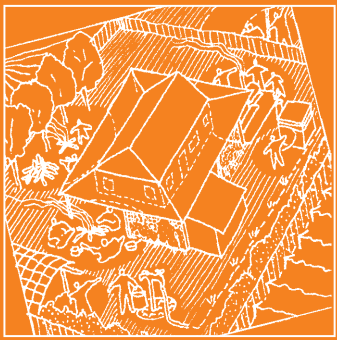
| Rubbish disposal systems | Percentage of houses | Total houses surveyed | Change since 2003* |
|---|---|---|---|
| **Type of rubbish disposal system** | | | |
| Kitchen bin, regular collection | 46% | 3,099 | ‹ |
| Kitchen bin, no regular collection | 3% | 3,099 | |
| No kitchen bin, regular collection | 45% | 3,099 | |
| No kitchen bin, no regular collection | 6% | 3,099 | |

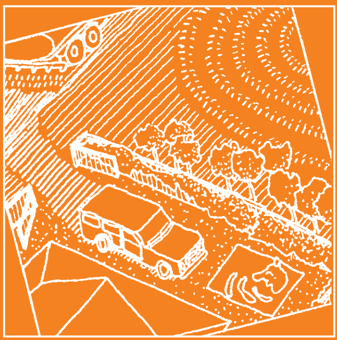
* See 'Changes in the conditions of houses' on page 18 for an explanation of the symbols used in this column.

# C5 Community planning







## C5 Community planning

*Relates to Healthy Living Practices:*

- *improving nutrition: the ability to store, prepare and cook food*
- *reducing the impacts of over-crowding*
- *reducing the negative effects of animals, insects and vermin*
- *reducing the health impacts of dust*

The overall planning and layout of the community affects many of the Healthy Living Practices.

Examples of community planning decisions that affect safety and health include whether:

- paths are provided for children to safely walk around the community
- there are street lights to allow people to safely walk around the community at night
- roads are laid out to avoid excessive speed and to reduce blind corners
- space between houses allows a garden and outdoor living area
- the new housing area is located on high ground to avoid being flooded in heavy rains
- rural or remote communities are fenced to keep out feral animals
- shrubs, ground covers and sealed roads are provided to prevent dust

New developments in communities are often based on urban design principles and engineering decisions related to power, water and sewerage services. Little consideration is given to the overall pattern of development and the community's wishes. These approaches do not achieve the best outcome for residents and may have long term negative social and financial implications.

A community plan should be developed to reflect community priorities and preferences, taking into account safety, health and environmental constraints. Allow plenty of time during the consultation process for residents to think about the proposed growth and development. The plan should be discussed with the community and ideally, could be pegged out on site to demonstrate the practical application of the plan. Opportunities should be provided for the community to make changes during the development process.

A community plan should cover all aspects of the community development, from small projects that are important to the community such as landscaping and playgrounds, through to the location of new housing and community buildings and infrastructure. The plan also needs to show areas that cannot be developed because of environmental or cultural constraints. Once developed, all agencies working with the community should formally acknowledge and adopt the plan. However, plans must be considered as 'living' documents and a process put in place to regularly review and update the plan.

*In the initial planning stage, identify:*

- current areas of development and the location of existing infrastructure
- sites, vegetation and topographical features that the community do not want to develop for cultural, historical, environmental or other reasons
- prevailing climatic conditions, such as hot and cold winds, dusty winds, the direction of storms and wind driven rain, and possible fire fronts
- topographical constraints, including steep hills, land subject to flooding, or sites that can become isolated by seasonal creeks and flooding; it is particularly important to discuss this with residents in arid areas where the water flow patterns may not be obvious
- areas subject to pooling or that retain stagnant water and may become mosquito breeding grounds
- environmentally sensitive areas.

*Consider and discuss with the community:*

- lines of sight people may want to maintain or develop in the community, such as to significant landscape features or of the main communal areas
- areas of the site that the community would like to develop for housing, and the feasibility of extending services to these areas
- the space people want between houses and how they want houses to be positioned in relation to other houses, streets and the whole community
- other community priorities and planned projects and suitable locations for these, including the feasibility of providing essential services and infrastructure to those sites
- providing safe foot paths for people to walk around the community
- providing safe playgrounds and other recreation or public spaces
- options for road designs, such as grid layouts versus cul-de-sacs and dead ends, speed reduction strategies, shared vehicle-pedestrian areas, car-parking and foot paths
- ways to reduce the number of roads and tracks used by cars and strategies to make them safer and connect them to new development
- opportunities for incorporating planting for shade, dust control and food bearing plants, along streets, around houses and in public places
- planning for the development of mounds, swales and other landscape elements that allow the collection and use of stormwater for landscaping
- the safe location of essential services infrastructure, such as locating treatment ponds down wind of living areas and in a location where they will not be flooded; and reducing noise and fumes from new power generators
- locating down wind of living areas, any areas that generate dust and airborne contaminants, including ungrassed ovals, dirt roads, unsealed airstrips and the rubbish tip
- in tropical communities, strategies to reduce pooling water and mosquito breeding areas
- the need for fences or other measures to keep feral animal out of the community.

## Standards and references

National Health and Medical Research Council 2005, *Australian Drinking Water Guidelines – Community Water Planner*, Australian Government, Canberra

Queensland Department of Health 2002, *Guidelines to minimise mosquito and biting midge problems in new development areas*

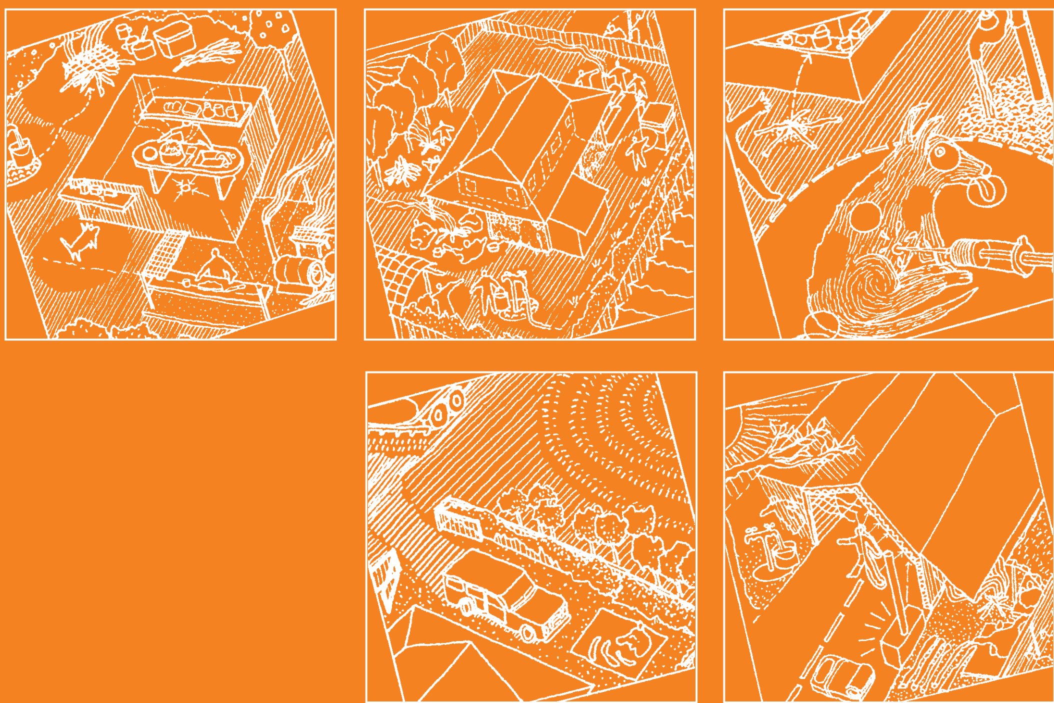
Harris, G (ed.) 2000, *Environmental Health Handbook: A Practical Guide for Remote Communities*, Menzies School of Health Research, Casuarina

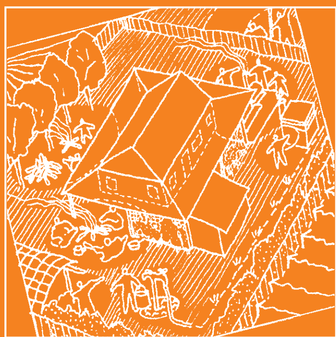
Centre for Appropriate Technology Inc. & Port Stewart Lamalama 1997, *Moojeeba-Theethinji: Planning for a healthy growing community*

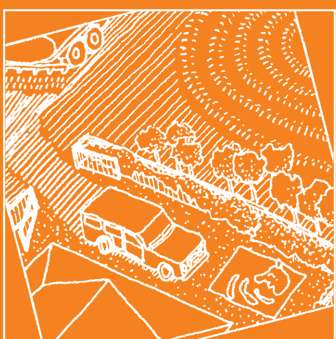
Djabugay Tribal Corporation & Centre for Appropriate Technology Inc. 1999, *Mona Mona: Working Together for a Healthy Community Planning Report*

Marpuna Corporation, Centre for Appropriate Technology and Queensland Health 1995 *Planning for a Healthy Community, Old Mappoon, A Pictorial Summary*, Centre for Appropriate Technology, Cairns

# C6 Landscaping






# C6 Landscaping

*Relates to Healthy Living Practices*

- *improving nutrition: the ability to store, prepare and cook food*
- *reducing the impacts of over-crowding*
- *reducing the negative effects of animals, insects and vermin*
- *reducing the health impacts of dust*
- *controlling the temperature of the living environment*

Landscape strategies for the whole community will support individual household efforts to grow food plants, ground covers and shade trees related to the Healthy Living Practices. References to the use of plants and landscape to support Healthy Living Practices have been made throughout this guide. In particular, see B7 Reducing the health impacts of dust, which discusses the use of landscaping to control dust and B8 Controlling the temperature of the living environment, which includes ideas for shade trees and wind breaks.

This section considers 'hard landscaping' such a pavers, fences and earth mounds, and 'soft landscaping' such as planting and cultivating trees.

## Design and specification

*Consider:*

- constructing planted earth mounds or planting vines on high fences throughout the community, for use as wind breaks in colder climates
- fencing all houses and buildings, and planting vines on the fences to stop dust
- planting shade trees and food plants along walkways and around places where people meet
- developing a community nursery to grow plants for household gardens, food plants and plants used for traditional ceremonies and crafts
- planting drought tolerant grasses on sports fields, and using stormwater or stored rainwater on the grass
- growing drought tolerant ground covers on open, unsealed areas to reduce dust
- capturing stormwater from roads, paths and open areas and using it to water plants
- planting trees or building earth mounds to prevent cars using unsealed tracks that cause dust and erosion
- developing a program to seal all roads in the community to reduce dust
- using native plants that need little water, wherever possible
- planting woodlots for communities that need fire wood for cooking or heating
- planning to make the public areas and houses more accessible to people with disabilities.

## Maintenance

*As part of cyclical maintenance:*

- employ and equip a parks and gardens team to maintain landscaping throughout the community.

## Survey data

| Landscaping | Percentage of houses | Total houses surveyed |
|---|---|---|
| Outside cooking areas | 41% | 3662 |
| Windbreak planting | 22% | 3662 |
| Food planting | 25% | 3662 |
| **Fenced yard** | | |
| No fenced yard | 31% | 3661 |
| Yard > = 900 sq m | 37% | 3661 |
| Yard < 900 sq m | 33% | 3661 |
| Fence and gate OK | 41% | 2952 |
| Fence and gate not OK | 45% | 2389 |
| **Working motor cars in yard** | | |
| No working motor cars in yard | 56% | 3660 |
| 1 working motor car in yard | 28% | 3660 |
| 2 working motor cars in yard | 10% | 3660 |
| 3 or more working motor cars in yard | 6% | 3660 |

## Standards and references

Centre for Appropriate Technology 'Rainwater harvesting', Bush Tech Brief #4, *Our Place*, 17, Winter 2002 Alice Springs, http://www.icat.org.au/documents/btb4.pdf

# C7 Communications

# C7 Communications

Access to telecommunications can be important for contacting emergency services in relation to safety and health, as well as a way of maintaining cultural, family, social and economic obligations. The current number of fixed telephone residential connections in remote Indigenous housing is extremely low by comparison with the wider Australian situation. For example, the service take-up rate amongst residents in remote Northern Territory Indigenous communities when surveyed in 2002 was estimated at 1.5% (Department of Communications Information Technology and the Arts 2002) compared to about 38% Australia wide.

Further, access to public telephone services is limited. In 2002, only 267 of 1002 small Indigenous communities with a population of fewer than 50 had a payphone.[14] However, in addition to the safety factors involved, more facilities are being introduced to encourage the uptake of residential services. These include:

- Country Calling Line, a Telstra low rental residential product that requires calls to all but 000 and some 1800 free call destinations to be made using a pre-paid phone-card;
- Extended zone calling, whereby calls within and between adjoining calling zones in remote Australia are untimed and are charged at the local call rate. (Extended zones cover about 80% of Australia's land mass and range between 8,000 and 300,000 square kilometres in area.)
- A delayed hotline feature, whereby a residential caller is connected through to a pre-programmed number without needing to dial.

For new housing, ensure that provision is made for residents to have the phone connected. It is recommended that facility cabling with at least two phone access sockets should be provided in each new or refurbished dwelling, to provide residents with some flexibility in the location of their phones. External cabling will normally be provided by the telecommunications carrier to extend the connection from their network to one of these sockets. Where a group of houses is being built or undergoing a major refurbishment, the provision of network cabling in the area should be coordinated with the carrier.

At a community level, ensure that public phones are accessible and reliable, and that they are in a safe location.

If the community has difficulty accessing phone services, they may be able to get assistance by contacting the Telecommunications Industry Ombudsman who can enforce the Community Service Obligation that requires telecommunication providers to offer services to rural and remote residents.

Also discuss with the community other communication needs, such as broad band internet, video conferencing and computer networking, and ensure the appropriate infrastructure is included in new and renovated buildings.

14 Australian Communications Authority 2004, *Report of the Payphone Policy Review*, Melbourne

## Contacts and references

Telecommunications Industry Ombudsman can be contacted at
**http://www.tio.com.au/**

Freecall: **1800 062 058***

Freefax: **1800 630 614**

TTY: **1800 675 692**

Translator & Interpreter Service: **131 450**

## Standards and references

Centre for Appropriate Technology 'How to get a telephone', Bush Tech Brief #8, *Our Place*, 18, Spring 2002 Alice Springs, http://www.icat.org.au/documents/op18.pdf