Fact sheet

SOUTH EAST LOCAL LAND SERVICES

Reticulated water systems

Reticulated water systems refer to the provision of water to livestock via a piped-water network, typically consisting of tanks, pumps, pipes and troughs.

Reticulated systems provide added flexibility in terms of sub-division and providing water throughout your farm. Supplying water through troughs can also improve water quality, which has flow-on benefits in terms of animal health and overall performance.

Careful planning is essential to ensure that your reticulation system is reliable and 'fit for purpose'. Designing a reticulation system incorporates decisions on:

- where the water will be sourced from and how much is required – is it a reliable source?
- how the water will be used (irrigation, livestock, domestic use?)
- where the water is required around the farm and at what rate
- pump selection and tank size
- selecting suitable diameter pipe, considering water requirements, distances, heights and pressures
- selecting suitable troughs for livestock (size, location, number of troughs, materials etc.)
- the potential for future expansion - this needs to be factored into the original design.

It is important to note that reticulation systems are not a 'one size fits all' as no two farms are the same. While this fact sheet outlines some of the key considerations when planning a reticulation system, it is recommended that you seek professional advice.

Water quality

Water on your farm may be derived from one or more sources, for example, a river, dam or a bore. Whatever the sources, it is important to have reliable information about your property's water supplies. This means knowing where the water is, how much is available and whether it is 'fit for purpose'. A water budget will provide this vital information.

Water quality and its suitability for stock use is critical. The quality of water can vary widely depending on the source, time of the year and recent environmental conditions.

Important water quality issues for livestock include salinity, pH and the presence of contaminants such as:

- algae
- organic material (manure, plant material etc.)
- heavy metal
- chemicals.

If you have any doubt about the quality of water that you intend to use for irrigation, stock or domestic purposes you should get it tested by an accredited lab. Local Land Services have water sampling kits available and provide advice on how to take a sample for testing and how to interpret the results.

Figure 1: Blue green algal scum on farm dam
Photo: Jenny Schabel (LLS)

Figure 2: Water sampling kits are available from Local Land Services. Photo: South East Local Land Services

How much water do you need?

The amount of water you need to keep on hand depends on:

- how much water you need (both now and in the future)
- how reliable the supply is.

Table 1 provides an indication of average water requirements for different classes of sheep and cattle. The figures quoted for consumption have a wide range. Actual daily consumption will vary according to:

- water quality (salinity, acidity, contaminants and algal growth)
- environmental factors (air and water temperature, humidity, feed quality)
- animal factors such as breed differences, age and condition of stock.

Table 1: Average water requirements of stock

Stock type	Consumption (Litres/hd/day)
Weaner sheep	2-4
Adult dry sheep	2-6
Ewes with lambs	4-10
Young cattle	25-50
Dry cattle (400kg)	35-80
Lactating cows	40-100

Importantly, the system needs to be able to cater for the '**worst case scenario'**. For example, lactating stock grazing dry feed in the middle of summer. This figure helps determine how much stored water is required on-farm and therefore determines tank size.

Components of a reticulation system

Pumps

Pumps are often a key component of a reticulation system. While pumps come in all shapes and sizes, they generally fall into one of three categories:

- kinetic/ hydrodynamic (centrifugal)
- positive displacement
- hydraulic ram.

Like all the other parts of a reticulation system, pump selection is an important consideration and care needs to be taken to ensure a suitable pump is selected – i.e. can the pump do what you need it to do? Pump suitability will depend on several factors including:

- pumping volumes
- pumping duty (a function of total head and flow rate)
- water source
- water quality
- available power.

No one type of pump is overall better than the others – the advantages of each type depend on the situation. For example, centrifugal pumps are often best suited to circumstances of medium volume and medium head. Positive displacement pumps are worth considering where you need a moderate flow of water against a higher head. The other key consideration is how you are going to power the pump. It is best to seek professional advice from your local supplier when selecting a pump for your reticulation system. Whatever pump you chose, take care when installing the pump to ensure it can work to specification and give long, reliable service.

Figure 3: Solar powered submersible pump.

Photo: South East Local Land Services

Tanks

Tanks should be large enough to supply the maximum daily demand plus several additional days' supply in case the system fails and needs repair. The number of additional days will depend on the reliability of the water source, pump type (solar vs electrical), whether stock have access to an alternative water source and so on. For example, 2 or 3 days' additional supply might be sufficient for a 'low risk system', while another system might need 5 or more days.

There are a number of 'mechanical' water tank level indicators on the market. These simple, low cost indicators enable you to get an exact visual of the water level in a tank from a distance.

If livestock are totally dependent on water being delivered to troughs, reticulated systems must be checked regularly to ensure they are working. Remote monitoring technology is now available and can be set up to send alerts if there is an issue such as a leak, overflow or broken pump. This technology is particularly useful if you need to leave the property for a number of days.

Tanks come in all shapes, sizes and constructed from various materials, with each material having specific advantages over another. One of the major advantages of concrete tanks is they can withstand fire. Whatever the material, all tanks should have a lid, roof or cover to reduce evaporation, prevent algae growth and keep birds and other animals out.

Consider locating tanks on hills or other high spots such as a tank stand so that water can gravitate to troughs and other water points, eliminating the need for extra pumps.

Tanks should be located to minimise total pipe length around the property. Pipe costs will usually be minimised when the tank is placed centrally among the troughs it serves. If the tank only supplies one trough, it should be situated as close as practicable to that trough.

Figure 4: Tanks located on hill so that water can gravitate to troughs, this can eliminate the need for extra pumps

Photo: South East Local Land Services

Pipes

Polyethylene, or poly pipe is the most commonly used pipe material. It is flexible, comes in long lengths and is available in grades to suit various applications.

Livestock often drink in groups, especially during the morning and evenings. For this reason, it is recommended that the pipe from the tank to the trough be designed to deliver the daily demand in four hours. Choosing the diameter of the pipe is a critical part of designing a reticulation system –it needs to be big enough to achieve a certain flow rate so the system can handle peak demand.

There are various ways of classifying poly pipe. For example, rural or metric; according to rated pressure/pressure number (PN); or according to the thickness of the side wall.

Rural pipe usually has a green strip on the side and is for carrying water at low pressures. Metric pipe (blue stripe) is available in a range of classes/diameters and has a thicker wall. For this reason, some landholders choose the 'blue line' poly pipe in rocky conditions (e.g. basalt soil) to minimise punctures. When selecting pipes, always allow for some safety margin in terms of pressure. A pipe working close to its rated pressure is much more likely to burst if anything

happens to weaken it. Consider professional advice when selecting pipes and fittings for your system.

Protect pipes from heat and other damage and to minimise twisting and coiling potential by burying them at least 300mm below the ground (450mm under roads or cultivated areas).

Troughs

Materials

The most common construction materials used in the manufacture of troughs are concrete, recycled plastic and polyethylene. Galvanised iron and fibreglass have also been used to good effect but are found less frequently.

Concrete troughs are robust, heavy and hard for stock to break or shift. They also keep water cool and can withstand fire. However, concrete troughs are difficult to relocate, hard to clean and can erode and crack if the water is acidic.

Poly troughs are lighter, easier to move and easier to clean as they are non-porous but are susceptible to fire. Black poly troughs absorb more heat than those of lighter colour, which can contribute to water temperature fluctuations and algae growth.

Height and size

It's important to think about the type of stock you run, both now and into the future. Although cattle can drink from sheep troughs, sheep may struggle to comfortably drink from cattle troughs. Combination troughs are available to suit sheep and cattle and offer greater flexibility. Some round troughs can be too high for young stock to access.

Providing enough space for stock to drink is essential to reduce the influence of dominant animals and crowding behaviour around troughs, especially during hot weather.

As a general 'rule of thumb':

- **Rectangular troughs:** allow 1m of length for every 30 head of cattle or 130 head of sheep.
- **Circular troughs:** allow 1m of circumference for every 15 head of cattle or 65 head of sheep.

Using the above rule of thumb, Table 1 and 2 provide a guide to the number of livestock that can be serviced by water troughs of various sizes.

Table 2: Rectangular troughs

Length Metres (feet)	Sheep per trough	Cattle per trough
2.4 (8')	310	70
3.6m (12')	470	110
4.8m (16')	620	140

Table 3: Circular troughs

Diameter Metres (feet/inches)	Sheep per trough	Cattle per trough
1.3m (4'4'')	270	60
1.4m (4'9'')	290	70
2.0m (6'8'')	410	90
3.0m (10')	610	140

Source: adapted from On-Farm Water Reticulation Guide, GWMWater, 2005

Figure 5: Concrete rectangular trough (suitable for sheep and cattle). Photo: South East Local Land Services

Figure 6: Concrete circular trough with float valve visible. Photo: South East Local Land Services

Protection

Trough guards or exclusion bars can minimize damage to troughs and keep stock and feral animals out of troughs. Ensure float valves, supply and drainage pipes are well protected so they aren't damaged by stock.

Provide a robust apron around troughs. This can be done using concrete, compacted road base or gravel. Aprons between 1.5m (for sheep) to 3m (for cattle) wide will prevent the immediate area around water troughs from becoming boggy or prevent holes from developing. These areas can also be protected using conveyor belt although care must be given to minimise any water splash or leakage as these bases will become slippery.

Always ensure you have spare parts on hand in case you need to do a quick repair job (e.g. joiners, taps, floats etc).

Hygiene

Troughs should be drained and cleaned regularly. It is a good idea to install a tap on the inlet pipe when setting up a trough – this will greatly assist with cleaning and maintenance work as you can shut of the water supply.

Frequency of cleaning will depend on temperature, wind, contamination and algae growth. Dust films can impact on intakes, particularly among weaner sheep. Young stock may need to be trained to recognise and use troughs.

Figure 7: Empty the trough and clean regularly to remove sludge accumulation. Photo: South East Local Land Services

Resources:

AgGuide Farm Water, NSW Department of Primary Industries 2012.

Interpreting water quality test results (NSW DPI)

On-Farm Water Reticulation Guide, GWMWater, 2005

Water for livestock: interpreting water quality tests (NSW DPI)

Water requirements for sheep and cattle (NSW DPI)