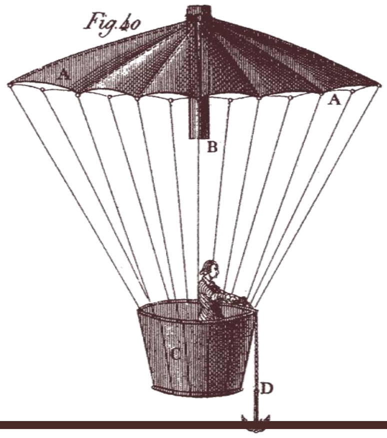

Tempus

Freycinet

Swansea

October 2019

Version control

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Contents

1 Introduction

1.1 General

Tempus is a proposed new retirement development just south of Swansea on the east coast of Tasmania. The development it targeted at a rural client base who wish to enjoy their retirement years in a familiar environment with state-of the art facilities.

Tempus places a strong focus on sustainability with a core value being stewardship of the land. To that end delivery of civil services including water, waste and power focuses on sustainable design, implementation, materials and processes.

The community structure at Tempus will facilitate resident engagement and involvement in stewardship of the site, such that it remains a well maintained financially, socially and environmentally viable development for years to come.

1.2 Site Description

Tempus will be located on a, 18 ha portion of 'Kelverton,' a farming property at 12 371 Tasman Highway, Swansea, Tasmania, Australia.

Figure 1: Site Location

The site is located 2 km south of Swansea, 130 km from Hobart and 140 km from Launceston.

A 40 m hill allows a sloping north easterly aspect to the site, with views across Great Oyster Bay to the ranges of the Freycinet National Park. The area has a dry climate with an average annual rainfall of 590 mm.

1.3 Service Strategy

The site will be developed as two separately titled lots, one containing the majority of the development and the other the co-located aged care facility. Provision of water, waste water, stormwater and waste management services to each lot will be separated.

2 Water Supply

2.1 General Strategy

Climate constraints mean that an off site water supply is necessary with the TasWater owned and operated Swansea town water supply being the most suitable source. There are significant opportunities to reduce water demand through rainwater harvesting, stormwater reuse and wastewater recycling for non-potable uses.

2.2 Potable Water Demand

Demand for the site has been estimated using the Equivalent Tenement coefficients provided by TasWater in the TasWater supplement to the Water Supply Code of Australia, summarised in **Table 1**.

Table 1: Water Demand

Building (units)	No.	ET Code	ET / unit	Total ET	Volume Estimate (L/day)
Nursing Home (suite)	75	AP01	0.657	49	33 753
Lindley (m^2)	2000	EF03	0.009	18	12 330
Workshop & Greenhouse (m^2)	1150	MM01	0.004	5	3151
Arena (m^2)	1500	EF03	0.009	14	9248
Type A ILU (unit)	24	RM02	0.6	14	9864
Type B ILU (unit)	70	RM02	0.6	42	28 770
Type C ILU (unit)	25	RM02	0.6	15	10 275
Type D ILU (unit)	11	RM01	0.4	4	3014
Total				**161**	110 405

Fixture loading has been used to model the probable simultaneous demand for water supply to buildings at the site as 6.2 L/s for cold water flows. Up to 10 L/s peak flow will be required to fill fire supply storage tanks at the prescribed minimum fill rate (half tank within 24 hours).

2.3 Water Main

While there is an existing private water main on the east side of Tasman Highway servicing the Piermont Estate development, it is insufficient to provide an appropriate level of service to the Tempus development.

TasWater have verified (meeting 21.08.2019) that an acceptable water supply solution would be to provide a new water main along the western side of the Tasman Highway connected to an existing DN300 main at the north west corner of Francis Street and extending to the Tempus site, for a total new water main length of approximately 2100 m.

Supply of water to the aged care facility will be via an additional 290 m of water main adjacent Mount Pleasant Road.

Works to install the water main within the road casement will require approval from the Department of State Growth.

2.4 Water Availability

TasWater have advised (meeting 21.08.2019) that the Swansea water treatment plant has ample capacity to meet the Tempus site demand. The treatment plant currently processes 1 to 1.5 ML of water per day, with a capacity of 4 ML/day. Infrequent rainfall is currently (Spring 2019) applying source water supply pressure to the Swansea Reservoir.

2.5 Potable Water Storage

The Tempus development proposes a 7.2 m tall, 14.4m radius water tower able to store up to 1.18 ML of water on site, sufficient for firefighting reserve capacity, 3 days potable water supply and potential internal segmenting for storage of non-potable water. The tower will provide some of the reticulation pressure to service the site. The tank inlet and outlet levels will be designed to ensure frequent cycling of water in the tank and effective maintenance of water treatment plant residual disinfection. TasWater service outages are typically less than 6 hours.

2.6 Reticulation

Pressure pumps will provide a boost to reticulation head to allow all site residents to receive an acceptable service pressure (nominally 35 m head).

2.7 Stormwater Harvesting

A combination of roof runoff and surface runoff collection is proposed. Refer **Section 4** for detail.

2.8 Fire Supply

The development requires sufficient fire supply storage and flow rate to allow three fire hydrants to deliver 10 L/s each at 800 kPa for 4 hours. The fire supply storage volume required is 432 kL. Fire supply will be pressurised by booster pumps.

2.9 Irrigation

Priority will be given to using non-potable water (stormwater, rainwater, treated effluent) for irrigation of food plants (garden beds, orchard, olive grove etc.) and landscape vegetation.

3 Wastewater

3.1 General strategy

Waste water will be collected from the buildings in the development via internal gravity sewer and either:

- Treated on site to an appropriate effluent quality for on site reuse.
- Pumped by an on site sewage pumping station to the Swansea gravity sewer network.

Any reuse of wastewater on site for irrigation, landscape maintenance, food cropping, fire supply or other non-potable use must be in accordance with the *Environmental Guidelines for the use of Recycled Water in Tasmania* (DPIPWE 2002). The Guidelines set specific treatment, testing, quality and operational requirements for the use of recycled water.

3.2 Greywater and Blackwater

While running a single gravity sewer drain is typically more cost effective, source separation of greywater (household wastewater from non-toilet fixtures) and blackwater (wastewater from sewer fixtures) may allow more cost effective treatment of greywater for reuse.

3.3 Wastewater Treatment Demand

Wastewater treatment demand is typically modelled using Equivalent Tenements (ET), in accordance with the TasWater Supplement to the WSAA Gravity Sewerage Code of Australia. ETs are a metric for the average sewer flows generated for a particular type of building. A daily demand of 150 L/ET/day has been used as the development will be serviced by scheme water. Greywater typically makes up 60 per cent of sewer ET design flow.

Building (units)	No.	ET Code	ET / unit	Total ET	Volume Estimate (L/day)	Blackwater (L/day)	Greywater (L/day)
Nursing Home (suite)	75	AP01	0.971	73	10950	4380	6570
Lindley (m^2)	2000	EF03	0.014	28	4200	1680	2520
Workshop & Greenhouse (m^2)	1150	MM01	0.004	5	750	300	450
Arena (m^2)	1500	EF03	0.014	21	3150	1260	1890
Type A ILU (unit)	24	RM02	0.75	18	2700	1080	1620
Type B ILU (unit)	70	RM02	0.75	53	7950	3180	4770
Type C ILU (unit)	25	RM02	0.75	19	2850	1140	1710
Type D ILU (unit)	11	RM01	0.5	6	900	360	540
Total				**223**	33450	13380	20070

A combined sewage treatment plant should have a capacity of 35 kL per day of sewage influent.

A standalone blackwater treatment plant should be sized to accept 15 kL per day of influent.

A standalone greywater treatment plant should be sized to accept 25 kL per day of influent.

3.4 Treatment Options

3.4.1 TasWater Connection

TasWater has verified they have capacity in the Swansea reticulated sewage network to receive influent from the Tempus Freycinet development.

Discharge from the development site to the network would require:

- A private sewage pumping station constructed on the site
- Approximately 1600 m of sewer rising main
- Approximately 500 m of new gravity sewer
- Possible upgrade of Duck Park Sewage Pumping Station (SWASP04) to increase pump duty and/or emergency storage capacity
- Possible upgrade of up to 1000 m of existing sewer pipework along Francis Street and Old Spring Bay Road to handle the increased flow from the Tempus Development
- Possible upgrade of existing gravity main across the Saltwater Creek ocean outlet.

Cost Estimate - Capital:
$250 000 Sewage Pump Station
$320 000 Rising Main
$75 000 Gravity Main
$300 000 Upgrade of Existing Main (Provisional)
$30 000 Upgrade of Saltwater Creek Crossing
$975 000 Total Capital

Cost Estimate – Operational:
$ Annual operational

3.4.2 Onsite Package Treatment Plant – Combined Blackwater and Greywater

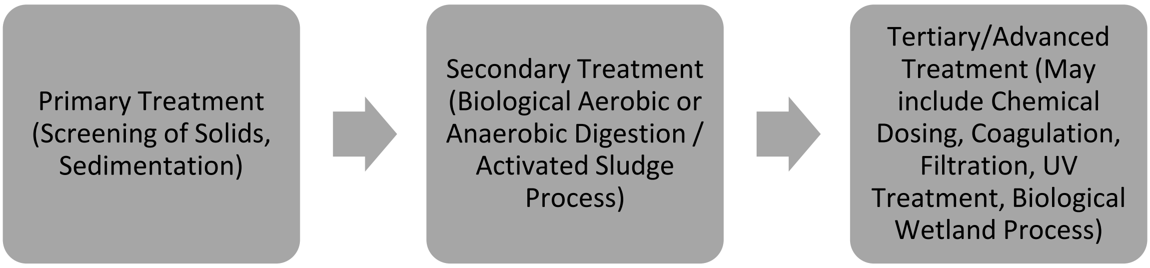
Combined sewage influent of approximately 35 kL/day may be treated in a package treatment plant. Below 100 kL/day (the threshold for a Level 2 Wastewater Treatment Plant), EPA Tasmania is not required to regulate Level 1 Wastewater Treatment Plants, unless there is a particular public interest for the Director of the EPA to do so.

On site treatment would be regulated by the Local Government Authority, which may request expert advice from the EPA. Minimum treatment standards for reuse may be imposed by the Local Government Authority as conditions of Planning and/or Building Approval.

A variety of treatment plant options are possible depending on the desired quality of effluent:

- Class C Effluent, suitable for subsurface irrigation of non-human food chain crops only.
- Class B Effluent, suitable for irrigation to food crops without direct contact (eg. Fruit with peel, or trickle irrigation to root systems of fruiting plants), suitable for irrigating for grazing animals.
- Class A Effluent, suitable for non-potable uses including direct application to food crops, fire service and irrigation of public areas.

A package treatment plant for a development of this size would typically include the following treatment train:



The amount of tertiary treatment would be dependent on the desired effluent class (A, B or C).

Cost Estimate - Capital
$300 000 Treatment to Class C
$500 000 Treatment to Class B
$700 000 Treatment to Class A

Cost Estimate - Operational
$ per annum

3.5 Separate Grey Water Treatment and Recycling

Greywater typically has significantly fewer (although not zero) pathogenic contaminants than blackwater. As such greywater separation may allow a higher throughput process with less treatment demand.

If wastewater streams are separated a 15 kL/day blackwater plant and 25 kL/day greywater treatment plant would be required.

A greywater only treatment train would still require Tertiary treatment to meet the DPIPWE standards for Class A water quality re-use. A Greywater only treatment train could incorporate grease-trap separation of oily food waste, screening, sedimentation, aerobic biological treatment, filtration and chemical / ultraviolet light dosing to meet reuse quality standards.

Cost Estimate - Capital
$150 000 Blackwater Treatment to Class C
$300 000 Blackwater Treatment to Class B
$500 000 Blackwater Treatment to Class A

$200 000 Greywater Treatment to Class C
$400 000 Greywater Treatment to Class B
$600 000 Greywater Treatment to Class A

Cost Estimate - Operational
$ per annum

3.6 Distributed Greywater Harvesting

Decentralised greywater harvesting for reuse at individual residences is a further option to reclaim wastewater for reuse. A variety of domestic scale greywater pre-treatment and storage units are available incorporating sedimentation and oily water separation.

3.7 Storage and Irrigation of Recycled Wastewater

Treated effluent from an on site treatment plant of an appropriate class for reuse may be discharged to the adjacent stormwater holding wetland for storage and non-potable use around the site, or pumped directly to its end use (irrigation or holding tank for reticulation about the site).

4 Stormwater Management

4.1 General Strategy

Runoff from impervious roof structures is collected for use as rainwater on site. Surface runoff from other areas is collected in vegetated swales and channelled to storage and water quality treatment wetlands across the site. Stored stormwater is pumped to a header tank for reticulation across the site as non-potable water.

4.2 Climate

Swansea has an average annual rainfall of 590 mm, with a relatively constant monthly average of 50 mm and minimal seasonal variation.

4.3 Rainwater Harvesting

The larger shared buildings on the site allow an opportunity for rainwater harvesting and use. Water balance modelling using MUSIC software estimates roof runoff outflow at 0.35 kL/m^2/year.

Building	Roof Area (m^2)	Estimated Capture Volume (kL/year)
Nursing Home	5000	1750
Lindley	1750	612
Workshop	1000	350
Arena	1580	553
Total	**9330**	**3265**

Rainfall harvesting from these four buildings is expected to generate approximately 3.2 ML of rainwater per year. Rainwater from well-maintained roofs is typically of high quality and appropriate for non-potable uses including toilet flushing, laundry and garden irrigation. It is ideally used at the source building, with any excess overflowing to the stormwater network.

Independent Living Units with green roofs are assumed to intercept and consume all the rainfall that falls on them.

4.4 Collection

Contours of the site are formed to create natural drainage lines (swales) that are either grassed or vegetated. A network of pits and pipes collects water from swales, roads and impervious landscape areas (driveways, footpaths, paved areas etc.).

4.5 Treatment

Stormwater from new developments requires treatment to reduce nutrient loading under Section E7.0 of the Glamorgan Spring Bay Interim Planning Scheme 2015.

Water Sensitive Urban Design (WSUD) treatment techniques must reduce nutrient and sediment loadings to the quality targets of the planning scheme.

Conceptual modelling using MUSIC (version 6.2) software has verified that the quality targets can achieved through a combination of:

- Vegetated swales collecting surface runoff from carparks, roads, paths and other impervious surfaces (500 linear metres of swales).
- Constructed wetlands totalling 900 m^2 of area.

Quality Parameter	Target Reduction (%)	Concept Design Reduction (%)
Total Suspended Solids	80	95.1
Total Phosphorus	45	79.4
Total Nitrogen	45	45.2

Detailed design will incorporate sufficient WSUD elements to achieve the planning scheme water quality targets.

4.6 Site Discharge

On site stormwater collection and detention structures will be sized to prevent any additional runoff from discharging to neighbouring properties when compared to the undeveloped site.

5 Site Access

Access to the site will be by a new intersection on the western side of Tasman Highway, approximately 220 m south of Mount Pleasant Road.

A detailed traffic impact assessment has been performed by Milan Prodanovic. The impact assessment recommends a Channelised Right Hand Turn treatment for southbound traffic at the site entry.

Drawing C025 and **Drawing C026** show the proposed intersection configuration including turning lane and bus bays.

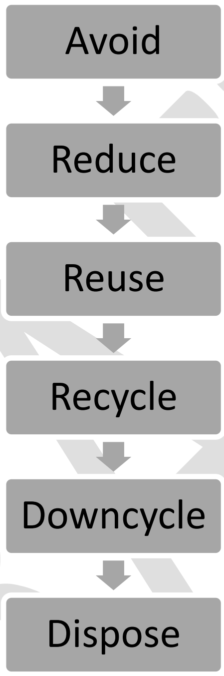
6 Waste Management

6.1 General Strategy

In alignment with the Tasmanian Government *Draft Waste Action Plan* (DPIPWE 2019), the Tempus development will aim to reduce waste generation, develop circular economies, track waste performance data and engage with community education. Tempus will encourage a community culture that is sensitive to the environmental impacts of lifestyle choices and supports residents active engagement in reducing waste.

6.2 Waste Hierarchy

The Tempus development will effectively use the waste hierarchy to limit the production of waste during both construction and ongoing operation of the development.



Waste avoidance is achieved through selecting products and materials to bring to the development that are durable and serviceable.

Waste reduction is achieved through efficient use of materials, with design of infrastructure making use of standard lengths and areas of materials.

Reuse is achieved through alternative end of first life pathways for consumables and packaging materials.

Recycling recovers the raw materials from waste products and reconfigures them into products of similar utility and function.

Downcycling processes raw materials from waste into a less durable or functional state.

Disposal is end of life landfill of wastes that are not recoverable.

6.3 Construction Waste Management Strategies

A variety of strategies will be employed during the design and construction of the Tempus development to limit the amount of construction waste generated. Some initiatives could include:

1. Sizing of infrastructure such as pipework, room dimensions and structure lengths to make use of standard pipe lengths, tile dimensions and block dimensions to limit waste offcuts.
2. Standardisation of building materials for ILU's to allow reuse of left over materials in future builds and limit the required inventory of spare parts/materials.
3. Recovery and reuse of raw materials during site earthworks – retention of topsoil, screening and landscape reuse of rocks/boulders, retaining existing trees where possible.
4. Optimising the size of site infrastructure plant and equipment to prevent over-construction.
5. Scheduling and sequencing works to minimise double-handling and rework.
6. Preferential selection of products and materials with a lower environmental footprint.
7. Preferential selection of locally produced materials and products that require less transportation energy.
8. Direct reuse of 'waste' products on site to provide a functional benefit – e.g. material offcuts for landscaping use or sculptural works,
9. On site sorting of waste during construction to separate reusable, recyclable and compostable materials.
10. Provision of locally sourced food catering in reusable packaging for site workers.

6.4 Operational Waste Management Strategies

Once construction is complete, a range of measures will be incorporated into the operation of Tempus to limit waste generation in alignment with the development values and waste strategy.

6.4.1 Waste Avoidance

Tempus is structured to provide engaging lifestyle opportunities for residents that are inherently low waste – landscape stewardship, horse riding, recreational sports and astronomy are all activities that can be undertaken with few single-use consumable requirements.

6.4.2 Waste Reduction

Through developing relationships with local product suppliers Tempus will strive to eliminate waste through the delivery of consumables such as fresh produce, cleaning products, hobby and craft supplies and plant seedlings in reusable containers that can be returned to their source, rather than discarded after use.

6.4.3 Waste Reuse

An area of the on-site workshop is set aside for storage of reusable objects. This will include furniture, building materials (wood, metal, paint etc.), clothing and other valuable or high embedded energy objects.

6.4.4 Source Separation and Recycling

Keeping waste streams and waste materials separate allows for more efficient and cost effective processing of these wastes. For the Tempus development this will consist of collection of waste from ILUs to a central sorting location. Each ILU will be provisioned with separate collection containers for organics, clean recyclables and landfill waste.

Recyclables will be sorted on site into glass, paper, plastic, ferrous metals and aluminium for either reuse on site or by an appropriate materials recycler.

Organic waste on site will be collected and composted for use in the communal vegetable garden.

6.4.5 Non Recyclable Wastes

Wastes that are not compostable or recyclable will be consolidated on site for municipal collection by sidelift truck and disposal to landfill.

6.5 Special Wastes

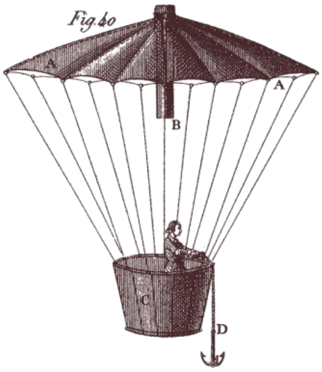
Wastes that require special recycling or disposal including batteries, electronic equipment (e-waste), fluorescent globes and household chemicals will be sorted and disposed of by an appropriate contractor.

6.6 Medical Waste

Medical Waste from the onsite clinic or care facility will be disposed of by an appropriately licensed contractor.

7 Appendix 1 – Drawings

Drawing C020
Drawing C021
Drawing C022
Drawing C023
Drawing C024
Drawing C025
Drawing C026



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