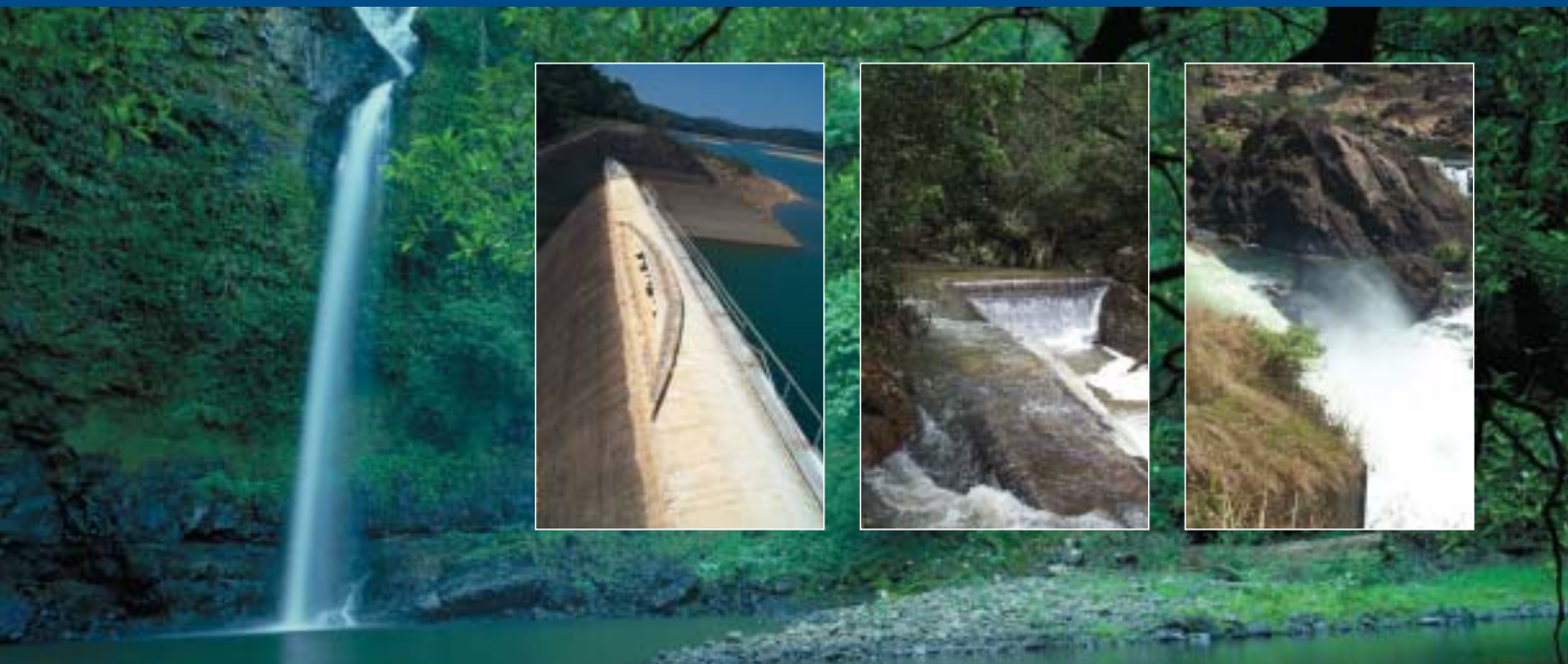


WATER INFRASTRUCTURE CODE OF PRACTICE



Field Guide for the Maintenance
and Operation of Water
Extraction Infrastructure in the
Wet Tropics World Heritage Area



Who should use this guide?

Anyone maintaining or operating water extraction infrastructure in the Wet Tropics World Heritage Area including:

- plant machine operators;
- contractors or employees of water supply agencies; and
- landholders.

What is a Code of Practice?

This field guide is a summary of a larger document “Code of Practice for Water Extraction in the Wet Tropics World Heritage Area”.

The Code of Practice is a manual on how to operate and maintain water supply infrastructure while protecting and minimising impacts on the Wet Tropics World Heritage Area.

Published by the Wet Tropics Management Authority with funding from the Natural Heritage Trust and assistance from Local Councils and Government Agencies. ISBN# 0-646-42504-8



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What is so special about the Wet Tropics World Heritage Area?

The Wet Tropics World Heritage Area:

- Is one of the world's richest sites of biodiversity. It covers only 1% of the landmass of Australia, yet it is the home of 35% of Australia's marsupial species, 25% of frog species, 62% of butterfly species and 50% of bird species.
- Has a very diverse range of vegetation including many types of rainforest, mangrove forests, wet and dry sclerophyll forests and tall open forests.
- Is enjoyed by over two million visitors each year.



What do we want to achieve?



The Goals of the Wet Tropics Management Authority is to manage water extraction in a way that:

- Maintains and enhances World Heritage integrity.
- Conserves the World Heritage values of the area.
- Protects the water regime required to sustain ecological values and systems.

Activity	Desired Outcome
Vegetation management	Prevent unnecessary damage and loss of plant and animal species associated with vegetation clearing.
Herbicide use	Prevent uncontrolled use of herbicides in the Wet Tropics World Heritage Area.
Weed control and hygiene	Prevent new outbreaks of weeds and control existing infestations in the Wet Tropics World Heritage Area. Prevent the introduction of non-endemic species.
Erosion and sedimentation control	Make sure that maintenance activities do not cause erosion and sedimentation of waterways.
Siting and design of infrastructure	Maintain and enhance existing infrastructure facilities in a way that blends with the natural environment. Ensure cultural heritage sites are not disturbed by maintenance activities.
Waste management	Minimise waste and prevent environmental pollution.
Operation of facilities	Prevent impacts on animals caused by vibration, noise or air pollution due to maintenance and operation activities.
Training of personnel	Ensure maintenance workers in the Wet Tropics World Heritage Area are given suitable environmental training.
Monitoring, performance indicators and reporting	Identify any impacts of water extraction on key ecological values so that appropriate remedial actions can be taken.

Some useful definitions

Permit

- A permit gives formal permission to undertake activities that interfere with soil, water or vegetation in the Wet Tropics World Heritage Area.
- These permits are issued by the Wet Tropics Management Authority under the Wet Tropics Management Plan 1998.
- All operators of water extraction infrastructure in the Wet Tropics World Heritage Area are required to have a permit.

Upgrade

- Widening or enlarging roads or car parks.
- Developing or enlarging existing structures.
- Increasing the amount of water extracted in excess of that lawfully permitted before the Wet Tropics Management Plan commenced (1 September 1998).

Maintenance activities

- Works taking place within the existing infrastructure footprint.
- Works which are not intended to 'upgrade' the infrastructure.

Flow regime

- The amount of water that flows through a river or creek system.
- The rate of water flow which is influenced by the width, shape and gradient of the river or creek. For example: bends in a river help to slow down the water flow and create habitats for creatures that prefer slow moving water.

Riparian vegetation

- Trees and other plants growing alongside a river or creek.

Key ecological values

- Ecological processes which maintain the healthy functioning of the World Heritage Area and its values. eg. natural stream flows.

Community water supply infrastructure

- Infrastructure managed by an agency for the supply of urban, rural or industrial water resources (including hydro-electrical facilities) to the community.

Infrastructure footprint

- The area of land covered by the road, building or other structure which forms part of the existing water supply infrastructure. Refer diagram on following page.

WTMA

- Wet Tropics Management Authority

QPWS

- Queensland Parks and Wildlife Service

DNRM

- Department of Natural Resources and Mines

World heritage values

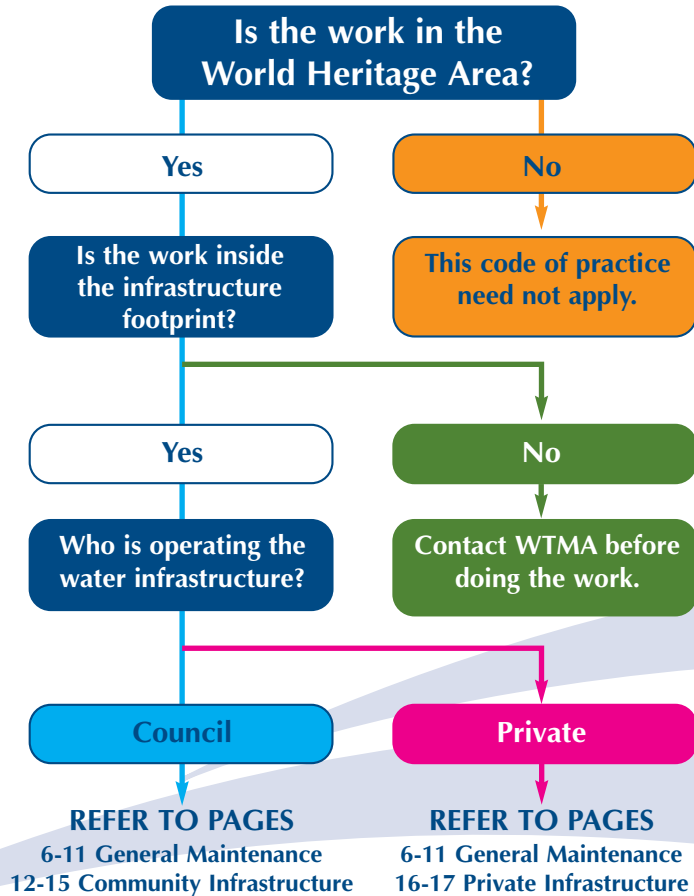
- Biological diversity in all its forms, including scenic values.

EPA

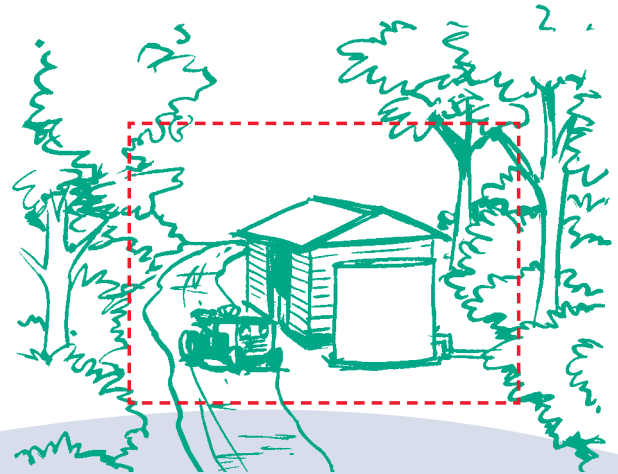
- Environmental Protection Agency



Check list - Before you commence work, take a minute to answer these questions



Infrastructure 'footprint'



General maintenance

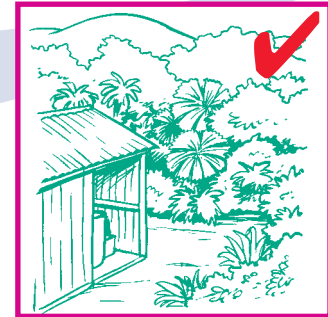
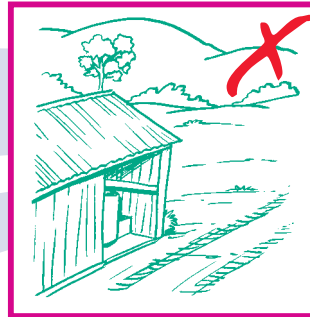


Vegetation management

When maintaining access tracks and areas around infrastructure:

- ✓ Only remove vegetation that poses a risk to safety or to infrastructure.
- ✓ Use the smallest machinery possible to carry out the works.
- ✓ Try to identify any areas of importance or particular plants that have conservation values* prior to trimming. Mark important areas or plants.
- ✓ Retain canopy vegetation as much as possible.
- ✓ Conduct minor vegetation management regularly (for example once per year) rather than leaving for longer periods.
- ✓ Conduct vegetation management works when soils are dry.
- ✓ Place native plant prunings in the forest next to the work area. Take care not to damage other plants or block drains.
- ✓ Use clean cuts when pruning.
- ✓ Leave ferns and orchids growing on the prunings.

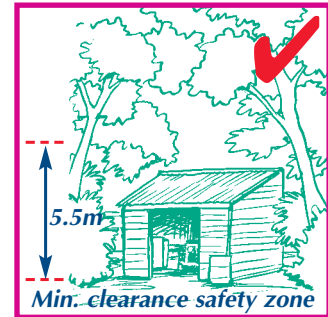
*Contact your local QPWS office for information about plants in your area with high conservation values.



Retain as much vegetation as possible around infrastructure



Trim trees rather than remove



Retain canopy vegetation as much as possible



Herbicide use

- ✓ Use herbicides only when mechanical methods are not economical or possible.
- ✓ Ensure herbicides are applied by properly trained staff.
- ✓ Use non-residual herbicides specifically registered for the purpose. Suitable additives should be used to prevent loss of herbicide by rain, runoff or wind.*
- ✓ Record herbicide use (type, location, amount, date).
- ✓ Store concentrates in a bunded, covered area. Where possible, mixing should be carried out in the store in accord with the manufacturer's guidelines.
- ✓ Take care to avoid spills.
- ✗ Do not use herbicides during windy or wet weather.



*Contact your local Council Pest Officer or DNRM Land Protection Officer for information on registered non-residual herbicides and suitable additives.



General maintenance

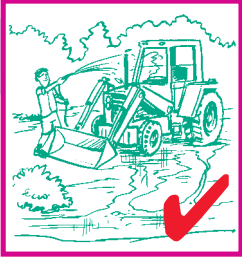
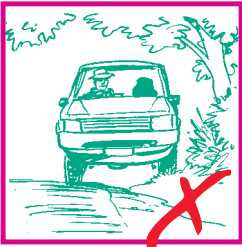
Weed control

- ✓ Try to identify the type of weeds occurring around infrastructure sites*.
- ✓ Seek training in the identification of weeds occurring within the district.
- ✓ Report any weed outbreaks to your Environmental Officer, local Council Pest Officer or WTMA. Seek advice for environmental management for control/eradication procedures from DNRM or QPWS.
- ✓ Treat weeds using specifically registered herbicides.
- ✗ Do not dispose of vegetation from other areas in the World Heritage Area, as they may contain weeds.

*A list of weed species of concern in the Wet Tropics is provided in The Weed Pocket Guide available from WTMA.

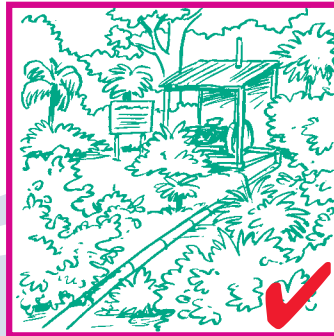
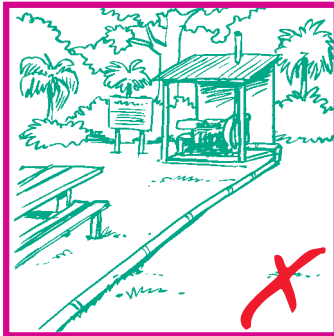


Hygiene

- ✓ Keep shoes, clothes and equipment (including vehicles and tyres) free of any soil or seed before moving between work areas.
 
- ✓ Wash down vehicles and machinery if they leave the road formation or go through weedy areas. Make sure water from wash down procedures does not enter waterways.
 
- ✓ Make sure any plants used for erosion control (eg. ground cover) are approved by WTMA prior to use.
- ✓ Monitor infrastructure areas for weeds or dieback. If dieback or weeds are suspected report to them to WTMA, DNRM or QPWS.
- ✓ Ensure construction materials and equipment are free of exotic animals (eg. spiders, toads, mice and house geckos) before being transported into the World Heritage Area.
- ✓ Ensure fill, topsoil or mulches used in any works are checked and treated for weed and disease contamination prior to importing to any sites within the World Heritage Area.
- ✗ Don't introduce new plants or animals such as crayfish or fish into any waterways.

Location, design and appearance

- ✓ Encourage regrowth of natural vegetation to screen infrastructure.
- ✓ Paint structures in colours that blend with surroundings.
- ✓ Use signs that blend in with the surrounding area where possible.
- ✓ Design walking tracks, entry points and maintenance to allow easy public access to waterways where required.
- ✓ Use anti-graffiti treatments on structures.



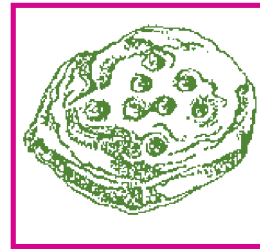
Access tracks

- ✓ Maintenance of access tracks and roads should conform to the Roads in the Wet Tropics Best Practice Manual (Main Roads, 2002) available from WTMA.

Cultural values

If a site of possible cultural heritage value is found:

- ✓ Mark the area and advise other workers that the area should not be disturbed.



Nutcracking stone



Ground edge axes

- ✓ Immediately report the site to the EPA (Cultural Heritage Section). Try to take photographs and sketch a map of the site.
- ✓ Advise WTMA of the location and nature of the site.
- ✗ Don't disturb the site. The relationship of artefacts to each other and to elements of the natural landscape are important in understanding the significance of the site.

General maintenance

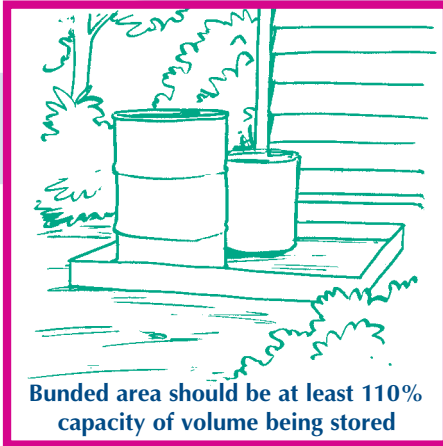
Waste management

- ✓ Reduce waste amounts and recycle where possible.
- ✓ Separate different types of wastes to make them easier to handle and recycle.

- ✓ Remove waste from the World Heritage Area as soon as possible.

- ✓ Store wastes in a sheltered, bunded area above flood level.

- ✓ Use marked, specific purpose containers to store liquid wastes.



- ✓ Ensure maintenance contractors responsible for management and removal of all waste are trained and aware of requirements for waste management.

Vibration, noise and air quality

- ✓ Select maintenance techniques and equipment that minimise noise, vibration and air pollution.

- ✓ Restrict the use of noise and vibration producing machinery to daylight hours.

- ✓ Use temporary noise barriers during maintenance work (eg. stacks of hay bales).

Training

All staff and contractors carrying out maintenance works must:

- ✓ Have appropriate training in environmental awareness protection procedures.

- ✓ Be briefed on all permit requirements and have an understanding of the impacts that inappropriate activities can have on the environment (refer pages 18-21).

Monitoring, performance indicators and reporting

Monitoring programs are used to measure the success of the Code of Practice. Each program contains a set of performance or 'key' indicators. Indicators may include:

- extraction and flow rates;
- changes in plant and animal communities, and/or numbers; or
- water quality parameters such as turbidity, nutrients and dissolved oxygen levels.

With your monitoring program make sure that you:

- ✓ Comply with permit conditions including any requirement for monitoring impacts of activities on key indicators.
- ✓ Provide reports to WTMA on the results of any monitoring in relation to indicators.
- ✓ Take appropriate actions to reduce impacts identified. This may require changes to the way water infrastructure is maintained and operated.
- For assistance in developing your monitoring program contact WTMA.



Community water infrastructure - specific structures

Water intakes

- ✓ Try to keep intakes at least 30 cm below water surface and 1 m from bank.
- ✓ Don't make weirs higher or excavate the stream bed to make the water deeper during dry periods.

Sand traps, screens, screen chambers

When maintaining these structures:

- ✓ Return leaves and sand removed from screens and traps to the stream. Try to put them back into the stream in a number of small loads after rain when the stream is running fast.
- ✓ Put material back immediately after a flood, as soon as safe access is possible.
- ✓ Place larger material nearby where it doesn't damage any vegetation, or use it for on-site stabilisation works.
- ✓ Remove bent or damaged screens to an off-site workshop for repair.

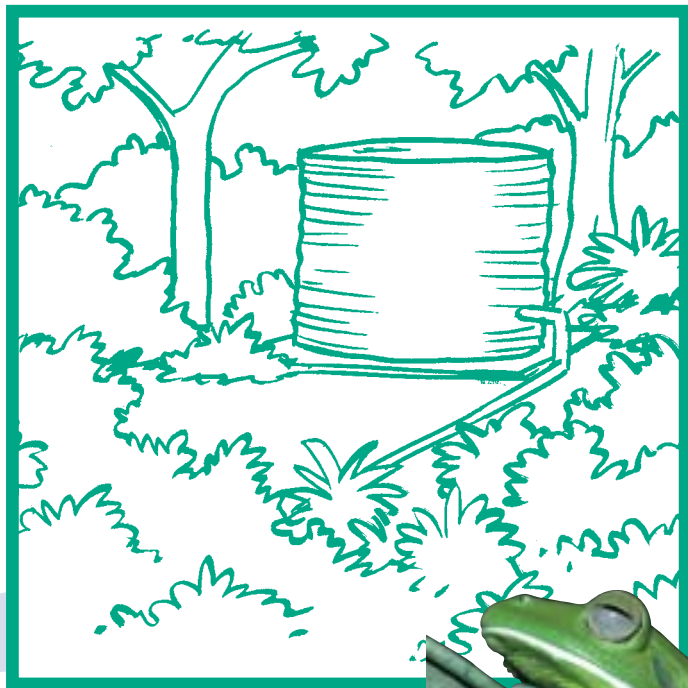




Off-stream storages

Reservoirs are often used for off-stream storage at some sites in the World Heritage Area. When maintaining reservoirs, make sure that you:

- ✓ Use plants to screen the structures.
- ✓ Paint structures in colours which blend with surroundings.
- ✓ Install drains from overflow points to natural drains/waterways.
- ✓ Try to:
 - line drains with vegetation;
 - line chutes to prevent water flowing down steep slopes; and
 - revegetate earthworks to control erosion and weeds, and improve visual amenity.



Community water infrastructure - specific structures



Water mains, pipelines

Pipelines require little maintenance. Above ground structures require periodic rust treatment and painting. Potential impacts relate to the type of products used (eg. lead based primer), handling and disposal of slag material during sand blasting and the use and storage of paint products. When maintaining these structures:

- ✓ Select products to minimise the potential for environmental harm.
- ✓ Collect all slag material generated during sand blasting and dispose at a licensed disposal facility.
- ✓ Store paint and other chemicals in a covered and bunded area.
- ✓ Mix chemicals and clean equipment in the bunded area.
- ✓ Mix and use chemicals according to manufacturers directions.
- ✓ Paint pipe-work in colours which blend with surroundings or use plants to screen the pipework.

Weirs

Concrete weirs are stable, low maintenance structures. However, they interrupt the flow regime of the stream creating barriers to movement of fish and other animals and interfere with reproduction and recruitment of juveniles. Instream structures also interrupt the transport of sand and organic matter from upstream areas to estuaries and coastal beaches. When maintaining these structures, make sure you:

- ✓ Regularly remove sediment from weirs. When safe access allows, try to put sediment back downstream from the weir in a number of small loads after rain when the stream is running fast.
- ✓ Investigate improvements to weirs that decrease the barrier effect of the weir to the natural flow. These could include low flow bypasses or the construction of fishways.

Earth dams

Dams interrupt the flow regime and create barriers to the movement of fish and other animals. They also trap sediment and starve coastal beaches of sand and organic matter. Deep water storages can create pockets of water which are low in oxygen and a different temperature to downstream. Release of poorly oxygenated water can have significant impacts on downstream aquatic life. When using or maintaining these structures:

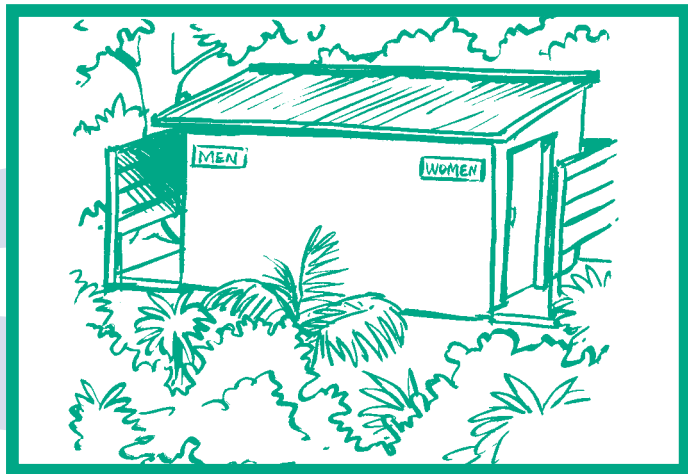
- ✓ Use mulch or hydraulically applied organic fibres to reduce regrowth on dam walls, while protecting the surface from erosion. Organic fibres should be weed free.
- ✓ Investigate release regimes that model natural flows. If possible, adjust releases to reinstate elements of natural flow and prevent impacts on downstream water quality (that is temperature and dissolved oxygen levels).
- ✗ Don't use herbicides in areas within 30m of a waterbody or drainage lines.



Minor infrastructure items

These include sheds, residences, walkways, stairways and visitor facilities (picnic tables, BBQs, walking paths, scenic lookouts, gardens, toilets). Maintenance (eg. painting, landscaping) of these structures will generally have a low impact. The greatest potential impacts are related to the presentation of World Heritage values. To avoid impacting on an area's appearance, make sure that you:

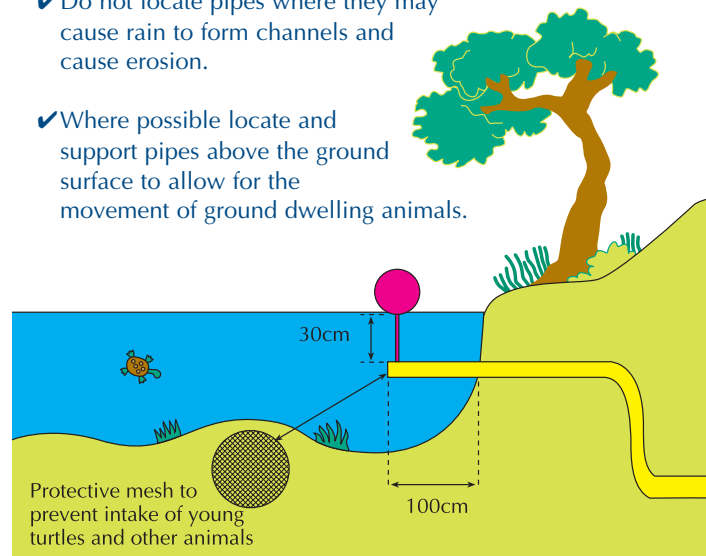
- ✓ Paint structures in colours which blend with surroundings.
- ✓ Use plants to screen the structures.
- ✓ Control or remove weeds.



Domestic or private water infrastructure

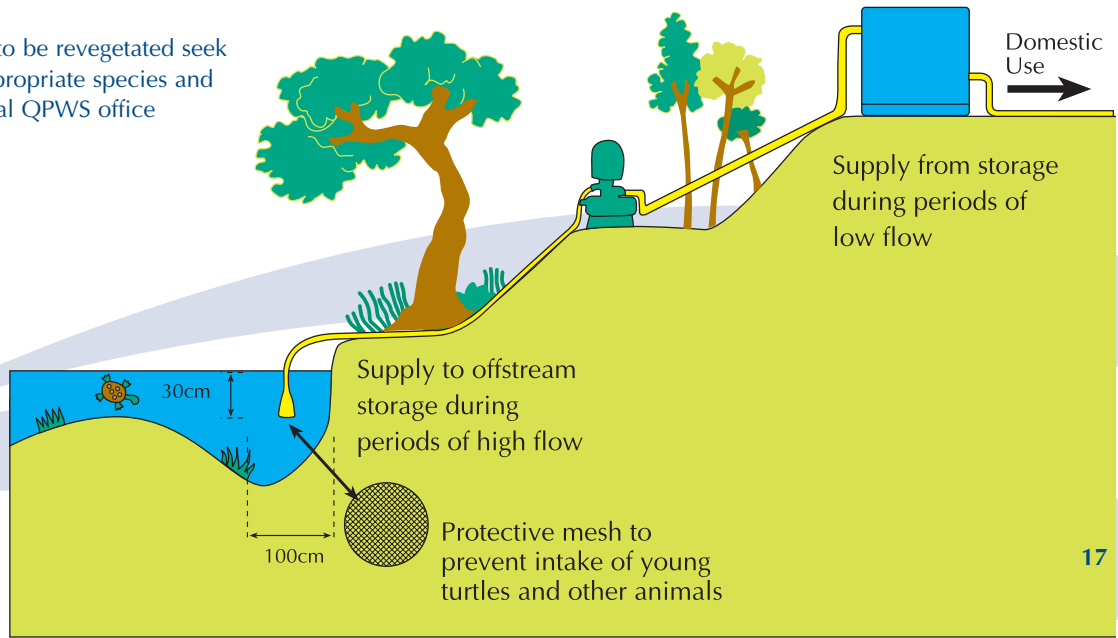
- ✓ Where practical, locate pumps above the highest flood level of the waterway.
- ✓ Pump inlets should be meshed and positioned at least 30 cm below the low flow water surface and at least 1m from the bank to avoid uptake of juvenile native fish, turtles and other animals.
- ✓ Keep the pipe inlet clear of vegetation and woody debris, and remove only the minimum amount necessary to allow water to be extracted. For example, remove material from no more than a 1m radius of the inlet mouth.
- ✓ If a fuel driven pump is being used, install engine mufflers to reduce noise levels and conduct frequent maintenance checks to ensure that noise reduction is effective.
- ✓ Fuel driven pumps should generally only be used during daylight hours. If the pump is to be used for extended periods close to residences it should be housed in a sound-proof structure.
- ✓ Use flexible pipes with compression or screw fittings which can be quickly dismantled so that the pump can be removed in flood situations.
- ✓ The pump should be fixed (using quick release fastenings) to concrete footings.

- ✓ If electric power has been brought to the site, then power poles must be made possum-proof. For example, metal shrouds should be fitted to poles.
- ✓ Consider options for minimising water demand. For example:
 - rainwater collection tanks;
 - composting toilets;
 - reuse of shower, bath and laundry water; and
 - the use of water saving devices such as mist shower roses and dual flush toilets.
- ✓ Do not locate pipes where they may cause rain to form channels and cause erosion.
- ✓ Where possible locate and support pipes above the ground surface to allow for the movement of ground dwelling animals.



- ✓ Road and track access to a pump site should be kept to a minimum and should preferably be walking access only.
- ✓ Vehicle tracks should not continue into the stream channel.
- ✓ Maintain roads and tracks in accord with the 'Roads in the Wet Tropics Best Practice Manual' (Main Roads, 2002) available from WTMA.
- ✓ Where the area of earth disturbance is small, cover with leaf litter or weed-free mulch immediately after completion of work.
- ✓ Where larger areas need to be revegetated seek information regarding appropriate species and techniques from your local QPWS office or WTMA.

- ✓ Do not store fuels or maintenance materials (eg. lubricants) with extraction equipment. Fuel tanks should be banded.
- ✓ Service equipment using a drop sheet to prevent spills, solvents, or lubricants contacting the ground or drainage pathway. Empty, sealable containers should be available to contain and remove spilt or waste lubricants or fuel.



Impacts of maintaining and operating water infrastructure

Poorly designed and operated water infrastructure can have a number of impacts on stream ecosystems. By following the best practice guidelines in this field guide you can reduce such environmental impacts.

Keep water flow as natural as possible.

Minimise adding extra water to a stream.

Adding water increases the flow of water downstream and the water level.

Increased water level can result in the loss of rapids which are important for oxygenating the water.

Increased flow can lead to increases in the frequency of flood events.

More flood events can sweep away fish larvae. Some fish species rely on low flow regimes during dry seasons.

Increased flow can lead to more erosion of stream banks.

Erosion of stream banks causes loss of vegetation and increased silt.

Streams may become blocked up with vegetation and silt causing more flooding due to blockages or too many snags in the stream.



Keep water flow as natural as possible.

Minimise the amount of water you extract.

The more water you take the less there is flowing down the river.

Less water flowing will mean that more silt will build up.

The silt will fill up the stream and reduce the size of the stream.

The silt will fill deep pools and smother habitat for fish and other animals.



Less water flowing reduces water levels that will mean that more of the banks can be invaded by weeds.

Weeds like paragrass will trap more sediment that in turn reduces how much water can flow in the stream.

As the amount of flow gets less it is more likely that flooding will occur when there is heavy rain.



Less water flowing will mean that the natural spacing of pools and rapids (riffles) will change.

Changes in the spacing reduces the amount of habitat available and water conditions.

Rapids are important for adding oxygen to the water. Oxygen is used by plants and animals.



Less water flowing will change the nature of the silt being moved in the stream.

Reduced flow means that more fine sediment will settle on the stream bed.

The fine sediment can smother habitat and eggs of fish and other animals.



Less water flowing will change the temperature of the water.

An increase in temperature can disrupt the reproductive cycles of fish and other creatures.



Less water flowing will increase the salinity of the water.

Less freshwater flowing into pools means that there will be less dilution of any dissolved salts in the pool. The salts come from groundwater discharge to the stream and tidal flushing.

Increased salinity can kill fish and animals.

Impacts of maintaining and operating water infrastructure

Don't transfer water between catchments.

When transferring water between catchments you may accidentally move aquatic animals as well.

Over thousands to millions of years animals in separate catchments have evolved and though they may be very close geographically they are genetically unique.

If animals from different catchments mix and breed it will disrupt the genetic separation within a very short time.


By adding water from another catchment you are adding water that has different qualities.

Adding water with a different temperature can change the water temperature.

An increase in water temperature can disrupt the reproductive cycles of fish and other creatures.

Adding water from another catchment will increase the flow of water in the stream.

Increasing the flow of water has a number of impacts as listed on the previous page.

<p>When removing sediment from weirs, dams and reservoirs add it back to the watercourse downstream.</p>	<p>Weirs, dams and reservoirs act as sediment traps.</p>	<p>If sediment accumulates in a weir less will be available downstream to maintain the stream bed and banks.</p>	<p>Less available sediment can result in increased erosion or 'scour' of the stream bed and banks.</p>	
			<p>Less sediment can result in the loss of habitat for plants and animals.</p>	<p>Many plants and animals depend upon the sediment that collects on the bottom of a stream.</p>
			<p>Less sediment can result in increased erosion of beaches and estuaries.</p>	<p>Beaches and estuaries in the Wet Tropics region rely on the transport of sediment and sand down the rivers and creeks.</p>
<p>When designing weirs, dams or reservoirs install devices that enable fish to move upstream.</p>	<p>Weirs, dams and reservoirs can act as barriers to the movement of fish and other animals upstream.</p>	<p>If fish and other animals are prevented from moving upstream they cannot replenish upstream populations.</p>	<p>Many juvenile fish migrate upstream to feed and grow into adults.</p>	



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MANAGEMENT AUTHORITY

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