New Water

RE-USING WASTEWATER IN THE MURRAY-DARLING BASIN, SA

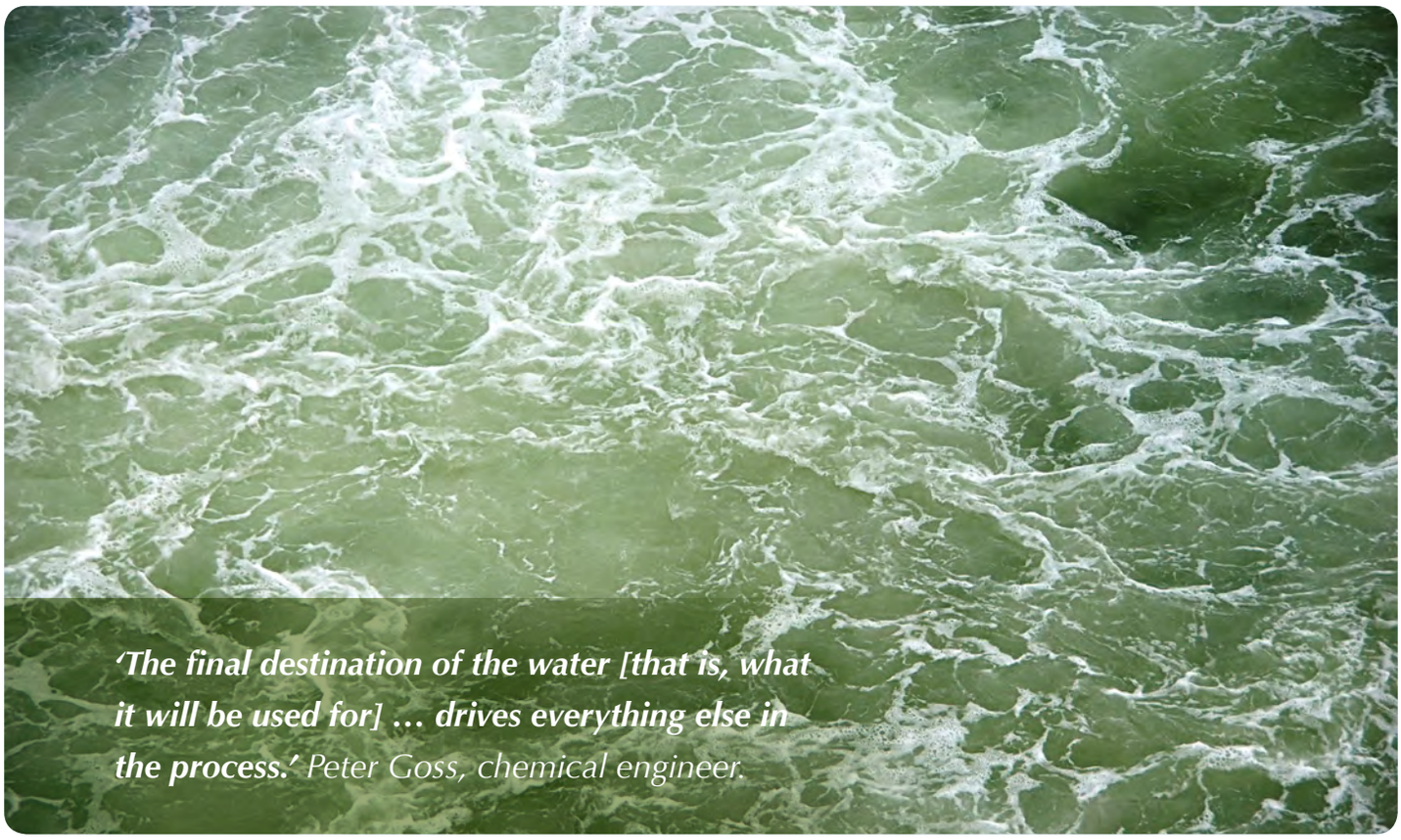
CASE STUDY: from wine, to water, to fodder | *Thachi Wines*

**This is the one of a series of fact sheets to demonstrate the true costs and benefits of wastewater management and re-use.*

Ecologically sustainable development relies on innovative uses of existing resources. At Thachi Wines, wastewater from the winemaking process is used to grow fodder crops.

Government of South Australia
South Australian Murray-Darling Basin
Natural Resources Management Board

The current drought has left agricultural businesses looking at alternatives for water supply, and re-use opportunities. Thachi Wines Pty Ltd, (formerly Tandou Limited) operates a winery licensed under the *Environment Protection Act 1993* and located in Monash in the Riverland region of South Australia. Wineries are relatively large generators of wastewater, producing between 1–5 ML per 1000 tonnes of grapes crushed. Thachi Wines crushes up to 26,000 tonnes of grapes annually, and the 40ML of wastewater resulting from this process must be dealt with according to EPA requirements.



'The final destination of the water [that is, what it will be used for] … drives everything else in the process.' *Peter Goss, chemical engineer.*

Recycling water

Effluent is produced during peak crushing times (February to April) and when wine is dispatched due to the cleaning and wash-down of vats. In addition to the 40ML of wastewater, another 2–3 ML of stormwater comes from road and local catchment runoff per year.

Previously, this effluent was diverted to a woodlot close to the winery but this is now only done for short-term emergency disposal (e.g. pump or pipe breakages). Since 2002, the effluent has been re-used on a nearby farm.

New crops with new water

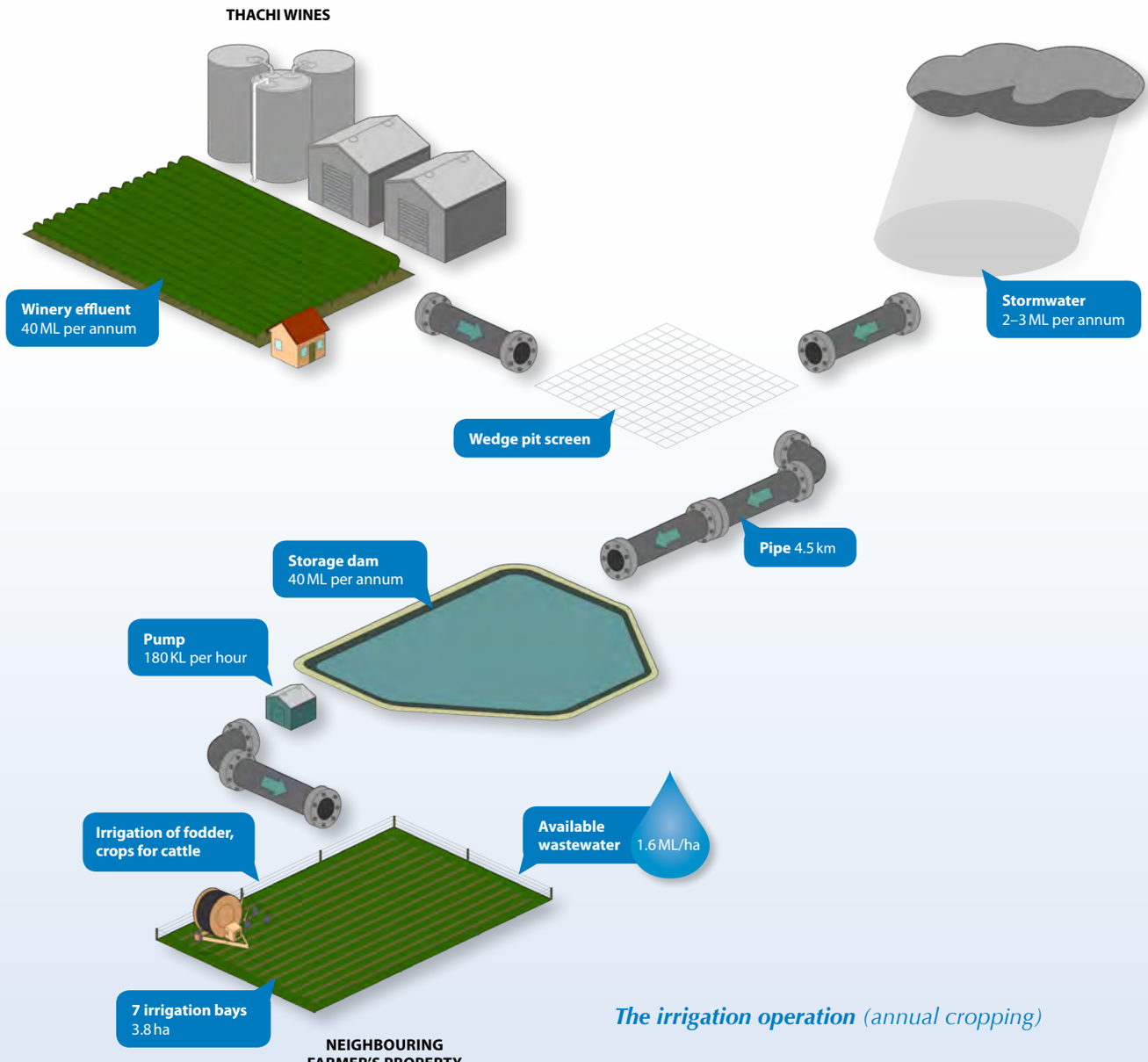
Thachi Wines leases land from a nearby farmer to irrigate fodder crops with the effluent and stormwater. Under the lease agreement, the winery pays for the seed, fertiliser, travelling irrigator and equipment, and for the baling and harvesting of the fodder. The farmer retains ownership of the fodder as payment for use of the property for wastewater management.

The effluent is collected and, along with any stormwater runoff, is passed through a wedge pit screen, pH-buffered and then pumped to the storage dam where it is available for irrigation (see Figure 1). This water is then pumped to the nearby property to irrigate fodder crops. The irrigation scheduling is based on the availability of effluent and stormwater from the storage dam, not the water requirements of the crop.

About 30 hectares on the farm have been laid out in seven irrigation bays, each of about 3.8 hectares. Each bay is cropped once per year. The selection of crop depends on the time of year and availability of wastewater. Thachi Wines is responsible for all compliance costs resulting from the application of the wastewater to the farm. This includes EPA compliance costs, such as report writing, sampling, soil and water analysis, groundwater monitoring and analysis. Ongoing monitoring of soil, recycled water and groundwater are requirements of the Irrigation Management Plan (IMP) to ensure minimal accumulation of salts and nutrients and minimal degradation of soil and water resources.

The cost of seed and fertiliser and the cost of harvesting and baling are met by the winery. The farmer is responsible for providing the labour, irrigation management and the machinery and equipment required for sowing, harvesting and baling. The parameters of the irrigation operation are set out in Figure 1.

Figure 1: Thachi Wines wastewater re-use system.



The agreement between Thachi Wines and the farmer is that the farmer is entitled to the production from the irrigated areas. This includes the harvested material and any grazing benefit from the stubble.

The irrigation operation *(annual cropping)*

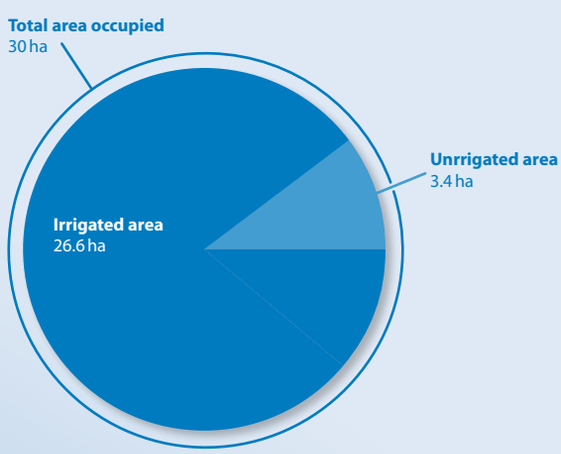


Figure 2: Annual costs per ML to Thachi Wines

Total = $105,000

Costs and benefits

The initial capital costs included:

- agreement negotiation costs
- system design
- storage dam (construction)
- pump (purchase and installation)
- pipe and travelling irrigator (purchase and installation)
- on-farm layout and grading of irrigation bays.

Thachi Wines incurred the costs of system design, storage dam, pump, and pipe and travelling irrigator. The agreement negotiation costs were incurred jointly and have not been estimated. The cost of the layout and grading of the irrigation bays has not been estimated nor allocated between Thachi Wines and the farmer. The estimated initial capital costs excluding any design or negotiation costs incurred by Thachi Wines are shown below in Figure 2.

These capital costs can be annualised in a number of ways based on various assumptions. An example is shown in Table 1.

Table 1: Annualised capital costs over a 10-year period

Set-up capital costs	$105,000
Salvage value in 10 years (est.)	$20,000
Interest rate	6%
Annual cost	**$15,783**

The annual winery-based wastewater operating costs (excluding depreciation) met by Thachi Wines include:

- diesel for operating the pump
- maintenance of pump, pipes and irrigator
- site management
- chemicals for water treatment
- EPA compliance and IMP monitoring.

A breakdown of these costs is shown in Table 2.

Table 2 : Annual winery-based operating costs

Pump operation (diesel)	$2,200
Operation and maintenance of pump (in-house)	$15,000
Site management	$15,000
Chemicals for water	$1,200
Maintenance (pipes and irrigator)	$5,000
EPA compliance and IMP monitoring	$16,000
Total annual operating cost	**$54,400**

The annual farm-based costs shared between Thachi Wines and the farmer include:

- purchase of seed ($90 per hectare; Thachi Wines)
- purchase of fertiliser ($150 per hectare; Thachi Wines)
- application of fertiliser (farmer)
- sowing of seed (farmer)
- irrigation management (farmer)
- harvesting and bailing costs ($25 per bale; Thachi Wines).

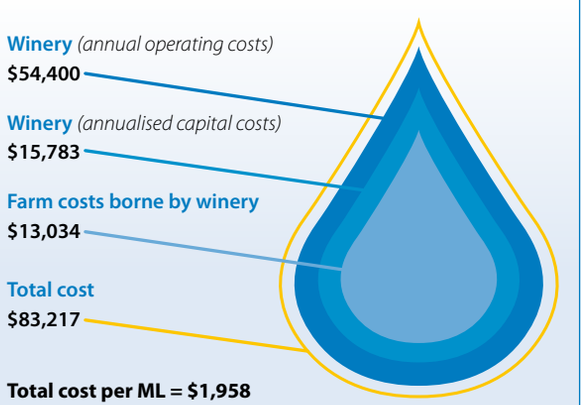
The costs met only by Thachi Wines are set out in Table 3. The annual costs per megalitre of wastewater to Thachi Wines are shown in Figure 3.

Table 3: Annual farm-based costs borne by Thachi Wines

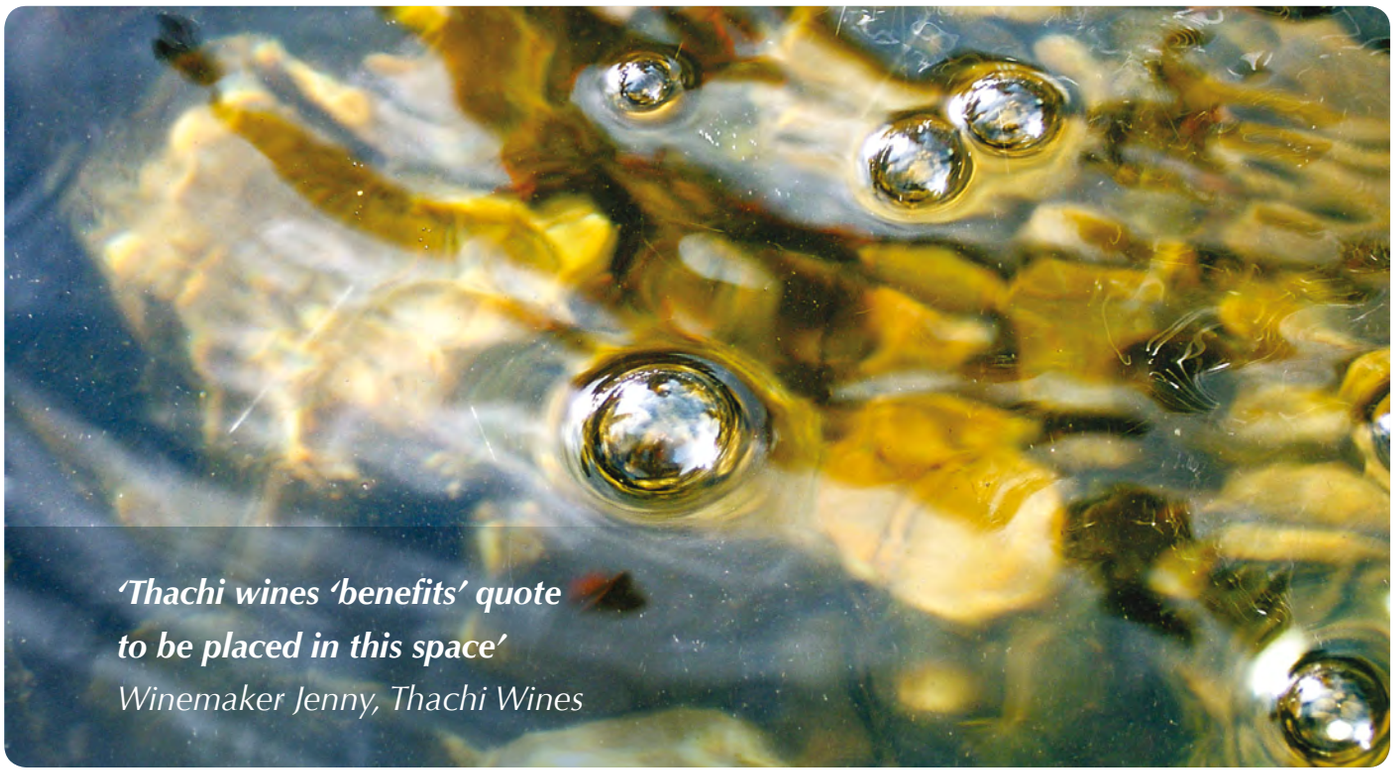
Seed	$2,394
Fertiliser	$3,990
Baling	$6,650[1]
Total	**$13,034**

[1] This assumes a yield of 10 bales per hectare, giving a total production of 266 bales of fodder per year. (266 multiplied by $25 per bale gives $6,650.)

Figure 3: Annual costs per ML to Thachi Wines



Costs incurred by the farmer include the application of fertiliser, sowing of seed, and irrigation management. These have not been estimated as they are not direct expenses and are assumed to be approximately equivalent to the benefits accrued by the farmer from the access to stubble grazing. Should the scale of the operation increase or further data become available, estimation of the benefits would be worthwhile.



Benefits to Thachi Wines

The main benefit to Thachi Wines is that the system fulfils its current obligation to deal with effluent and stormwater in a way that meets EPA requirements. Other possible methods of fulfilling this obligation include:

- treatment of the effluent to a much higher standard so that discharge into drainage or groundwater is allowed
- a system involving irrigation of woodlots.

The latter method was used prior to 2002 and proved unsustainable as it was not able to accommodate variations in the volume of wastewater produced.

The benefit to Thachi Wines is the difference between the cost of this system and the cost of the lowest-cost alternative method of disposing of wastewater in a way that meets regulatory obligations. The lowest cost alternative method has not been identified or estimated. However, it is likely that it would cost substantially more than the method used.
Due to the farm size, the system is also able to accommodate the wastewater disposal needs of a range of expansion plans for the winery. This benefit has not been estimated nor allocated between Thachi Wines and the farmer.

Benefits to the farmer

The major benefit to the farmer is the production of the fodder produced by the wastewater irrigation system and the commercial options this provides. The value of production of fodder is estimated to be $35,378, given a value of $133 per bale with production of 266 bales per year. While this reflects the market value of the bales, the farmer is more likely to feed the baled fodder to cattle. However, an estimation of the benefit based on this would be quite complex and depends on prices and management.

The farmer is also able to realise a benefit from the availability of stubble for grazing purposes. This benefit can be estimated by obtaining data on the number of cattle grazing the stubble and the number of weeks grazing provided by the stubble. Using market rates for agistment of cattle (commonly between $3 and $7 per head per week) this benefit could also be estimated. However, as data on the grazing capacity (cattle/weeks) provided by the stubble is not available, the benefit provided has been considered approximately equivalent to the cost to the farmer of sowing of seed, application of fertiliser and irrigation management.

It is possible also that irrigation via wastewater will lead to improvements in soil condition. This potential benefit has not been estimated.

Summary

Thachi Wines have developed a system of treating wastewater and disposing of it by irrigation at a nearby farm. The system meets EPA requirements and has benefits for both the winery and the farmer. Data is limited, but it is estimated that the annual benefits to the farmer are less than the estimated costs to Thachi Wines. However, the annual benefits to the winery of not having to implement a more costly system of treating and disposing of wastewater that meets EPA requirements have not been estimated. As well, the costs to the farmer have not been estimated but have been assumed to equal the grazing benefit obtained from the stubble.

Table 4 : Estimated annual costs and benefits

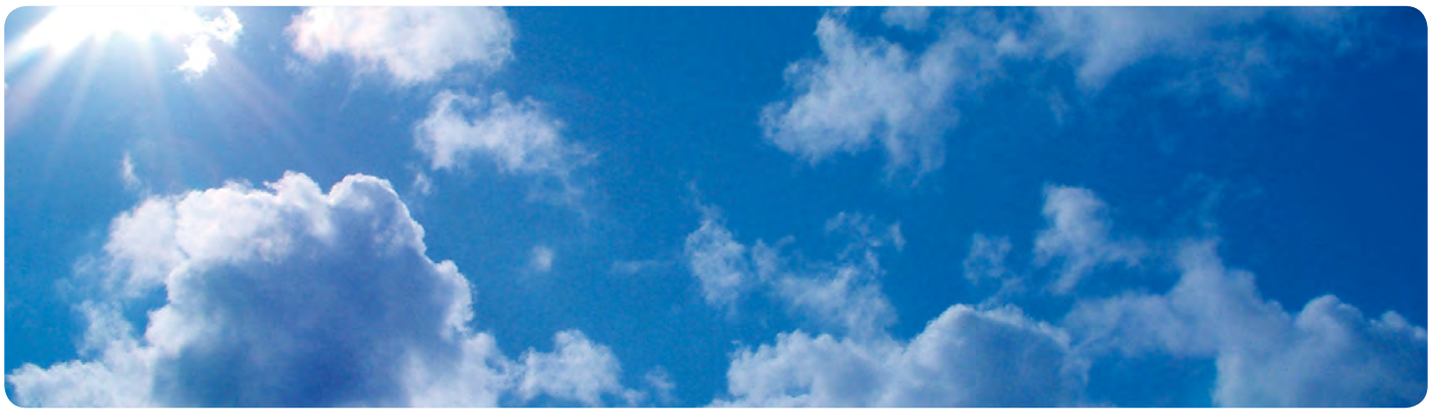
Description	Cost	Cost (per ML)
Costs to Thachi Wines	$83,217	$1,958
Costs to farmer	not est.	
Total costs	$83,217	$1,958
Benefits to Thachi Wines	not est.	
Benefits to Farmer	$35,378	$832
Total Benefits	$35,378	$832
Deficit	**$47,839**	**$1,126**

The estimated annual costs and benefits based on treating 42.5 ML of wastewater annually is shown in Table 4.

Thachi Wines has implemented a low-cost, low-maintenance wastewater re-use system based on farm irrigation of remediated water to produce fodder and stubble grazing. Annual running costs to Thachi Wines of the established system are estimated at $83,217 which equates to 1958 per ML (or $1.96 per kL) assuming that 42.5 ML per year must be treated.

Benefits of the system captured by the farmer are estimated at more than $35,000 per year.

In addition, improvements have been made to the soil by the application of the winery wastewater. By producing fodder for cattle from wastewater, this case study is an example of agricultural businesses working together to mitigate the impact of drought.



Acknowledgements and assumptions

This fact sheet was prepared with the permission and assistance of Thachi Wines Pty Ltd. Initial diagrams were supplied by Thachi Wines Pty Ltd, (re-interpreted by Ecocreative®)

For the NPV, it is assumed that all capital and operational costs and benefits have been supplied by Thachi Wines for inclusion in the calculations. The information in this case study was correct as of October 2007.

For more information visit

- the SA Murray-Darling Basin NRM Board Website at <www.samdbnrm.sa.gov.au> for:
  - Case Study 2: Alexandrina Council and Strathalbyn Racing Club, Case Study
  - New Water: Re-using Wastewater in the Murray Darling Basin SA (Business case for future investment)
  - Wastewater Forum 2007 podcasts of presentations.
- the EPA Website at <www.epa.sa.gov.au> where you can find:
  - EPA Guidelines for Wineries and distilleries, <www.epa.sa.gov.au/pdfs/guide_wineries.pdf>
  - EPA Guidelines for Wastewater irrigation management plan: a drafting guide for wastewater irrigators, April 2008, <www.epa.sa.gov.au/pdfs/guide_wimp.pdf>.

Contact us

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Footnotes: 1. The project was initiated in 2006 by the River Murray Catchment Water Management Board prior to the creation of the South Australian Murray-Darling Basin Natural Resources Management Board. **2.** Findings and estimates based on 2005–06 data gathered from 12 local councils and 67 businesses (48% able to provide accurate data, remainder estimates). **3.** Government of South Australia, p 3. **4.** Government of South Australia, p 48. **5.** Environment Protection and Heritage Council and Natural Resources Management Ministerial Council. **6.** Department of Water, Land & Biodiversity Conservation. Fact Sheet 02 Water Reuse. | **Acknowledgements:** Graphic design, map illustration and editing by Matthew Wright-Simon, Cameron Raynes and Nigel Black. This publication is printed on recycled paper with 100% post-consumer waste content. Inks are vegetable-based. Print production was carbon-neutral. The paper mill and printer operate with environmental management systems certified under ISO 14001. |