



# Strategic Plan for Managing Sorell and Midway Point Wastewater



**September 2006**



# SUMMARY AND RECOMMENDATIONS

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## The Issues

Sorell is a rapidly growing municipality, with a current average annual growth of 1.6% for Sorell and Midway Point, which is well above the average Tasmanian and National growth rates.

The Penna effluent reuse scheme was introduced in 2000 with the aim of achieving full reuse, however only partial reuse has been achieved, with farmer interest not being as great as hoped. As such, effluent is currently discharged in winter to Orielton Lagoon and Pitt Water.

The existing treatment plants serving Sorell and Midway Point were installed over 12 to 15 years ago, and their treatment performance in some cases may not be compatible with increasing environmental requirements for discharge to the receiving waters of Orielton Lagoon and Pitt Water.

Significant upgrading or replacement of the existing wastewater systems at Sorell, Midway Point and Penna is required, if effluent disposal is to continue.

A long-term wastewater strategy for Sorell and Midway Point is required to meet statutory requirements and to maintain and, where possible, to enhance the environmental values of the municipality.

## Historical and Projected Growth and Development

The present and projected future connected population and houses of the areas serviced by Sorell, Midway Point and Penna WWTPs is shown below.

The current population connected to the sewerage systems totals 3630 persons and is projected to increase to 5816 persons over the next 30 years, based on the present average growth rate of 1.6 % p.a and scenario 1 growth model (ie only existing Zones R1 and R2 will be sewered and full development will occur on all existing vacant lots). This growth model is considered to most likely reflect future development in the area in year 2035.

Further growth could occur if all existing residential Zones R6 and R7 also are sewered. This is the Scenario 2 growth model and this model predicts a total population up to 7515 persons. This growth model is considered to most likely reflect future development in the area in 50 years (approximately year 2055).



## Historical and Projected Connected Houses and Population for Sorell, Midway Point, Penna and Sorell WWTP Service Areas

Year	Sorell	Midway Point	Penna	Total	
	Population	Population	Population	Houses	Population
1991					3199*
1996					3596*
2001				1564*	3606*
2005				1789*	3970*
<b>2005</b>	<b>1325</b>	<b>2205</b>	<b>100</b>	<b>1556</b>	<b>3631</b>
Future (yr 2035) # Scenario 1 growth model	2722	2722	373	2449	5816
Future (2055) % Scenario 2 growth model	3589	3553	373	3164	7515

Source: ABS Census data, Sorell Council

\* Total value for area, including rural and rural residential zones

# Scenario 1 growth model - Sewer only existing Zones R1 & R2 and full development of existing vacant lots

% Scenario 2 growth model - Sewer all potential lots in Zones R1, R2, R6 to R7 & full development of all existing and new lots

## Current Situation

### Existing Sorell WWTP and Outfall

- Current flow is 420 kL/d (~50% of the original design flow of 810 ML/d (3000 EP).
- Plant flow capacity will be reached by year 2040, based on the current growth rate of 1.6% p a and a 15 % reduction in unit wastewater production.
- The plant is only 12 years old and in reasonable condition, with a residual life of at least 20 years from an operational and maintenance perspective.
- Plant performance is generally good, with 97% of effluent BOD, SS and FC values complying with current DTAE licence, although low ammonia oxidation and nitrogen removal is achieved.
- Odour is a significant issue, particularly with the inadequate buffer distances from commercial premises (Giblin Drive industrial estate < 50 m) and residential area to the north west (~150 m)
- Upgrading of the sludge handling facilities is required in the short-term.
- Major upgrade of the plant processes and/or a new plant will be required, if effluent discharge to receiving waters in to continue, to meet the more stringent future effluent discharge requirements.
- The site has scope to at least double in size by developing the land to the east.
- The Sorell outfall currently discharges close to the surface, which limits dilution and dispersion with the tidal flushing in Lower Pitt Water.
- Recent investigations found however, that it was not possible to distinguish the effects of the existing discharge from the range of other environmental factors in Sorell Rivulet. The study concluded that nutrients do not appear to be causing a large effect on the marine ecosystem in Sorell Inlet and that plant growth appears to be limited by sedimentation and turbidity (ie low light).

### Existing Midway Point WWTP and Outfall

- The site is small with limited scope for expansion.
- There is very limited buffer distance to residences (~30 m to the west) and limited distance to the environmentally sensitive Orielton Lagoon.
- Current flow 580 kL/d (72% of original design flow of 810 ML/d (3000 EP)).
- Wastewater flows will approach the Plant's original design flow with projected full development on residential zones (ie Scenario 2 growth model) with a 15 % reduction in unit wastewater production.
- The plant is only 16 years old and in reasonable condition, with a residual life of at least 20 years from an operational and maintenance perspective.
- Plant performance is generally good, with 91% to 97% of effluent BOD, SS and FC values complying with current DTAE licence, although low ammonia oxidation, nitrogen and phosphorus removal is variable.
- Upgrading of the sludge handling facilities is required in the short-term.
- There is potential to achieve more consistent operation and improved treatment
- Major upgrade of the plant processes and/or a new plant will be required, if effluent discharge to receiving waters in to continue, to meet the more stringent future effluent discharge requirements.
- Effluent is discharged to Orielton Lagoon during winter and spring when the Penna reuse lagoons are full. Orielton Lagoon is recognised as internationally significant under the Convention on Wetlands (Ramsar Convention). Orielton Lagoon is poorly flushed and there is limited scope for effluent dispersion. DTAE have advised at effluent discharge to Orielton Lagoon is to cease.

## Existing Penna WWTP

- The lagoon treatment plant is estimated to be operating at about two-thirds capacity.
- The plant is 8 years old and in reasonable condition, with an estimated residual life of at least 20 years, however the integrity of the clay liner is a potential issue.
- No effluent discharge licence is required as the flow is less than 100 kL/d, and when the lagoons are full, the effluent will be reused.

## Existing Penna Effluent Reuse Scheme

- The existing polishing lagoons are adequately sized to handle the existing flows and for future flows for many years.
- The polishing and storage lagoons are 6 years old and in reasonable condition, with an estimated residual life of at least 20 years, except for the PVC bank protection liner requires replacement.
- Algae is an issue in the lagoons, particularly during warmer weather.
- There are currently four effluent reusers (3 farmers and a golf course), reusing a total of 137 ML/yr of effluent (38% reuse of the effluent volume).

## Options

## **'No Action Option'**

The no action option has several major disadvantages, including environmental and public health risks. It does not comply with State and national standards and guidelines for wastewater management. DTAE have requested that Council cease to discharge effluent from the Midway Point WWTP to Orielton Lagoon. The 'do nothing' option is not a sustainable strategy for the long term and therefore is not considered further in this report.

## **Effluent Disposal Options**

Significantly more stringent effluent quality limits apply for future discharges to Pitt Water, which is a small, confined and sensitive water body, including the need to remove much of the nitrogen and phosphorus.

Recent discussions with DTAE indicate that nitrogen removal may not be required during winter for discharge of effluent to the lower section of the River Derwent Estuary, and this may also apply to effluent discharge to Frederick Henry Bay, which is a similarly water body. A secondary treatment plant with ammonia oxidation and effluent disinfection is nonetheless required as a minimum to achieve the effluent discharge requirements.

An effluent outfall that achieves an initial dilution of at least 50:1 is likely to be required to discharge effluent in the future to marine waters.

## **Effluent Reuse Options**

Less stringent effluent quality limits apply for most effluent reuse applications compared with discharge to surface waters. The effluent quality presently produced by both the Sorell and Midway Point WWTPs generally meets the requirements for Class B reuse, which is suitable for a wide range of agricultural, horticultural and silviculture enterprises.

While there is sufficient suitable land for full effluent reuse, only partial effluent reuse has been achieved to date with local landowner interest not being as great as hoped. To achieve full reuse, one or more of the following needs to occur; (1) new landowners need to be found that are interested in effluent reuse; (2) existing reusers need more incentive to reuse more effluent; and (3) Council needs to provide additional effluent storage and purchase suitable land for reuse. Council could either undertake effluent reuse themselves or lease out the land to others to operate and manage.

Effluent reuse options considered are:

1. Full effluent reuse by others and/or Council, which involves large (and expensive) winter storage; and
2. Partial effluent reuse, which requires less storage and discharges excess flow to water.

## **Treatment Options**

The extent of wastewater treatment required and locations for treatment are a function of whether full or partial effluent reuse is adopted, and the location of any effluent discharge.

## **Short-Listed Options**

### **Option 1 – Full Effluent Reuse**

The existing Sorell and Midway Point WWTPs, with secondary treatment and effluent disinfection, would be retained and upgraded as required to address identified issues and handle projected future flows and loads. The Penna effluent reuse scheme would be significantly expanded, with both local landowners and Council undertaking a future development with construction of more effluent storages and reuse enterprises.

### **Option 2 – Partial Effluent Reuse with Discharge to Lower Pitt Water**

The existing Midway Point WWTP, with secondary treatment and effluent disinfection, would be retained and upgraded as required to address identified issues and handle projected future flows and loads. All effluent from the Midway Point WWTP would be pumped to the Penna effluent reuse scheme.

The existing Sorell WWTP would be either upgraded to a biological nutrient removal plant and augmented as required to handle projected future flows and loads, or a new biological nutrient removal plant would be constructed at the Penna WWTP/effluent reuse storage site. Effluent would preferentially be pumped to the Penna effluent reuse scheme, with excess discharged to Lower Pitt Water at the Midway Point Bridge on the ebb tide when the Penna effluent storage lagoons were full.

The Penna effluent reuse scheme would be modestly expanded (ie considerably less than Option 1).

### **Option 3 – Partial Effluent Reuse with Effluent Discharge to Frederick Henry Bay**

The existing Midway Point WWTP would be upgraded as for Option 2, and all effluent from the Midway Point WWTP would be pumped to the Penna effluent reuse scheme.

The existing Sorell WWTP would be upgraded to include nitrification and augmented as required to handle projected future flows and loads. Effluent would preferentially be pumped to the Penna effluent reuse scheme and discharged via a new effluent pipeline to Dodges Ferry and outfall to Frederick Henry Bay when the effluent storage lagoons are full.

The Penna effluent reuse scheme would be modestly expanded, as for Option 2.

## Capital Cost Comparison of Options

The capital cost comparison given below, shows that the capital cost for Option1 – Full Effluent Reuse is about \$8.8 million. The capital costs for Options 2 and 3 are about \$11.5 million and \$11.8 million respectively.

Item	Option 1 Full effluent reuse with additional winter storage	Option 2 Partial effluent reuse with winter discharge of Sorell BNR effluent to Pitt Water	Option 3 Partial effluent reuse with winter discharge of Sorell nitrified effluent to Frederick Henry Bay
Short-term WWTP Upgrades	\$ 1,780,000	\$ 1,350,000	\$ 1,780,000
Long-term WWTP Upgrades	\$ 340,000	\$ 4,160,000	\$ 940,000
Effluent Reuse	\$ 3,650,000	\$ 1,100,000	\$ 1,100,000
Effluent Disposal	\$ -	\$ 1,610,000	\$ 4,280,000
Subtotal (excl on-costs)	\$ 5,760,000	\$ 7,890,000	\$ 8,090,000
Land Purchase	\$ 400,000	\$ -	\$ -
Total Project Capital Costs	\$ 8,780,000	\$ 11,480,000	\$ 11,760,000
\$/lot	\$ 3,100	\$ 4,400	\$ 4,500

The capital costs estimates adopted for developing irrigation areas are based on installing fixed sprays (as used for market gardens), and as such are near the top end of irrigation development costs. There are potential capital cost savings, particularly for Option 1 (ie full effluent reuse option), if lower cost irrigation development options are adopted, such as centre pivot (ie about 50% the cost of fixed sprays) or travelling irrigators (ie about 30% the cost). However, there are additional siting constraints and labour costs with these options.

## Overall Option Assessment

Option 1 is considered the best solution when economic, technical, environmental, risk and social factors are considered, followed by Options 2 and 3 (approximately equal, but not preferred).

Option 1 has the highest economic ranking with the lowest capital cost of \$8.8 million, compared with \$11.5 million for Option 2 and \$11.8 million for Option 3. Option 1 also has the lowest annual costs. Option 1 also has the highest technical, environmental, risk and social ranking.

## Description of Recommended Strategy

The objective of the full reuse option is to achieve 100% reuse of effluent on sustainable irrigation of agricultural land. The strategy will be constructed in three stages:

Stage 1 – Short-term (2007 to 2010);

Stage 2 – Medium to long term (2011 to ~2035); and

Stage 3 – Longer term (>~2035).

## **Stage 1 – Short-term Upgrades (2007 to 2010)**

The major components of recommended short-term strategy are:

- Undertake investigations and Stage 1 of upgrade the Sorell and Midway Point wastewater collection systems to reduce wet weather flows (2007 to 2010);
- Upgrade the existing wastewater treatment facilities and operations to achieve compliance with current licences, and to address current issues (2007 to 2008);
- Encourage existing and new farmers to reuse more effluent and to construct additional effluent storages; and
- Cease effluent discharge from Midway Point WWTP to Orielson Lagoon by maximising reuse at Penna and discharging excess effluent at Sorell outlet.

Specific short-term tasks include:

1. Undertake a waste minimisation program to reduce water consumption by encouraging use of more efficient consuming devices, increased public awareness regarding water conservation, and implementing user pay charging.
2. Undertake stormwater inflow and groundwater infiltration (I/I) studies at Sorell and Midway Point and remedial work to reduce I/I.
3. Investigate (and implement if viable) flow attenuation in the Midway Point catchment to reduce the peak daily flow to the plant during dry weather.
4. Provide fine mechanical screening of the inlet of both WWTPs to remove material >5 mm (eg 3 to 5 mm aperture screens), including influent pumping at Sorell.
5. Cover the inlet works at both plants to reduce odour emissions and provide covers on the brush aerators to reduce odour and aerosol emissions.
6. Provide additional effluent storage and/or standby power supply for effluent pumping at Midway Point WWTP.
7. Investigate options for additional sludge stabilisation at both sites to increase extent of stabilisation to reduce odour emissions, and to line the sludge lagoons;
8. Investigate options for sludge thickening/dewatering at both sites.
9. Provide better/more intensive process control, monitoring and reporting of the treatment processes and performance.
10. Encourage farmers (new and existing) to reuse more effluent and to construct additional storages, by maintaining a low unit charge for effluent supply in summer (eg \$10 to \$20/ML) and charging a nominal amount in winter (eg \$1/ML).
11. Until full reuse is achieved, cease effluent discharge to Orielson Lagoon from Midway Point WWTP by diverting effluent not reused at Penna to Sorell.
12. Extend the Sorell outfall to the deepest point in the Rivulet channel to optimise dilution and dispersion, and minimise the potential exposure of any ecosystem component to elevated ammonia or nutrient levels.
13. Cease effluent discharge from Midway Point WWTP to Orielson Lagoon, by maximising reuse of Midway Point effluent at Penna and discharging excess to Sorell Rivulet (ie Sorell WWTP outlet).
14. Monitor appropriate biological indicators in Sorell Rivulet to confirm that environmental values in Sorell Rivulet are not being compromised.
15. Timing for implementation of full effluent reuse depends on monitoring results and risk based analysis for Sorell Rivulet, and thus may implementation be short, medium or long term.



The indicative time schedule for each recommended action for each of the above components, together with the estimated capital costs is given below.

### Indicative Time Schedule for Recommended Short Term Actions and Estimated Capital Costs

Item No.	Description	Time Schedule		Estimate Cost*, \$
		Start	Complete	
<b>SORELL</b>				
S1-1	I/I study and remedial work in catchment	Jan-07	Dec-10	\$136,000
S2	Upgrade influent screening facility (incl. inlet pumps)	Jan-07	Dec-08	\$254,000
S3	Cover inlet works	Jan-07	Dec-08	\$15,000
S4	Additional covers to brush aerator	Jan-07	Dec-08	\$22,000
S5	Sludge handling options study	Jan-07	Jul-07	\$15,000
S6	Upgrade sludge handling facilities	Jul-07	Dec-08	\$712,000
S7	Additional vegetation/mounding along Giblin Dr boundary	Jan-07	Dec-07	\$15,000
S8	Resolve issue of commercial and residences in adjacent Industrial Zone	Jan-07	Jun-07	
S9	Increase process control, monitoring and reporting	Jan-07	on going	\$29,000
S10	Effluent reuse pipeline risk study and mitigation work	Jan-07	Dec-08	TBD
S11	Extend outlet and monitor Sorell Rivulet	Jan-07	ongoing	\$10,000
	<b>TOTAL SORELL</b>			<b>\$1,210,000</b>
<b>MIDWAY POINT</b>				
MP1-1	I/I study and remedial work in catchment	Jan-07	Dec-10	\$91,000
MP2	Flow attenuation in catchment study and implementation	Jan-07	Dec-07	\$22,000
MP3	Upgrade influent screening facility	Jan-07	Dec-07	\$109,000
MP4	Cover inlet works	Jan-07	Dec-07	\$15,000
MP5	Additional covers to brush aerator	Jan-07	Dec-07	\$22,000
MP6	Additional effluent storage and/or standby power supply for effluent pumping	Jan-07	Jun-08	\$145,000
MP7	Sludge handling options study	Jan-07	Jun-08	\$15,000
MP8	Upgrade sludge handling facilities	Jul-07	Dec-08	\$712,000
MP9	Resolve issue of leased land for sludge lagoon	Jan-07	Jun-07	
MP10	Increase process control, monitoring and reporting	Jan-07	on going	\$29,000
MP11	Effluent pump station overflow and reuse pipeline risk study and mitigation work	Jan-07	Dec-07	TBD
	<b>TOTAL MIDWAY POINT</b>			<b>\$1,160,000</b>
<b>PENNA</b>				
P1	Seal Barwick lagoons	Jan-07	Dec-07	\$73,000
P2	Reline Penna effluent polishing lagoons	Jan-07	Dec-08	\$145,000
P3	Improve screening of lagoons from overlooking residences	Jan-07	Dec-07	
P4	Implement algal management for the effluent storages	Jan-07	Dec-07	
	<b>TOTAL PENNA</b>			<b>\$220,000</b>
<b>PENNA EFFLUENT REUSE</b>				
	Included in stage 2 - medium to long term stage			
<b>TOTAL STAGE 1 (SHORT-TERM ACTIONS 2007 to 2010)</b>				<b>\$2,590,000</b>

## **Stage 2 – Medium to Long Term Actions (2011 to ~2035)**

Local farmers and Council to provide additional effluent storage and irrigation area to achieve full reuse for projected future flows up to at least year 2035, as follows:

- Pump **all** effluent (produced at both plants (ie disinfected secondary effluent quality) to the Penna effluent reuse scheme, via the existing effluent pipelines.
- Initially, increase effluent storage capacity from existing capacity of 95 ML up to at least 280 ML to store the present effluent flows during winter for the 1 in 10 wet year conditions (ie at least 180 ML additional storage required).
- Significantly expand the Penna effluent reuse scheme to achieve full effluent reuse of present and projected future effluent flows, in accordance with Tasmanian DTAE Guidelines for long-term sustainability. Effluent application rates are to be based on meeting crop demand. Council would undertake a leading role in development of the scheme with construction of most of the additional effluent storage and a reuse area required.

The reuse scheme would initially be expanded to irrigate the present annual effluent production volume of 300 ML/year (note currently irrigating 138 ML/yr). Over the next 30 years the scheme would be expanded to irrigate 420 ML/yr (ie 40% increase). Ultimate development is estimated to be 570 ML/yr ((ie full development of Sorell and Midway Point in year 2055).

The existing 50 ha irrigation area would initially be increased up to at least 140 ha, based on irrigating pasture with the present effluent flows, for the 1 in 10 wet year conditions (ie at least 90 ha additional irrigation area is needed).

The actual development split between local landowners and Council will depend on local landowner interest.

Undertake Stage 2 of upgrade the Sorell and Midway Point wastewater collection systems to reduce wet weather flows to within industry standards by 2016 (ie 10 years).

**Indicative Time Schedule for Recommended Medium to Long Term Actions**

Item No.	Description	Time Schedule		Estimate Cost*, \$
		Start	Complete	
<b>PENNA EFFLUENT REUSE</b>				
PER1	Provide 200 ML additional effluent storage	~2011	~2016	\$1,860,000
PER2	Provide 4000 m of 150 mm dia effluent supply pipework	~2011	~2016	\$870,000
PER3	Develop 100 ha of irrigation area for effluent reuse	~2011	~2016	\$1,860,000
PER4	Provide 100 ML additional effluent storage	~2016	~2025	\$ 680,000
PER5	Develop 30 ha of irrigation area for effluent reuse	~2016	~2025	\$440,000
	Subtotal			\$5,710,000
<b>SORELL</b>				
S1-2	I/I study and remedial work in catchment	~2011	~2016	\$300,000
<b>MIDWAY POINT</b>				
MP1-2	I/I study and remedial work in catchment	~2011	~2016	\$200,000
TOTAL STAGE 2 (MEDIUM TO LONG TERM ACTIONS 2011 to 2035)				\$6,210,000
TOTAL STAGES 1 & 2 (SHORT, MEDIUM TO LONG TERM ACTIONS 2007 to 2035)				\$8,800,000

\* Estimates costs include 15% contingency allowance and 15% allowance for engineering, supervision and management

**Stage 3 - Longer Term (>~2035)**

Both the Sorell and Midway Point WWTPs will reach the original design flow capacity in about 35 years (ie by year 2040), based on the current average growth rate for the area of 1.6% p a and a 15 % reduction in unit wastewater production.

Hence, by about 2035 it will be necessary to either upgrade the capacity of these plants and/or provide additional treatment at another site (preferred site is Penna WWTP and effluent reuse storage site).