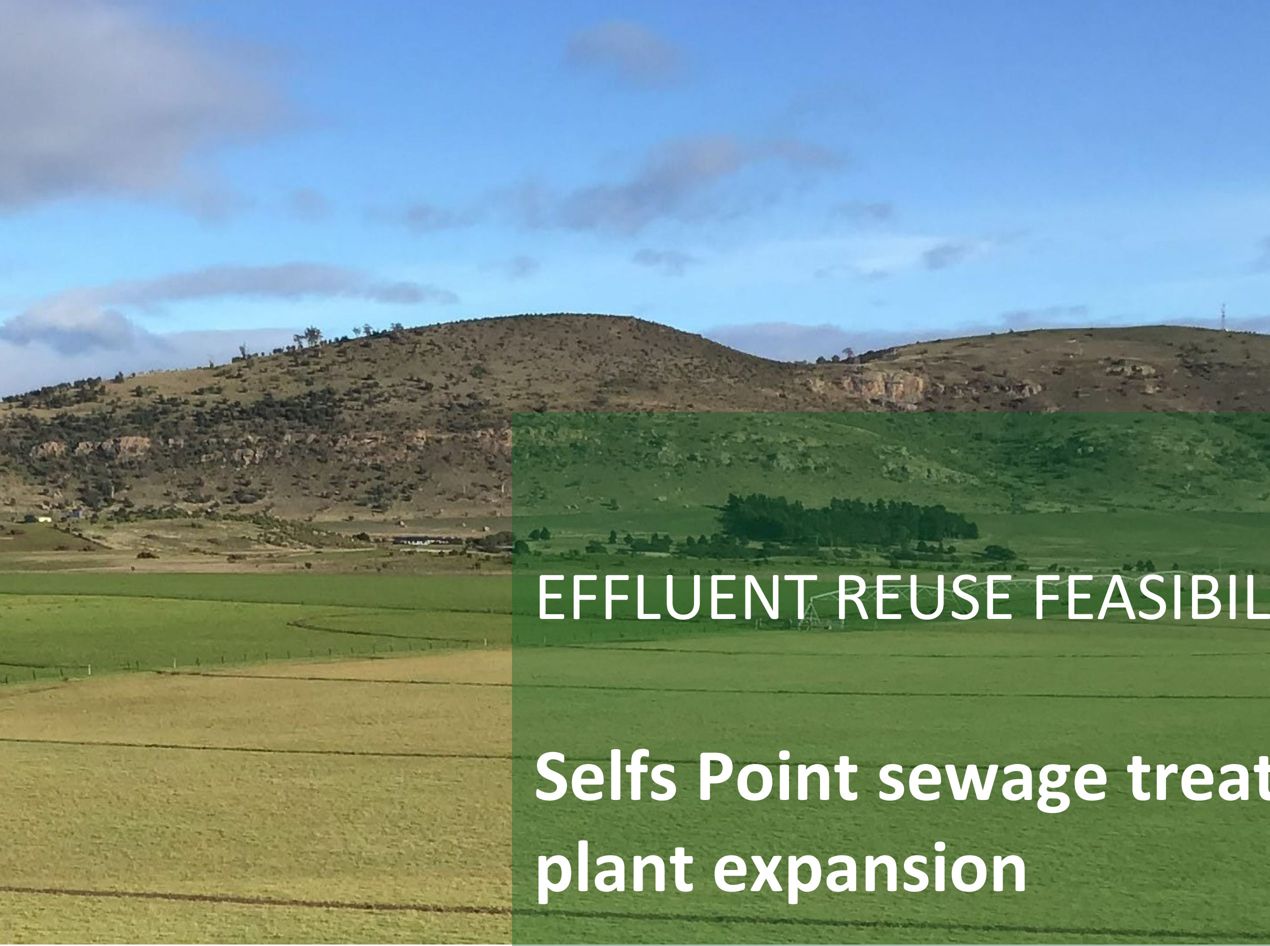

EFFLUENT REUSE FEASIBILITY STUDY

Selfs Point sewage treatment plant expansion

ERA Planning & Environment

MARCH 2022

pinion ADVISORY

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Cover image: Pasture irrigated with recycled water, Richmond Park - Clarence RWS (2021). Photo: L. Hanslow.

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Introduction

Pinion Advisory was engaged by ERA Planning and Environment to develop an effluent reuse feasibility study (RFS) for the Selfs Point sewage treatment plant (STP) expansion project. It is proposed that Macquarie Point STP be decommissioned to allow development of the new Macquarie Point precinct. To achieve this, the Macquarie Point sewage catchment will be redirected to an expanded Selfs Point STP.

A review of the proposed effluent standard from the expanded STP indicates that recycled water will meet class B quality standards. Proposed nutrient and microbiological concentrations are not limiting to a potential recycled water development. Forecast median salinity (1207µS/cm) is unlikely to significantly limit irrigation potential but salinity peaks may need to be diverted from any future customer supply.

Projected year 2054 combined sewage inflow (for the Macquarie Point and Selfs Point STP catchments) of 24.9 ML/day (9089ML/year) has been used to inform this report. To determine irrigation area and storage requirements for full reuse (100%) and partial reuse (minimum 30% of discharge) options, several crop water balances have been prepared (ES Table 1).

ES Table 1. Summary of irrigation area and storage requirements years 2020 and 2054 – 100% reuse option

	Annual rainfall (mm)*	STP outflows (ML)	Pasture irrigation area required (ha)	Irrigation requirement (ML/ha)	Storage required (ML)
2020					
Median	472	6753	977	6.9	2558
90^{th}%ile	662	6753	1211	5.6	2857
2054					
Median	472	9089	1314	6.9	3442
90^{th}%ile	662	9089	1630	5.6	3846

An assessment of the reuse opportunities identified for consideration in this study were broken into three categories:

1. Industrial reuse (within 5km of the STP or along the Blinking Billy Point outfall) such as manufacturing.
2. Irrigation of public green spaces such as sports grounds, parks and gardens (within 5km of the STP or along the Blinking Billy Point outfall).
3. Contribution to an existing recycled water scheme, located to the east of the Derwent River (e.g. Brighton and Clarence recycled water schemes).

To maximise opportunities to supply recycled water to several sites along a single pipeline route the assessment of options 1 and 2 has been combined.

Industrial reuse and public green space irrigation

A desktop search and GIS analysis was conducted to identify potentially suitable locations for industrial reuse and irrigation of public green spaces within 5km of the STP and along existing linear infrastructure. A review of Hobart's potable water customers was also undertaken to identify the largest users, and make assessment of their potential to transition water consumption from potable water to recycled water.

Opportunities were broadly grouped into three spatial options:

1. Northern pipeline - from Selfs Point STP to the Tasracing facility – anchored by potential demand from Nyrstar.
2. Western pipeline - from Selfs Point STP up into Lenah Valley.
3. Southern pipeline– the existing outfall from Selfs Point STP to Blinking Billy Point.

Of the three potential recycled water supply regions identified, north of the STP presents the only potential option and would be contingent on participation from Nyrstar, and a higher water quality than currently proposed. Nyrstar, identified as TasWater's largest industrial user of potable water is located approximately 1.3km north of the Selfs Point STP. However, recent consultation with Nyrstar found that the supply of recycled water is likely to be cost prohibitive due to additional treatment costs required to make the recycled water fit for purpose.

The western pipeline option was deemed insignificant and did not warrant further consideration due to the lack of total demand and requirement for a higher class of water quality than proposed.

Various potential options were identified along the southern option, although most public green spaces require class A quality water. Utilisation of the existing outfall pipeline route to Blinking Billy Point, would require all effluent from the Selfs Point STP to be treated to class A. Alternatively a duplicate pipeline would be required for class A water supply to relevant sites.

None of these options identified by this assessment will fulfil the scale required to meet the partial (30%) reuse requirement of discharge from the Selfs Point STP (ES Table 2).

ES Table 2. Summary of pipeline distance, costs and demand for each option (class B only).

Option	Pipeline distance (km)	Pipeline cost ($M)*	Potential demand (ML/year)	% reuse - 2020	% reuse - 2054
Northern	7.0	6.65	986	15	11
Western	4.3	4.09	48.5	0.7	0.5
Southern**	-	-	160	2.4	1.8

*Based on a rate of $950 per metre for the supply and placement of pipeline in urban areas (Source: TasWater).

**Using existing outfall pipeline and class B water.

On this basis an urban recycled water scheme, that can utilise greater than 30% of STP flow, is considered unviable at this stage.

Opportunities for broadscale recycled water irrigation schemes

TasWater operates three large recycled water schemes to the east of the Derwent River at Brighton, Penna and Clarence. In addition to this, Tasmanian Irrigation (TI) South East Irrigation Scheme (SEIS) footprint also services much of this same region.

The Penna recycled water scheme has not been considered in this assessment due to a) its isolated location and b) current insufficient scheme capacity to achieve full reuse of the STPs it already services.

Brighton recycled water scheme

Connection to the Brighton recycled water irrigation scheme from the Selfs Point STP would require a minimum 15.7km pipeline to the Green Point STP (including a 1.2km Derwent River crossing).

Supply infrastructure (pumps and pipelines) on this scheme is already undersized (resulting in seasonal discharge to the Derwent River from the Green Point STP). For a connection into this scheme to be a possibility, duplication of piping, pumping and storage infrastructure would be necessary.

Given that irrigable land around Brighton is generally small and non-contiguous, and that the current scheme does not have capacity (in linear infrastructure) to manage the existing supply, connection into this scheme is not an option.

Clarence recycled water scheme

A connection from the upgraded Selfs Point STP into the Clarence scheme would require construction of a Derwent crossing, potentially from the existing Macquarie Point STP outfall, into the Clarence recycled water scheme (possibly at Rosny STP or Tunnel Hill reservoir). The crossing might be supplied from the existing pressurised sewer to Blinking Billy outfall.

Similar to the Brighton recycled water scheme, the Clarence scheme is currently constrained by insufficient storage and linear infrastructure capacity. For additional water to be transferred via the scheme, existing piping, pumping and storage infrastructure on the eastern shore would need to be upgraded or duplicated.

To allow the Selfs Point scheme to achieve full reuse targets, development of the entire Selfs Point water balance requirement for storage (2558ML-3442ML) would be necessary. In a region where land is of high value and irrigation storage dams are typically in the range of 10 to 100ML. The likelihood of obtaining a suitable site is low.

Furthermore, the South East Irrigation Scheme, operated by Tasmanian Irrigation, covers much of the same region. Some potential irrigation areas identified as options in previous recycled water assessments, such as the Sorell Irrigation District, are now serviced by TI irrigation schemes.

A comparison of previous cost estimates for augmenting the Brighton and Clarence schemes, and current costings from the TI SEIS Stage 3 found that development costs per ML of water were similar, approximately $11,000/ML. Based on an average cost of $11,000/ML and 6753ML/year (2020 flow from the Selfs Point STP), the development of a new recycled water scheme would be approximately $75M. In 2054, the cost would be approximately $100M (based on 9089ML/year and $11,000/ML).

Conclusion

Desktop assessment of recycled water opportunities from the Selfs Point STP determined that options for a full reuse are very limited. Whilst a full recycled water irrigation scheme from the Selfs point STP is aspirational (to increase drought resilience of various water users and reduce environmental discharge to the Derwent River), such a scheme is currently constrained by availability of contiguous irrigable land and industrial reuse sites, and significant costs to improve water quality. For a scheme to be commercially viable, external funding would likely be required and considered in TasWater's long term planning strategy.

1 Introduction

1.1 Background

Pinion Advisory was engaged by ERA Planning and Environment (ERA) to develop an effluent reuse feasibility study (RFS) for the Selfs Point sewage treatment plant (STP) expansion project. The RFS will form part of the Environmental Impact Statement (EIS) for the project.

It is proposed that Macquarie Point STP be decommissioned to allow development of the new Macquarie Point precinct. To achieve this, all flows from Macquarie Point and existing Selfs Point sewage catchments will be redirected to an expanded Selfs Point STP.

The Selfs Point STP is located at 12 Selfs Point Road New Town, approximately four kilometres (km) north of the Hobart CBD. This STP discharges at Blinking Billy Point, located on the western shore of the Derwent River at lower Sandy Bay, approximately 8km south of the STP (Figure 1). A second outfall is located at the Selfs Point STP but is only used for emergency purposes. The current discharge arrangements will remain for the expanded STP (TasWater CDO, 2020).

Figure 1. Location of Selfs Point STP and current outfall sites (Source: ListMap).

1.2 Regulatory requirements

This study has been undertaken in accordance with:

- EPA Tasmania's Effluent Reuse Feasibility Study Guidelines (EPA, 2011).
- Environmental Impact Statement - Project Specific Guidelines for TasWater Selfs Point WWTP Expansion, New Town, Tasmania (EPA, 2020a).
- Environmental Guidelines for the Use of Recycled Water in Tasmania (DPIWE, 2002).
- Regulatory Framework for the Sustainable Discharge of Treated Wastewater from Level 2 WWTPs (EPA, 2020b).

The Regulatory Framework for the Sustainable Discharge of Treated Wastewater from Level 2 WWTPs (EPA, 2020b), defines full reuse as a scheme that caters for the diversion of waste flows to reuse for 90^{th}%ile wet years and a partial reuse scheme of greater than 30% of discharge volume diverted to reuse on a five-year average. These requirements have informed the search for suitable reuse options.

In addition, section 15.1 of the *State Policy on Water Quality Management 1997* describes the regulatory framework for water quality management in Tasmania and states that:

"A regulatory authority must not authorise a point source discharge pollutant to surface waters or ground waters unless it is satisfied that:

> *a) it is not practical to avoid the need for the discharge of wastes by re-cycling or re-use in accordance with clause 16.2.*
>
> *b) land application of the wastewater in an environmentally acceptable and sustainable manner is not practical or would result in a higher net environmental risk than disposal to surface water or groundwaters."*

1.3 Scope

The scope of this investigation was to undertake an assessment of the options available to TasWater for use of recycled water from the upgraded Selfs Point STP.

The study addresses the following:

- Review available data including recycled water quality and volumes.
- Review of previous recycled water demand studies for industrial reuse and irrigation in the Clarence and Brighton regions.
- Assess effluent quality to determine suitability for irrigation and/or industrial use. In particular, assessment of effluent conductivity as noted in the EPA project guidelines (EPA, 2020a).
- Evaluate the seasonal discharge flow data to determine the effluent available for irrigation and the land area necessary to cater for a full reuse scheme and partial reuse scheme options for now and projected 30-year future flows.
- Conduct a desktop search for potentially irrigable land, and industrial reuse options in the vicinity of the STP and along possible (and existing) pipeline routes. Industrial reuse being a

specific consideration noted in the EPA project guidelines (EPA, 2020a). A nominal distance of 5km was applied.

- Assess potential for supply of recycled water into the existing Clarence and/or Brighton recycled water schemes.
- Summarise opportunities and constraints of potential options.

1.4 Previous studies

Several studies and assessments of recycled water options relevant to this project have been considered in the development of this report. An effluent reuse feasibility study into seven STPs located along the Derwent River was conducted for TasWater by Pitt & Sherry (2014). The study investigated reuse options from Green Point, Cameron Bay, Prince of Wales Bay, Selfs Point, Macquarie Point, East Risdon and Rosny STPs.

In summary, the study found that interest in the volume of recycled water by industry in the greater Hobart area was limited to 7% of the total available (or 1,085ML/year), with a large proportion of this water dedicated to the Nyrstar smelter. However, recycled water would have required further treatment (e.g. reverse osmosis to improve water quality) to make it suitable for industrial purposes. The small volume of high-quality water, higher costs and dispersed location of other industries meant that reuse was not considered a suitable option at the time of the study.

A costing analysis found that a low-cost scenario (assuming winter storages are constructed by farmers at no cost to TasWater) to supply to the existing Brighton, Penna and Clarence recycled water schemes would be in the order of $80M, which equates to a per-megalitre capital cost of $6,000/ML. The high-cost scenario (assuming TasWater constructs all winter storages), would be $145M at a capital cost of $11,000/ML, which is significantly greater than the costs for a raw irrigation scheme (approximately $5,000/ML) and therefore, considered unlikely to be commercially viable. If no winter storages were constructed, only 57% reuse could be achieved, and the per ML capital cost would be approximately the same as the high-cost case (Pitt & Sherry, 2014).

The study concluded that full reuse from the Derwent STPs was not feasible. The only available strategy to achieve substantial reuse of the effluent from the Derwent STPs was to progressively develop a staged, consolidated reuse scheme to pipe effluent from successive Derwent STPs to the existing Brighton, Penna and Clarence recycled water irrigation schemes, and ultimately also to the Sorell Irrigation District where it could supplement raw water irrigation (Pitt & Sherry, 2014).

Data and findings from these reports have been consulted in the development of this study.

2 Forecast volumes

Combined Selfs Point/Macquarie Point STP discharge data was supplied by GHD (2021) (Table 1).

Full year flow data from 2020 (18.5 ML/day or 6753 ML/year) has been used to inform this report and water balance calculations. Seasonal variation has not been considered.

To allow for future growth in the catchments, TasWater is seeking to increase the capacity of the Selfs Point STP to 26 ML/day ADWF (30 year design horizon), based on a projected total flow of 24.9 ML/day (9089ML/year) in 2054, an increase of 34.6% from 18.5ML/day in 2020 (Table 1).

Table 1. Current and projected STP outflow data by catchment (2020 – 2054).

Catchment/STP outflows	ADWF (ML/d)					
	2020	2025	2035	2040	2045	2054
Macquarie Point	10.3	10.8	11.8	12.3	12.9	14.0
Selfs Point	8.0	8.4	9.2	9.6	10.0	10.9
Total	18.5	19.2	21.0	21.9	22.9	24.9

Source: GHD (2021). Selfs Point STP Upgrade - Concept Design Report CPB UGL JV, 13 December 2021. ADWF: Average dry weather flow.

3 Selfs Point STP water quality assessment

3.1 Recycled water quality

To adequately review opportunities for recycled water irrigation, an assessment of the proposed STP recycled water quality was undertaken.

In the absence of actual water quality data, treated effluent design parameter data, based on GHD (2021) was adopted. Key parameters compared to class B recycled water quality limits (DPIWE, 2002) are presented in Table 2. Recycled water quality will meet class B quality limits for pH, BOD and E. coli.

Table 2. Treated effluent design parameters (Source: GHD, 2021).

Parameter (unit)	Adopted 50^{th}%ile	Adopted 90^{th}%ile	Adopted maximum	EPA licence maximum	Class B limits
pH (pH units)	-	-	-	-	5.5 – 9.0*
Biochemical oxygen demand (mg/L)	10	15	20	15	<50
Total suspended solids (mg/L)	10	20	30	20	
Ammonia (mg/L as N)	1	2	5	2	
Total nitrogen (mg/L)	5 - 8	10	15	10	
Total phosphorous (mg/L)	2	5	10	3	
Oil and grease (mg/L)	2	5	10	5	
Faecal coliforms (cfu/100mL)	200	500	750	750	Median <1000^ Max 10,000

*pH range expanded by EPA for various TasWater sites in 2019 (5.5-9.0).
^*E.coli* limit of 10,000 organisms/100ml replaced thermotolerant coliforms as TasWater's microbiological indicator in 2019.

3.2 Salinity

Salinity (measured as electrical conductivity) is a critical water quality parameter for sustainable irrigation. In Southern Tasmania, conductivity below 1000µS/cm has typically been adopted as a general indicator of recycled water irrigation suitability. Many years of soil monitoring on existing irrigation schemes in the region has demonstrated this indicator to be conservative, and whilst a more site specific, risk-based approach should be implemented in establishing a salinity limit appropriate for the proposed recycled water use, 1000µS/cm is a useful benchmark.

It is well known that saltwater ingress under certain tidal and weather conditions occurs along the Hobart waterfront which discharges into the Macquarie Point STP resulting in high salinity levels (TasWater CDO, 2020). Salinity issues caused by saltwater ingress within the Macquarie Point catchment would need to be managed for a recycled water scheme to be successful.

Based on data provided from TasWater, the estimated median salinity concentration for combined flows from Selfs Point and Macquarie Point catchments is 1207µS/cm (minimum: 644µS/cm, maximum: 4119µS/cm). At the median concentration, salinity is unlikely to significantly limit irrigation potential, but peaks would likely need to be excluded from customer supply.

3.3 Trade waste inputs

A review of Selfs Point STP trade waste inputs (in view of impacts on recycled water quality) found that Bega Dairy and Drinks and Blue Line Laundry were key contributors to the catchment (Aurecon, 2016).

Trade waste from Bega Dairy and Drinks made up approximately 1.6% of total flow and contributes BOD and COD loadings of 25% and 18% of the total STP load respectively. Blue Line Laundry contributed approximately 1.4% of the total flow, although considerably less loadings (Aurecon, 2016).

Trade waste inputs from the Macquarie Point STP catchment include breweries, distilleries and other commercial operations. Cascade Brewery was identified as a significant trade waste customer although, as a result of pre-treatment undertaken onsite at the brewery, with final discharge concentrations of BOD and COD below that of typical domestic sewage (GHD, 2021).

4 Options assessment

An assessment of the reuse opportunities identified for consideration in this study were broken into three categories:

1. Industrial reuse (within 5km of the STP or along the Blinking Billy Point outfall) such as manufacturing.
2. Irrigation of public green spaces such as sports grounds, parks and gardens (within 5km of the STP or along the Blinking Billy Point outfall).
3. Contribution to an existing recycled water scheme, located to the east of the Derwent River (e.g. Brighton and Clarence recycled water schemes).

To maximise opportunities to supply recycled water to several sites along a single pipeline route the assessment of options 1 and 2 has been combined.

Key limitations on these opportunities relate to constraints and management restrictions for use of class B recycled water in public spaces (public access must be restricted during and after irrigation). Meanwhile, food manufacturing and processing requires potable water quality and therefore, at this time when direct potable reuse is not active in Australia, can be dismissed as an option.

On the western side of the Derwent River there is no scope for agricultural irrigation hence the only agricultural opportunities considered are in combination with the existing recycled water schemes that dominate the irrigable land on the east of the Derwent River.

Reticulated supply of treated recycled water for residential non-potable use has not been achieved in Tasmania, is not practical or cost effective in a brownfield area and has therefore not been considered in this study.

5 Water balance assessment for a future irrigation scheme

5.1 Irrigation area and storage volume requirements

To determine irrigation area and storage requirements for full reuse (100%) and partial reuse (minimum 30% of discharge[1]) of any future irrigation scheme, several crop water balances have been prepared (Appendix 1). The results are summarised in Table 3 to Table 6.

Scenarios have been modelled on best practice irrigation of pasture but can be applied to other non-pasture irrigation purposes.

Proportional 90th%ile rainfall values were calculated from the Hobart Airport BoM site 94008 (90th%ile data 1958-2021). The proportional 90th%ile rainfall calculations are based on annual 90th%ile data from BoM, apportioned over a 12 month period (as opposed to a dataset consisting of 12 consecutive 90th%ile rainfall months). Utilising proportionate rainfall data results in slightly less conservative, more realistic, irrigation demand assessment.

5.1.1 Current 2020 requirements

Based on the 2020 STP outflows of 6753ML/year, rainfall data from Hobart Airport (BoM site 94008), and best practice irrigation, a total of 977ha of pasture and 2558ML of storage is required for full reuse in a median rainfall year, at an application rate of 6.9ML/ha.

The pasture irrigation area requirement increases to 1211ha in a 90th%ile rainfall year with the need for 2857ML of storage (Table 3), at an application rate of 5.6ML/ha.

[1] 30% is the minimum requirement of the Effluent Reuse Feasibility Study Guidelines (EPA, 2011)

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For a partial reuse option (minimum 30% or 2026ML/year), a total of 293ha of pasture and 767ML of storage is required in a median rainfall year. This increases to 363ha in a 90th%ile rainfall year with 857ML of storage (Table 4).

5.1.2 Projected 2054 requirements

TasWater growth forecasts indicate that by year 2054 STP outflows will increase by approximately 34.6% up to 9089ML/year.

Based on the 2054 STP outflow of 9089ML/year, a total of 1314ha of pasture is required to achieve full irrigation in a median rainfall year with 3442ML of storage. This increases to 1630ha in a 90th%ile rainfall year with 3846ML of storage (Table 5).

For a partial reuse option (30% or 2727ML/year) in 2054, a total of 394ha of pasture and 1033ML of storage is required in a median rainfall year. The pasture irrigation area requirement increases to 489ha in a 90th%ile rainfall year with 1154ML of storage (Table 6).

Table 3. Summary of irrigation area and storage requirements year 2020 – 100% reuse option

	Annual rainfall (mm)*	STP outflows (ML)	Pasture irrigation area required (ha)	Irrigation requirement (ML/ha)	Storage required (ML)
Median	472	6753	977	6.9	2558
90th%ile	662	6753	1211	5.6	2857

* Rainfall values used in the model are annual values proportioned monthly from Hobart Airport data (BoM 94008).

Table 4. Summary of irrigation area and storage requirements year 2020 – 30% reuse option

	Annual rainfall (mm)*	STP outflows (ML)	Pasture irrigation area required (ha)	Irrigation requirement (ML/ha)	Storage required (ML)
Median	472	2026*	293	6.9	767
90th%ile	662	2026*	363	5.6	857

*30% of total STP flows.

Table 5. Summary of irrigation area and storage requirements year 2054 – 100% reuse option

	Annual rainfall (mm)*	STP outflows (ML)	Pasture irrigation area required (ha)	Irrigation requirement (ML/ha)	Storage required (ML)
Median	472	9089	1314	6.9	3442
90th%ile	662	9089	1630	5.6	3846

* Rainfall values used in the model are annual values proportioned monthly from Hobart Airport data (BoM 94008).

Table 6. Summary of irrigation area and storage requirements year 2054 – 30% reuse option

	Annual rainfall (mm)*	STP outflows (ML)	Pasture irrigation area required (ha)	Irrigation requirement (ML/ha)	Storage required (ML)
Median	472	2727*	394	6.9	1033
90th%ile	662	2727*	489	5.6	1154

*30% of total STP flows

5.2 Industrial reuse and public green spaces

A desktop search and GIS analysis was conducted to identify potentially suitable locations for industrial reuse and irrigation of public green spaces.

Mapping of potential recycled water usage sites within 5km of the STP and along existing linear infrastructure is presented in Figure 2. This includes the existing treated effluent outfall from Selfs Point STP (to be retained) that discharges at Blinking Billy Point (lower Sandy Bay) and therefore crosses 8km of urban Hobart.

A review of Hobart's potable water customers was also conducted to identify the largest industrial users, summarised in Table 7, and make assessment of their potential to transition water consumption from potable water to recycled water. The large water consumer sites, located within the study region, were also spatially identified (Figure 2).

Table 7. Largest potable water users within the Hobart region, 2021.

Name	Location	Industry	Water usage - 2021 (kL)*
Nyrstar	Lutana	Zinc manufacturing	3,182,977
Tasmanian Irrigation SE3 (OP85)	Granton	Primary production	1,666,440
Tasmanian Irrigation SE2 (OP23)	Richmond	Primary production	727,120
Mondelez Australia Pty Ltd	Claremont	Food manufacturing	278,062
Tasracing	Glenorchy	Racetrack	103,395
Hobart International Airport Pty Ltd	Cambridge	Aviation/transport	68,583
Botanical Gardens	Queens Domain	Parks and gardens	68,733
Hobart City Council	Glebe	Parks and gardens	60,582
Top Centre Laundry	Goodwood	Service industry/laundering	60,046
Gibson's Limited	Cambridge	Food manufacturing	58,842
Bega Dairy and Drinks Pty Ltd	Lenah Valley	Food manufacturing	55,525
University of Tasmania	Sandy Bay	Education	55,429
Tasmanian Health Service	Hobart	Hospital	53,140
Tea Tree Valley Irrigation Co-op (OP19)	Tea Tree	Primary production	50,276
Boral Shared Business Service	Bridgewater	Quarry/sand/gravel	45,779
Houston Properties Pty Ltd	Cambridge	Farming/cropping	39,670
Hobart City Council	Hobart	Sports ground	38,225
Hotel Grand Chancellor Pty Ltd	Hobart	Hotel	38,158
Hobart City Council – McRobies Road	South Hobart	Waste disposal	37,247
Tasmania Golf Club Inc	Cambridge	Golf course	34,910
Tasmanian Ports Corporation Pty Ltd	Hobart	Marine/transport	34,115
Tasracing	Brighton	Racetrack	33,956
Community & Rural Health Division	New Town	Medical services	32,207
University of Tasmania	Battery Point	Education	32,136
Tea Tree Irrigation Company (OP05)	Tea Tree	Primary production	29,367
Department of Education	Bellerive	Education	29,149
Australian National Hotels Pty Ltd**	Sandy bay	Hotel	27,790
University of Tasmania	Hobart	Residential accommodation	27,300
Aquatas Pty Ltd	Barretta	Manufacturing	27,149
Brighton Council	Pontville	Sports ground	26,841
Master Blenders Australia Pty Ltd	Granton	Primary production	26,619

Name	Location	Industry	Water usage - 2021 (kL)*
Dept of Justice - Prison services	Risdon Vale	Gaol, reformatory	26,145
Claremont Partners (Tas) Pty Ltd	Berriedale	Museum	25,963
LCM Calvary Health Care Holdings Ltd	Lenah Valley	Hospital	25,514
Blueline Laundry	New Town	Service industry/laundering	25,204
Hobart City Council	North Hobart	Sports ground	24,295
Australian National Hotels Pty Ltd**	Sandy Bay	Hotel	19,346

*Source: TasWater.

**Wrest Point consists of two separate PIDs and accounts.

Following the review of green space, and sites with a high potable water demand (Table 7), GIS opportunities were broadly grouped into three spatial options:

1. Northern pipeline - from Selfs Point STP to the Tasracing facility – anchored by potential demand from Nyrstar.
2. Western pipeline - from Selfs Point STP up into Lenah Valley.
3. Southern pipeline – the existing outfall from Selfs Point STP to Blinking Billy Point (Figure 2).

An assessment of the potential for recycled water at sites identified along these routes is summarised in Table 8.

A consideration specific to the southern option is that, being the existing outfall required to carry all treated effluent, any requirement for water quality in excess of the proposed design standard (class B recycled water) can be excluded. There is no potential to treat and pump only a portion of the treated effluent if utilising this infrastructure.

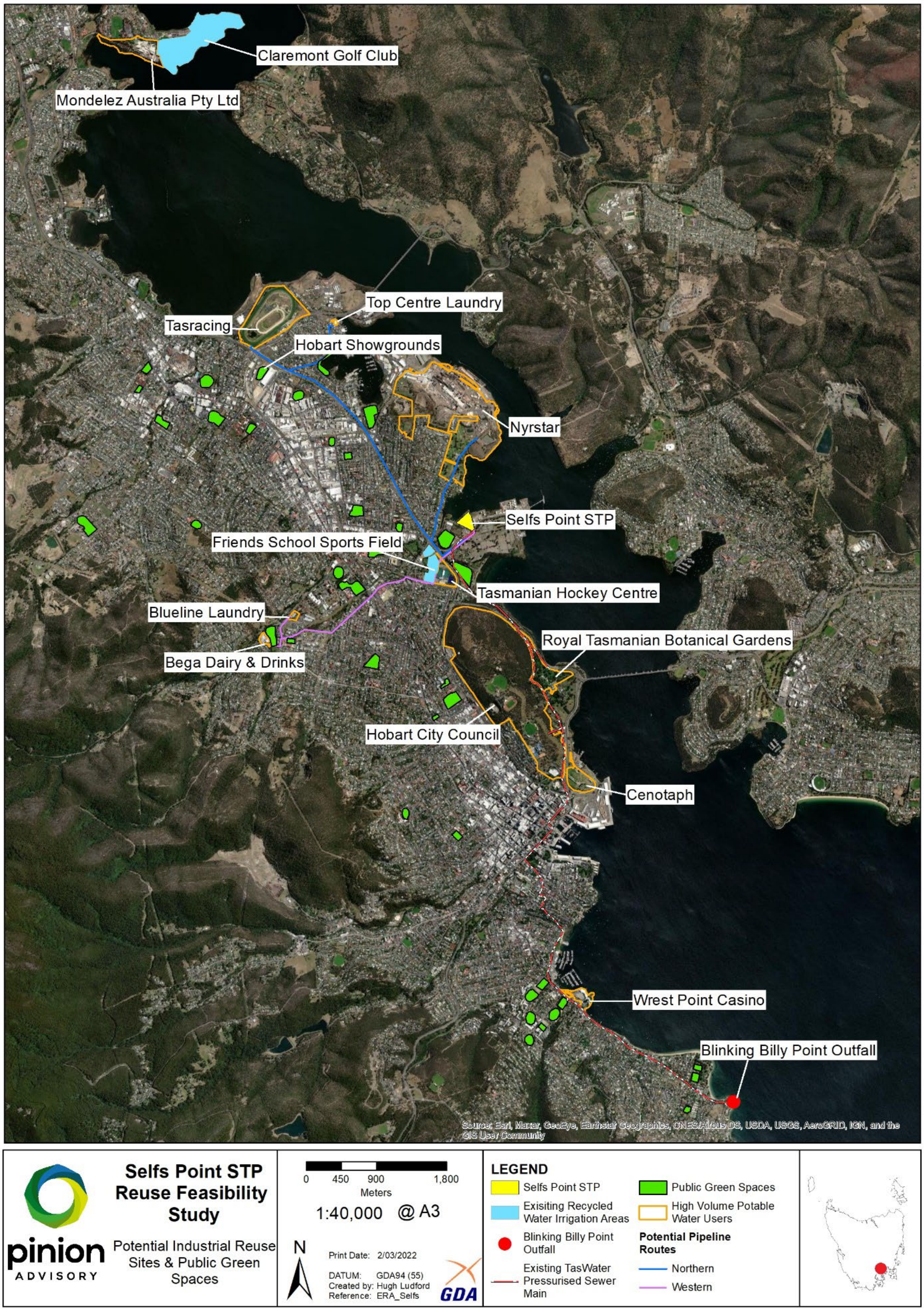

Figure 2. Desktop GIS analysis of potential industrial reuse sites and public green spaces.

Table 8. Options assessment – industrial users and public green spaces.

Name	Potable water use – 2021 (ML/year)	Potential recycled water requirement (ML/year)	Comments	Assessment
Northern pipeline				
Nyrstar	3183	730 (based on 2ML/day)*	Requires high quality water for zinc processing. Year round demand. Large water user located close to STP. Consultation with Nyrstar found that the supply of recycled water is likely to be cost prohibitive due to additional treatment costs required to make recycled water fit for purpose.	Potential reuse site
Hobart Showground	-	17**	Irrigation of public showground, seasonal demand. Withholding periods to be considered (Size: ~2.5ha, annual irrigation requirement: 8.3ML).	Potential reuse site
Top Centre Laundry	60	60	Laundry services with consistent water demand. Class B water unsuitable and therefore additional treatment required prior to use. Unknown if user is willing to pay for treatment upgrades.	Potential reuse site
Tasracing	103	103	Water used for maintenance of grass racetrack. Seasonal demand (spring to autumn).	Potential reuse site
Mondelez Australia Pty Ltd	278	-	Food processing facility. Year round demand. Requires drinking water quality, treatment required and > 5km from STP. Unlikely to be suitable.	No
Other public green space along proposed route	-	76**	New Town Bay Golf Club (Size: 9ha, annual irrigation requirement: 62ML). Prince of Wales Bay Sports Grounds (Size: 2ha, annual irrigation requirement: 14ML).	Potential reuse sites
Sub-total (Northern)	-	**986**	-	-
Western pipeline				
Blueline Laundry	25	-	Laundry services with consistent water demand. Class B water unsuitable and therefore additional treatment required prior to use. Unknown if user is willing to pay for treatment upgrades. Likely high infrastructure supply cost due to location and demand insignificant in the scheme of total STP volume.	No
Bega Dairy and Drinks Pty Ltd	56	-	Food processing facility. Year round demand, requires drinking water quality, treatment required. Unlikely to be suitable.	No
Other public green space along route	-	23.5**	Ogilvie High School Grounds (Size: 2.2ha, annual Irrigation requirement: 15.2ML). New Town Oval (Size: 1.2ha, annual irrigation requirement: 8.3ML).	Potential reuse sites

Name	Potable water use – 2021 (ML/year)	Potential recycled water requirement (ML/year)	Comments	Assessment
Sub-total (Western)	-	**23.5**	-	-
Southern (Blinking Billy Point outfall pipeline) – class B only				
Tasmanian Hockey Centre	16*	-	Water irrigated to synthetic grass (wet playing surface), requires class A. Unsuitable without further treatment.	No
Botanical Gardens	69	-	Previous discussions have highlighted concerns with water quality (requires class A water), buffer distances and withholding periods. Seasonal demand. Unlikely to be suitable.	No
Hobart City Council (Glebe, Parks)	61	61	Irrigation of public parks, seasonal demand. Withholding periods and public access to be considered.	Potential reuse site
Hobart City Council (Hobart, Sports)	38	38	Domain tennis centre and surrounds – irrigation of sports ground, seasonal demand. Withholding periods and public access to be considered.	Potential reuse site
Hobart City Council (Hobart, Sports)	24	24	North Hobart Football Oval - irrigation of sports ground, seasonal demand. Withholding periods and public access to be considered.	Potential reuse site
Cenotaph and Cornelian Bay sports grounds	Unknown	-	Irrigation of public green space/sports ground, seasonal demand. Existing class B connection not utilised due to public access requirements. Requires class A water. Unlikely to be suitable.	No
Wrest Point Casino	47	23.5 (based on ~50% of potable water use)	Outside of 5km zone but located on existing outfall route. Irrigation of public parks, seasonal demand. Buffer zones and withholding periods to be considered. Any potential for internal reuse (e.g. toilet flushing) would require onsite treatment.	Potential reuse site
Friends School	-	13	Irrigation of school sports grounds (~2.8ha). Seasonal demand. Existing recycled water customer.	Current reuse site
Other public green space along route	-	-	Irrigation sites unlikely to be suitable due to public access requirements. Requires class A. Unsuitable without further treatment. Cornelian Bay Sports Grounds (Size: 6.5ha, annual irrigation requirement: 45ML)- previous supply disconnected due to public access.** University of Tasmania Sports Grounds (Size: 6.5ha, annual irrigation requirement: 45ML).**	No

Name	Potable water use – 2021 (ML/year)	Potential recycled water requirement (ML/year)	Comments	Assessment
			Sandown Park Sports Grounds - Sandy Bay (Size: 1.5ha, annual irrigation requirement: 10ML).** Total irrigation demand (all sites): ~100ML/year.	
Sub-total (Southern)	-	**160**	-	-

*Source: Pitt & Sherry (2014). **Based on an irrigation requirement of 6.9ML/ha.

5.2.1 Northern pipeline option

The potential for Nyrstar Zinc Smelter to receive treated wastewater from multiple STPs was assessed by Pitt & Sherry (2014). The smelter is located approximately 1.3km north of the Selfs Point STP, in 2021 the site utilised 3183ML of potable water (Table 8).

At the time of the Pitt & Sherry study, TasWater discussed the possibility of supplying recycled water to the smelter but Nyrstar had recently committed to taking 30% of their water from a stormwater harvesting scheme being constructed by Glenorchy City Council. The scheme has since been decommissioned.

The study concluded that the remaining 70% of Nyrstar demand (~2,030ML) could be supplied from the Selfs Point STP, however was unlikely to be commercially viable due to advanced treatment costs (estimated ~$4 million infrastructure upgrade required). Furthermore, the additional treatment would create a nutrient rich brine that would need to be disposed of into the Derwent River, therefore largely negating the environmental benefit of reuse (Pitt & Sherry, 2014).

TasWater contacted Nyrstar in late 2021 regarding the potential supply of recycled water from the Selfs Point STP. Nyrstar confirmed that high quality water would be required, therefore necessitating treatment with reverse osmosis prior to use. As was concluded by Pitt & Sherry (2014), this option is likely to be cost prohibitive due to additional treatment costs to make recycled water fit for purpose.

Tasracing could use up to 103ML/year of class B recycled water during the irrigation season (spring to autumn). Top Centre Laundry utilise 60ML/year but will require pre-treatment of recycled water prior to use.

An indicative northern pipeline route to the Tasracing site is presented in Figure 2. Note, the route is based on a desktop assessment and provided for discussion purposes only. The route (including connections to Nyrstar, Hobart Showgrounds and Top Centre Laundry) is approximately 7km.

A search of other irrigation sites along the northern pipeline route found a few, small public green spaces (e.g. golf course and sports ground) with low water demand (76ML/year) (Table 8). Required buffer zones have not been included in the area calculations and as a result actual water demand is likely to be lower.

A northern pipeline would be anchored by demand from Nyrstar. Other potential recycled water customers include Tasracing and the Hobart showground facility (Table 8, Figure 2) but without Nyrstar there is likely insufficient demand for this option to be viable.

5.2.2 Western pipeline option

The largest water users to the west of the Selfs Point STP are Blueline Laundry and Bega Dairy and Drinks Pty Ltd, located in Lenah Valley (Figure 2).

Bega Dairy and Drinks Pty Ltd require potable water quality and therefore, at this time when direct potable reuse is not active in Australia, can be ruled out.

An indicative western pipeline route to Blueline Laundry is presented in Figure 2. Note, the route is based on a desktop assessment and provided for discussion purposes only. Additional treatment would be required to improve water quality prior to use. This cost would be additional.

A search of other irrigation sites along the western pipeline route revealed a few, small public green spaces with low water demand (23.5ML/year) (Table 8). Required buffer zones have not been included in the area calculations and as a result actual water demand is likely to be lower.

The total potential demand of Blueline Laundry (25ML/year) and other public green spaces (23.5ML/year) is 48.5ML/year and is insignificant to the current annual STP discharge of 6753ML. This option therefore, does not warrant further consideration.

5.2.3 Southern pipeline (Blinking Billy Point outfall) option

The Friends School (existing recycled water customer), Tasmanian Hockey Centre, Botanical Gardens and various public green spaces are located south of the STP along the existing outfall route that continues to Blinking Billy Point (Figure 2).

Friends school is an existing TasWater customer and only uses a small volume of recycled water, approximately 13ML/year to irrigate 2.8ha of sports fields (Table 8).

The Tasmanian Hockey Centre was assessed by Pitt & Sherry (2014) and found to be an unsuitable candidate for class B recycled water due to the frequency of application and requirement for a wet playing surface.

TasWater has previously discussed the possibility of supplying irrigation water from the Selfs Point STP to the Botanical Gardens and Government House. The Botanical Gardens (managed by the Tasmanian Government's Department of Natural Resources and Environment) expressed concern over the quality of the water and its potential impact on its flora collection and the required buffer distances to residences at Government House, further restricting the useable area (Pitt & Sherry, 2014).

Hobart City Council sites include public parks located at Glebe, North Hobart and the Domain tennis centre. Public parks and sports grounds require consideration of withholding periods and are limited by seasonal demand.

A search of other irrigation sites along the existing Blinking Billy Point outfall found some public green spaces with a water demand of up to 100ML/year (Table 8). Required buffer zones have not been included in the area calculations and as a result actual water demand is likely to be lower. Furthermore, due to the small size of most sports grounds (<1ha), buffer distances and public access requirements, irrigation at these sites is unlikely to be suitable.

Previous experience with recycled water irrigation at the Cenotaph and Cornelian Bay sports grounds highlights the need for high quality irrigation water (higher than class B). If recycled water was treated to class A quality approximately 245ML/year could be utilised at the Tasmanian Hockey Centre, Botanical Gardens, Government House, Wrest Point Casino, Friends School and various public green spaces. However, this would require utilising the existing outfall pipeline route to Blinking Billy Point and all effluent from the Selfs Point STP to be treated to class A, or a duplicate pipeline constructed for class A water.

5.2.4 Other options

Several other large industrial water users were identified but excluded from the assessment due to distance, isolated location (requiring a single supply pipeline) and/or the requirement for low volumes of high quality water. These include Mondelez Australia Pty Ltd (Cadbury factory at Claremont), McRobies Road waste facility (South Hobart), Risdon prison (Risdon Vale) and Hobart International Airport Pty Ltd (Cambridge).

5.2.5 Discussion

Several small, isolated opportunities were identified for local use of recycled water within 5km of the STP or along the existing outfall route. None of these options will fulfil the scale required to meet the partial (30% reuse requirement) of discharge from the Selfs Point STP.

The assessment identified several constraints associated with irrigating recycled water within the urban environment. Public green spaces are generally small, isolated and require small volumes of high-quality recycled water. Most of the sites assessed were also constrained by the lack of land for onsite storage and the need to restrict public access. Meanwhile, industrial users typically required a higher water quality and would therefore require additional treatment (either by TasWater or onsite by the end user) which would come at significant additional cost.

Of the three potential recycled water supply regions identified, north of the STP presents the only potential option and would be contingent on participation from Nyrstar and additional water treatment. However, due to high treatment costs, this option is likely to be cost prohibitive. Nyrstar, identified as TasWater's largest industrial user of potable water is located approximately 1.3km north of the Selfs Point STP (Table 8, Figure 2).

If a pipeline was constructed to supply Nyrstar there would also be potential to supply up to 103ML to Tasracing for irrigation of the racetrack, up to 76ML/year for various public green spaces and 17ML/year to the Hobart Showgrounds, however, water demand at these sites will be seasonal. The total estimated demand of this option totals only 15% of current STP volume (Table 9) and therefore while it initially appears a useful option, it will not achieve the 30% target of a partial reuse scheme.

Table 9. Summary of pipeline distance, costs and demand for each option (class B only).

Option	Pipeline distance (km)	Pipeline cost ($M)*	Potential demand (ML/year)	% reuse - 2020	% reuse - 2054
Northern	7.0	6.65	986	15	11
Western	4.3	4.09	23.5	0.3	0.2
Southern**	-	-	160	2.4	1.8

*Based on a rate of $950 per metre for the supply and placement of pipeline in urban areas (Source: TasWater). Does not include other infrastructure costs (e.g. pump stations, etc).

**Using existing outfall pipeline and class B water.

On the basis of the above, an urban recycled water scheme that can utilise greater than 30% of STP flow comprising of industrial reuse and irrigation of public green space is considered unviable at this stage.

5.3 Opportunities for broadscale recycled water irrigation schemes

5.3.1 Background

TasWater operates three large recycled water schemes to the east of the Derwent River. The Brighton, Penna and Clarence recycled water irrigation schemes supply class B recycled water to approximately 36 properties for agricultural and public recreation uses (including pasture, cropping, orchards, vines and golf courses).

These schemes are presented in Figure 3 in conjunction with the Tasmanian Irrigation (TI) South East Irrigation Scheme footprint which services much of this same region.

The Penna recycled water scheme has not been considered further in this assessment due to a) its isolated location and b) current insufficient scheme capacity to meet the full reuse needs of the STPs it already services.

There is strong demand for recycled water from the Brighton and Clarence recycled water schemes and over the lifetime of their operation there have been various assessments in relation to augmenting and increasing scheme supply. The opportunities and challenges follow.

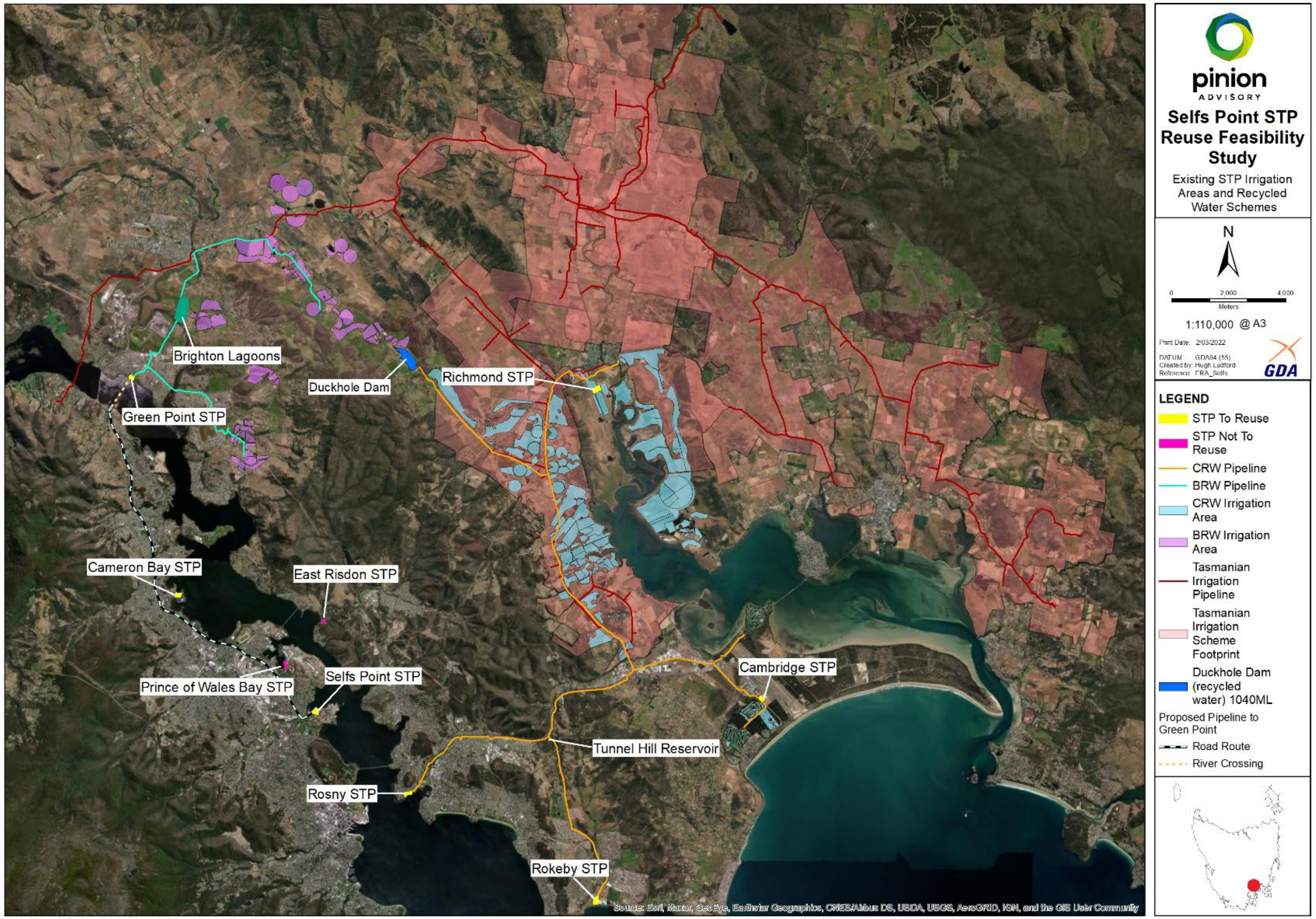

Figure 3. Location of urban STPs, the Brighton and Clarence recycled water schemes and TI SEIS Stages 1-3.

5.3.2 Brighton recycled water irrigation scheme

5.3.2.1 Current scheme

The Brighton recycled water scheme (shown in Figure 3) is supplied by Green Point STP and Brighton lagoon STP.

Typically, between 700 and 900ML per year is supplied to properties connected to the Brighton scheme. Of the combined 1289ML of class B recycled water generated by Green Point and Brighton STPs in 2020-2021, approximately 881ML (68%) was supplied to the Brighton scheme and 408ML (32%) was discharged to the Derwent River.

5.3.2.2 Discussion

In order to supply the Brighton irrigation area with recycled water from the Selfs Point STP, a 15.7km pipeline to the Green Point STP (including a 1.2km Derwent River crossing) would be necessary. A proposed route is shown in Figure 3.

Recycled water supply infrastructure (pumps and pipelines) from the Green Point STP into the existing Brighton recycled water scheme is currently at capacity. There are already periods where Green Point STP discharges to the Derwent River as there is either no storage capacity or the pump/pipeline infrastructure cannot match STP output.

Therefore, rather than additional water simply being added to the existing scheme, for this to be a possible option, duplication of piping, pumping and storage infrastructure would be necessary.

An alternate strategy would be to bypass the existing scheme and take recycled water further north to large pastoral properties in the Southern Midlands or north-west of Brighton (out to Broadmarsh) where there might be more potential to find sufficient land to make an impact on reducing discharge at Selfs Point. Utilisation of effluent from Cameron Bay STP (located further north than the Selfs Point STP, as shown in Figure 3, and therefore closer to Brighton or the Southern Midlands) would also be a logical consideration.

An additional consideration is the commitment of landowners in the Southern Midlands to an existing TI development which covers much of the high value irrigable land in this district (Figure 3). Land from Epping Forest in the north to Elderslie in the south (located 20km north west of Brighton) is serviced by TI's Midland Irrigation Scheme (TI, 2022).

5.3.2.3 Conclusion

Given that irrigable land around Brighton is generally small and non-contiguous, and that the current scheme does not have capacity (in linear infrastructure) to manage the existing supply, connection into this scheme is not an option.

Development of a new scheme would require new infrastructure from Selfs Point to the Southern Midlands (including crossing of the Derwent River) to a region that is/will be serviced by Tasmanian Irrigation SEIS Stage 3.

5.3.3 Clarence recycled water irrigation scheme

5.3.3.1 Current scheme

As shown in Figure 3, the class B Clarence recycled water scheme connects the Rosny, Rokeby, Cambridge and Richmond STPs to a network of pipelines, storage points and customers through the Coal River Valley and Seven Mile Beach areas. The scheme has been supplying 2000-2500ML/annum of class B water since 2013.

The Rokeby and Rosny STPs pump to a 2ML header tank at Tunnel Hill. From Tunnel Hill, the scheme is gravity fed through the Coal River Valley and to Seven Mile Beach. One of the pipelines terminates at TasWater's 1040ML Duckhole Dam.

A process diagram of the Clarence recycled water irrigation scheme is provided in Appendix 2.

A connection from the upgraded Selfs Point STP into the scheme would require construction of a Derwent crossing, potentially from the existing Macquarie Point STP outfall into the Clarence recycled water scheme (possibly at Rosny STP or Tunnel Hill reservoir). For this scenario, the existing pressurised main sewer line to the Blinking Billy Point outfall could potentially be used to transfer recycled water from Selfs Point STP to Macquarie Point before the Derwent crossing.

5.3.3.2 Previous assessment of this option

In 2018, a collective of farmers known as South East Reuse Scheme (SERUS) approached TasWater to investigate the potential for a privately funded and operated irrigation scheme to pipe effluent from Selfs Point STP across the Derwent River. The proposed scheme would link into the Clarence scheme at Rosny STP and use the existing pipeline infrastructure. The proposal also included pump upgrades and a possible link to the Brighton recycled water scheme. The proponents claim the scheme would double the recycled water irrigation supply of the Coal River Valley at the time to 6,000 ML/year. The capital costs for the project were estimated at $5 million (GHD, 2018).

More information regarding consultation with SERUS and TasWater is provided in Section 6.1.

As noted in section 1.4, a costing analysis by Pitt & Sherry (2014) found that a low-cost scenario (assuming winter storages are constructed by farmers at no cost to TasWater) to supply to the existing Brighton, Penna and Clarence recycled water schemes would be in the order of $80M, which equates to a per-megalitre capital cost of $6,000/ML.

A recent review of TI SEIS Stage 3 costings (TI, 2022) found that total build cost was approximately $11,000/ML (based on ~$33M for the project), more than double the value estimated by Pitt & Sherry (2014) and similar to the high-cost scenario presented in that report (this is further explored in Table 10).

5.3.3.3 Discussion

Similar to the Brighton recycled water scheme, the Clarence scheme is currently hydraulically constrained by linear infrastructure capacity and storage.

For additional water to be transferred via the scheme, existing piping, pumping and storage infrastructure on the eastern shore of the Derwent River would need to be upgraded or duplicated.

While customer demand on the scheme has, and continues to, exceed recycled water supply, experience from 2021 (wet year) has highlighted the lack of storage capacity on the scheme. Insufficient storage resulted in discharge to the Derwent from October to December 2021.

Therefore, to allow the scheme to achieve full reuse targets, development of the entire Selfs Point water balance requirement for storage (2558ML-3442ML) would be necessary. In a region where land value is high and irrigation storage dams are typically in the range of 10 to 100ML, the likelihood of obtaining a suitable site of this size is low.

A risk presented by supplementation of supply from the new Selfs Point STP is salinity. Salinity from Macquarie Point is known to fluctuate due to sea water ingress within the catchment. This risk would need to be addressed before supply to irrigation could be seriously considered. Some work had been completed at Salamanca to address the salinity issues at Macquarie Point, but subsequent monitoring found there was no significant improvement.

Furthermore, many properties on the Clarence scheme have access to additional water supplies. The South East Irrigation Scheme, operated by TI, covers much of the same region. Some potential irrigation areas identified by Pitt & Sherry (2014), such as the Sorell Irrigation District, are now serviced by TI irrigation schemes (refer to Figure 3).

6 Stakeholder consultation

As a part of the Selfs Point STP expansion, TasWater has consulted widely with government regulators, council, landowners and adjacent land users who may have interest in the project (TasWater CDO, 2020).

Specific stakeholder consultation for the reuse of recycled water includes SERUS and Nyrstar.

6.1 SERUS

In 2018, TasWater signed a collaboration agreement with South East Reuse Scheme Inc (SERUS). SERUS is a collective of farmers who were investigating the potential for a private funded and operated irrigation scheme to pipe effluent from the Selfs Point STP across the Derwent River to service the Coal River Valley area. According to TasWater the collaboration agreement has since expired and no consultation had occurred with SERUS since late 2019.

The proposal included a connection point and pipeline from near Macquarie Point to the existing scheme at the Rosny Point STP and would have doubled the recycled water supply for irrigation of the Coal River Valley by up to 6,000 ML/year. However the proposal was based on utilising the existing scheme pipeline infrastructure network, which is already at capacity.

A Memorandum of Understanding was enacted between SERUS and consultants GHD to advance the proposal. According to a presentation by GHD in 2018, an initial examination (but not a pre-feasibility report) of the irrigation project's technical and financial feasibility was positive and the estimated $5 million project capital cost was feasible and funding arrangements were available at the time.

However, the salinity concentration of the combined effluent (from Macquarie Point STP) was identified as a key issue for the proposal. Between 2015 and 2019 some maintenance work was carried out at Salamanca by TasWater to reduce the salinity levels, but by 2019 no significant improvement was observed.

GHD (2018) also investigated other potential sources of water for irrigation for the Coal River Valley as part of the proposal but were deemed cost-prohibitive under the arrangement. Other irrigation sources included supplementing the existing Brighton Reuse Scheme from other STPs (e.g. Cameron Bay), piping effluent from other STPs over the Meehan Range, and piping water from the Derwent River upstream of Granton via the northern extent of the Coal River Valley.

No other information or studies were available at the time of writing (March 2022). However, it is understood that SERUS was working on securing private funding to facilitate a more detailed feasibility study that will inform the proposal business case. It could be assumed, that if private funding were obtained (and salinity risk water addressed), the proposed Selfs Point upgrade would not prevent this proposal proceeding.

6.2 Nyrstar

In 2014, TasWater held discussions with Nyrstar as the most prospective industrial user of recycled water. At the time Nyrstar had recently committed to taking water from a stormwater harvesting scheme proposed by the Glenorchy City Council, although the project did not proceed.

It was found that recycled water supplied to Nyrstar would require advanced treatment by reverse osmosis (estimated total cost of $4 million) and as a result would not be economically feasible (Pitt & Sherry, 2014).

In late 2021, TasWater contacted Nyrstar regarding the potential supply of recycled water from the Selfs Point STP. Feedback from Nyrstar confirmed that this option remains unfeasible due to additional treatment costs.

7 Recycled water scheme cost analysis

A comparison of previous irrigation scheme cost estimates (Pitt & Sherry, 2014; GHD, 2018) and current costings from the TI SEIS Stage 3 (TI, 2022) is presented in Table 10. Note, estimates from Pitt & Sherry (2014) include costs for pumps, pipelines and storages (in the high-cost scenario) and pumps and pipelines only (in the low-cost scenario).

Cost per ML of water for TI's SEIS Stage 3 was found to be similar to Pitt & Sherry's high-cost scenarios for recycled water development at $11,000/ML.

Based on an average cost of $11,000/ML and 6753ML/year (2020 flow from the Selfs Point STP), the development of a new recycled water scheme would be approximately $75M. In 2054, the cost would be approximately $100M (based on 9089ML/year and $11,000/ML) (Table 10).

Table 10. Summary of previous recycled water cost estimates and current raw water irrigation scheme.

Source	Captial cost ($M)	Cost per ML ($/ML)	Assumptions/comments
SERUS (GHD, 2018)	5	-	Use of existing pipework from Clarence scheme, therefore no new pipeline infrastructure. Costing includes pump upgrade at Rosny STP and possible link to Brighton RWS.
Effluent reuse feasibility study Low-cost scenario - Stages 1-6* (Pitt & Sherry, 2014)	80	6,000	Winter storages are constructed by farmers at no cost to TasWater. Based on 14,203 ML/year. STPs included: GP, CB, PoW, SP, MP and ER.
Effluent reuse feasibility study High-cost scenario - Stages 1-6* (Pitt & Sherry, 2014)	145	11,000	Winter storages are constructed by TasWater. Based on 14,203 ML/year. STPs included: GP, CB, PoW, SP, MP and ER.
Effluent reuse feasibility study Low-cost scenario – Stages 2-5** (Pitt & Sherry, 2014)	77	6,000	Winter storages are constructed by farmers at no cost to TasWater. Based on 12,488ML/year. STPs included: CB, PoW, SP and MP.
Effluent reuse feasibility study High-cost scenario – Stages 2-5** (Pitt & Sherry, 2014)	135	11,000	Winter storages are constructed by TasWater. Based on 12,488ML/year. STPs included: CB, PoW, SP and MP.
TI SEIS Stage 3 (Tranche 1) (TI, 2022)	33	11,000	Services Tea Tree, Campania, Orielton, Pawleena, Penna, Sorell and Forcett. 3,000ML capacity. Includes a 250ML storage dam at Rekuna. Commenced September 2015.
Selfs Point STP – new recycled water scheme (2020 flow)	75	$11,000	Based on 6753ML/year (2020 flow) and TI/Pitt & Sherry (2014) estimate of $11,000/ML.
Selfs Point STP – new recycled water scheme (2054 flow)	100	$11,000	Based on 9089ML/year (2054 flow) and TI/Pitt & Sherry (2014) estimate of $11,000/ML. Costings not adjusted for CPI.

*Stages 1-6 include Green Point (GP), Cameron Bay (CB), Prince of Wales PoW), Selfs Point (SP), Macquarie Point (MP) and East Risdon (ER) STPs.

**Stages 2-5 include Cameron Bay, Prince of Wales, Selfs Point and Macquarie Point STPs.

8 Concluding commentary

Desktop assessment of recycled water opportunities from the Selfs Point STP determined that options for a full reuse scheme are very limited. While water quality is anticipated to meet class B standards (and is therefore suited to a range of agricultural uses) salinity (from salt water ingress into the current Macquarie Point STP catchment) is a risk that would require further consideration.

For most public green spaces and industrial irrigation application treatment to class A standards would be necessary and this would come at significant cost. Even if this were to occur, no options with sufficient demand to achieve a minimum of 30% reuse have been identified and therefore make an urban irrigation scheme currently unviable.

Opportunities to connect into an existing recycled water scheme across the Derwent River (e.g. Brighton or Clarence) are severely limited by lack of existing storage capacity and lack of capacity in linear infrastructure. The reality of this is that any irrigation opportunities to the east of the Derwent River essentially require development of a whole new irrigation scheme, and not an augmentation into an existing scheme. Furthermore, with the development of TI SEIS Stage 3 much of the area east of Brighton to Sorell is now serviced with a reliable irrigation supply.

Infrastructure costs to supply, store and treat (if class A water is required) for a new recycled water irrigation scheme have been assessed as part of several studies undertaken in the past 14 years. Costs for high-cost scenarios (including storage infrastructure) are comparatively similar to those for a raw water irrigation scheme.

Whilst a full recycled water irrigation scheme from the Selfs point STP is aspirational (to increase drought resilience of various water users and reduce environmental discharge to the Derwent River), such a scheme is currently constrained by availability of contiguous irrigable land and industrial reuse sites, and significant costs to improve water quality. For a scheme to be commercially viable, additional/external funding would be required and considered in TasWater's long term planning strategy.

9 References

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10 Appendices

Appendix 1: Water balance

Median rainfall year (2020)

Assumptions	Median rainfall year														
Median rainfall data obtained from	Hobart Airport														
Evaporation data obtained from	Modelled from SILO														
Total irrigation area required (ha)	976.5														
STP average wastewater flow of	6752.5	ML/year	based on historical (2020) monthly wastewater flows by TasWater												
		unit	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**TOTAL**
Evaporation (Pan)	**A**	mm	200.4	145.6	126.45	78.15	48.4	32.55	39.05	55.15	87.45	122.35	138.75	169.05	1243
Effective Lagoon Evaporation	**B**	mm	160.3	116.5	101.2	62.5	38.7	26.0	31.2	44.1	70.0	97.9	111.0	135.2	995
Rainfall	**C**	mm	32.2	27.2	29.3	29.2	30.1	27.9	31.7	42.1	35.7	39	40.3	43.8	472
Effective Rainfall	**D**	mm	22.5	19.0	20.5	20.4	21.1	19.5	22.2	29.5	25.0	27.3	28.2	30.7	286
Direct Crop Coefficient	**E**		0.85	0.85	0.85	0.75	0.65	0.5	0.4	0.5	0.7	0.75	0.85	0.85	
Evapotranspiration (A x E)	**F**	mm	170.3	123.8	107.5	58.6	31.5	16.3	15.6	27.6	61.2	91.8	117.9	143.7	966
Irrigation Requirement (F - D)	**H**	mm	148	105	87	38	10	0	0	0	36	64	90	113	692
Net Lagoon Evaporation	**I**	kL	37155	25891	20839	9663	2500	-539	-133	586	9935	17075	20503	26518	169992
Wastewater Flow	**J**	kL	573500	518000	573500	555000	573500	555000	573500	573500	555000	573500	555000	573500	6752500
Net Lagoon Inflow (I + H)	**K**	kL	536345	492109	552661	545337	571000	555539	573633	572914	545065	556425	534497	546982	6582508
Water Used in Irrigation (G x Irrigation Area)	**L**	kL	1443262	1022587	849284	372753	101458	0	0	0	353736	629474	876186	1103759	6752500
Average Daily Irrigation Rate	**M**	kL/d	46557	36521	27396	12425	3273	0	0	0	11791	20306	29206	35605	
Cumulative Storage (Storage in Previous Month + J - K)	**N**	kL	780371	518000	0	182247	654289	1209289	1782789	2356289	2557553	2501578	2180392	1650134	
Lagoon Depth	**O**	m	3.1	2.1	0.0	0.7	2.6	4.8	7.1	9.4	10.2	10.0	8.7	6.6	

Lagoon (reuse dam) Area		ha	25
Assume Effective Rainfall Factor			0.70
Irrigation Area Required		ha	**976.5**
Lagoon Volume Required		ML	**2557.6**
Lagoon Depth		m	**10.2**

pinion ADVISORY

90th%ile rainfall year (2020)

Assumptions	**90th percentile rainfall (wet year)**		
90th percentile rainfall data obtained from	Hobart Airport		
Evaporation data obtained from	Modelled from SILO		
Total irrigation area required (ha)	1211.2		
STP average wastewater flow of	6752.5	ML/year	based on historical monthly wastewater flows by TasWater

		unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
Evaporation (Pan)	**A**	mm	200.4	145.6	126.45	78.15	48.4	32.55	39.05	55.15	87.45	122.35	138.75	169.05	1243
Effective Lagoon Evaporation	**B**	mm	160.3	116.5	101.2	62.5	38.7	26.0	31.2	44.1	70.0	97.9	111.0	135.2	995
Rainfall	**C**	mm	53.8	47.7	49.2	54.6	48.1	45.8	56.2	63.6	54.2	63.5	59.7	70.5	662
Effective Rainfall	**D**	mm	37.7	33.4	34.4	38.2	33.7	32.1	39.4	44.5	37.9	44.5	41.8	49.4	467
Direct Crop Coefficient	**E**		0.85	0.85	0.85	0.75	0.65	0.50	0.40	0.50	0.70	0.75	0.85	0.85	
Evapotranspiration (A x E)	**F**	mm	170.3	123.8	107.5	58.6	31.5	16.3	15.6	27.6	61.2	91.8	117.9	143.7	
Irrigation Requirement (F - D)	**H**	mm	133	90	73	20	0	0	0	0	23	47	76	94	557
Net Lagoon Evaporation	**I**	kL	30892	19938	15065	2295	-2730	-5742	-7245	-5660	4570	9969	14869	18770	94990
Wastewater Flow	**J**	kL	573500	518000	573500	555000	573500	555000	573500	573500	555000	573500	555000	573500	6752500
Net Lagoon Inflow (I + H)	**K**	kL	542608	498062	558435	552705	576230	560742	580745	579160	550430	563531	540131	554730	6657510
Water Used in Irrigation (G x Irrigation Area)	**L**	kL	1607069	1094327	884598	246952	0	0	0	0	281903	573022	922065	1142562	6752500
Average Daily Irrigation Rate	**M**	kL/d	51841	39083	28535	8232	0	0	0	0	9397	18485	30736	36857	
Cumulative Storage (Storage in Previous Month + J - K)	**N**	kL	887425	518000	0	308048	881548	1436548	2010048	2583548	2856645	2857122	2490057	1920994	
Lagoon Depth	**O**	m	3.1	1.8	0.0	1.1	3.0	5.0	6.9	8.9	9.9	9.9	8.6	6.6	

Lagoon (reuse dam) Area		ha	29
Assume Effective Rainfall Factor			0.70
Irrigation Area Required		ha	**1211.2**
Lagoon Volume Required		ML	**2857.1**
Lagoon Depth		m	**9.9**

pinion ADVISORY

Median rainfall year (2054)

Assumptions	**2054 Median rainfall year**		
Median rainfall data obtained from	Hobart Airport		
Evaporation data obtained from	Modelled from SILO		
Total irrigation area required (ha)	1314.3		
STP average wastewater flow of	9088.5	ML/year	based on predicted monthly wastewater flows by TasWater

		unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
Evaporation (Pan)	**A**	mm	200.4	145.6	126.45	78.15	48.4	32.55	39.05	55.15	87.45	122.35	138.75	169.05	1243
Effective Lagoon Evaporation	**B**	mm	160.3	116.5	101.2	62.5	38.7	26.0	31.2	44.1	70.0	97.9	111.0	135.2	995
Rainfall	**C**	mm	32.2	27.2	29.3	29.2	30.1	27.9	31.7	42.1	35.7	39	40.3	43.8	472
Effective Rainfall	**D**	mm	22.5	19.0	20.5	20.4	21.1	19.5	22.2	29.5	25.0	27.3	28.2	30.7	286
Direct Crop Coefficient	**E**		0.85	0.85	0.85	0.75	0.65	0.5	0.4	0.5	0.7	0.75	0.85	0.85	
Evapotranspiration (A x E)	**F**	mm	170.3	123.8	107.5	58.6	31.5	16.3	15.6	27.6	61.2	91.8	117.9	143.7	966
Irrigation Requirement (F - D)	**H**	mm	148	105	87	38	10	0	0	0	36	64	90	113	692
Net Lagoon Evaporation	**I**	kL	49967	34819	28025	12995	3362	-725	-179	788	13361	22963	27573	35662	228610
Wastewater Flow	**J**	kL	771900	697200	771900	747000	771900	747000	771900	771900	747000	771900	747000	771900	9088500
Net Lagoon Inflow (I + H)	**K**	kL	721933	662381	743875	734005	768538	747725	772079	771112	733639	748937	719427	736238	8859890
Water Used in Irrigation (G x Irrigation Area)	**L**	kL	1942553	1376347	1143090	501706	136557	0	0	0	476110	847238	1179299	1485600	9088500
Average Daily Irrigation Rate	**M**	kL/d	62663	49155	36874	16724	4405	0	0	0	15870	27330	39310	47923	
Cumulative Storage (Storage in Previous Month + J - K)	**N**	kL	1050337	697200	0	245294	880637	1627637	2399537	3171437	3442328	3366989	2934690	2220991	
Lagoon Depth	**O**	m	3.1	2.1	0.0	0.7	2.6	4.8	7.1	9.3	10.1	9.9	8.6	6.5	

Lagoon (reuse dam) Area		ha	34
Assume Effective Rainfall Factor			0.70
Irrigation Area Required		ha	**1314.3**
Lagoon Volume Required		ML	**3442.3**
Lagoon Depth		m	**10.1**

pinion ADVISORY

90th%ile rainfall year (2054)

Assumptions	**2054 90th percentile rainfall (wet year)**		
90th percentile rainfall data obtained from	Hobart Airport		
Evaporation data obtained from	Modelled from SILO		
Total irrigation area required (ha)	1630.2		
STP average wastewater flow of	9089	ML/year	based on predicted monthly wastewater flows by TasWater

		unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
Evaporation (Pan)	**A**	mm	200.4	145.6	126.45	78.15	48.4	32.55	39.05	55.15	87.45	122.35	138.75	169.05	1243
Effective Lagoon Evaporation	**B**	mm	160.3	116.5	101.2	62.5	38.7	26.0	31.2	44.1	70.0	97.9	111.0	135.2	995
Rainfall	**C**	mm	53.8	47.7	49.2	54.6	48.1	45.8	56.2	63.6	54.2	63.5	59.7	70.5	662
Effective Rainfall	**D**	mm	37.7	33.4	34.4	38.2	33.7	32.1	39.4	44.5	37.9	44.5	41.8	49.4	467
Direct Crop Coefficient	**E**		0.85	0.85	0.85	0.75	0.65	0.50	0.40	0.50	0.70	0.75	0.85	0.85	
Evapotranspiration (A x E)	**F**	mm	170.3	123.8	107.5	58.6	31.5	16.3	15.6	27.6	61.2	91.8	117.9	143.7	
Irrigation Requirement (F - D)	**H**	mm	133	90	73	20	0	0	0	0	23	47	76	94	557
Net Lagoon Evaporation	**I**	kL	41544	26813	20260	3087	-3671	-7723	-9743	-7612	6146	13407	19996	25243	127745
Wastewater Flow	**J**	kL	771900	697200	771900	747000	771900	747000	771900	771900	747000	771900	747000	771900	9088500
Net Lagoon Inflow (I + H)	**K**	kL	730356	670387	751640	743913	775571	754723	781643	779512	740854	758493	727004	746657	8960755
Water Used in Irrigation (G x Irrigation Area)	**L**	kL	2163029	1472905	1190621	332384	0	0	0	0	379427	771257	1241050	1537827	9088500
Average Daily Irrigation Rate	**M**	kL/d	69775	52604	38407	11079	0	0	0	0	12648	24879	41368	49607	
Cumulative Storage (Storage in Previous Month + J - K)	**N**	kL	1194426	697200	0	414616	1186516	1933516	2705416	3477316	3844889	3845532	3351482	2585555	
Lagoon Depth	**O**	m	3.1	1.8	0.0	1.1	3.0	5.0	6.9	8.9	9.9	9.9	8.6	6.6	

Lagoon (reuse dam) Area	ha	39
Assume Effective Rainfall Factor		0.70
Irrigation Area Required	ha	**1630.2**
Lagoon Volume Required	ML	**3845.5**
Lagoon Depth	m	**9.9**

Appendix 2. Clarence recycled water scheme – process diagram

COAR - COAL RIVER RECYCLED WATER SYSTEM OVERVIEW - PROCESS DIAGRAM