SORELL COUNCIL

SOUTHERN BEACHES ON-SITE WASTEWATER
AND
STORMWATER STRATEGY

24 JULY 2025

Cover

View towards houses along Carlton Bluff Road at the western end of Primrose Sands Beach.
Photo: Bill Cromer, 4 December 2024.

Refer to this report as

Whitehead, J. H., Cromer, W. C. and Mason, R. (2025). *Southern Beaches On-site Wastewater and Stormwater Strategy.* Unpublished report for Sorell Council. 24 July 2025.

Executive Summary

The Southern Beaches in Sorell Municipality in south-eastern Tasmania include the coastal townships of Lewisham, Dodges, Ferry, Carlton, Primrose Sands and Connellys Marsh. The district is not served by reticulated sewerage, and it is uncertain whether or when this will become available. The population continues to rely on on-site wastewater management systems (OWMS). There is no reticulated water supply, and a limited public stormwater network, Development of the Southern Beaches, including the commercial centre at Dodges Ferry, is constrained by this lack of services. Over a quarter of a century, Sorell Council has engaged consultants to provide advice on on-site wastewater and stormwater management. Some of these reports are now outdated, new regulatory requirements are in place, and community expectations may have changed.

This report presents a strategy for how on-site wastewater and on-site stormwater will be managed in the Southern Beaches and guides the future Southern Beaches Structure Plan. The report reviews existing strategies and reports and provides advice on the suitability of on-site wastewater and stormwater land application and includes recommendations on design standards, mitigation and management measures, it evaluates the Southern Beaches On-site Wastewater and Stormwater Management Special Area Plan (SB-SAP) and provides advice on whether it is sufficient, along with recommendations on possible changes. It also considers the suitability of on-site wastewater in the commercial area of Dodges Ferry. The report includes the findings of desk-top studies, field investigations and community consultation.

The report pays particular attention to lots of up to 1,500m^2 in area, and makes recommendations for improved on-site wastewater and stormwater management. It reviews the current processes for assessment of land for on-site wastewater, the types of systems used and reasons for non-compliance, and the management choices for private stormwater systems on individual lots. It considers climate change and implications for rainfall, sea-level rise and changing groundwater levels.

The report presents a flowchart outlining means of improved wastewater and stormwater management and considers the roles of property owners, designers and regulators in the process.

The report makes recommendations throughout and provides a summary of the recommendations in the final section of the report. These include improved use of the SB-SAP.

Options for the development of a community wastewater system for the commercial area of Dodges Ferry are described. Whilst these are feasible and may offer further opportunity for future development of the commercial centre, available space is limited and constrains options to some degree.

In conclusion, the report recognises that reticulated water and sewerage will not be connected to the five townships in the Southern Beaches for the foreseeable future (perhaps 25 – 50 years), that reticulated water would also need a new stormwater system, and that on-site wastewater and stormwater systems (OSWMS) are here to stay. The report has examined the historical background and the advantages and disadvantages of current processes, has considered the view of the community as presented in the community survey undertaken by Council and at the community meeting and has made recommendations about tightening the roles of Council Environmental Health Officers and private Suitably Qualified Persons in on-site wastewater and stormwater management. It has identified the need to consider wastewater and stormwater management as a single issue, changing some aspects of the SB-SAP, limiting the use of septic tanks in future developments, considering the need and types of decentralised wastewater systems for the commercial centre of Dodges Ferry, and the need for regular audits and inspections of existing and future OWMSs and OSWMSs.

Abbreviations and definitions

AS/NZS 1546		Australian/New Zealand Standard. On-site domestic wastewater treatment units.
AS 1546 Part 3		Australian/New Zealand Standard. Aerated wastewater treatment units.
AS 1546 Part 4		Australian Standard. Domestic greywater treatment systems.
AS/NZS 1546 Part 1		Australian/New Zealand Standard. Septic tanks.
AS/NZS 1546 Part 2		Australian/New Zealand Standard. Waterless composting toilets.
AS/NZS1547		Australian/New Zealand Standard. On-site domestic wastewater management.
Blackwater		Wastewater from toilets.
BOD_5		Biochemical Oxygen Demand (5-day test).
cfu	Colony forming units	A measure of bacterial concentration (cfu/100mL).
Controlled stormwater		Stormwater which has been collected and diverted to a storage or to one or more discharge points. Collection may be in rainwater tanks, in-ground, or in detention basins; diversion is usually via buried pipes or open drains, on an individual lot scale (private system), or at municipal scale (public system).
DIR	Design Irrigation Rate	The rate at which secondary treated effluent is applied to a surface sprinkler system or shallow subsurface drip irrigation system in an LAA. Usually measured in litres/m^2/day, or litres/day/m^2.
Director's Guidelines		The Tasmanian Director of Building Control's Director's Guidelines for On-site Wastewater Management Systems. Version 2 (July 2017).
DLR	Design Loading Rate	The rate at which primary treated effluent is applied to an in-ground or raised trench or bed in an LAA. Usually measured in litres/m^2/day, or litres/day/m^2.
E. coli	Escherichia coli	An anerobic bacterium found in the gut of warm-blooded animals. It is used as an indicator of human faeces. Some strains are harmless; others are pathogenic.
Effluent		Liquid discharge from a wastewater treatment unit.
EHO		Environmental Health Officer (at Sorell Council).
Failure of a wastewater system		Failure is indicated by saturated surface soils or effluent runoff at or downgradient from a wastewater disposal area, usually accompanied by odour.
Greywater		Wastewater from hand basins, showers, baths, kitchen sinks, dishwashers and washing machines.
Greywater diversion		The diversion of greywater (excluding kitchen wastewater) to an in-ground or raised disposal area. It may include storage of the greywater for up to 24 hours.
IPCC		International Panel on Climate Change.
L/day		Litres per day.
L/m^2/day		Litres per square metre per day. Units used for DIR or DLR.
L/day/m^2		Litres per day per square metre. Units used for DIR or DLR.

LAA	Land Application Area: the area wetted by effluent applied to ground via trenches, beds, raised beds or irrigation. It excludes a reserve area.
LUPA	Land Use Planning and Approvals Act (1993).
mg/L	milligrams per litre (the same as parts per million).
OSWMS	On-site stormwater management system. Incudes the detention unit (septic tank, AWTS, etc.), and the SLAA.
OWMS	On-site wastewater management system. Incudes any treatment unit (rainwater tank(s), pumps), and the SLAA.
Primary treated greywater	Greywater filtered by coarse screening (to remove hair and lint) and used for greywater diversion.
Primary treatment	The separation of suspended material from wastewater in septic tanks, primary settling chambers, or other structures, before effluent discharge to either a secondary treatment process, or to a land application system.
RCP	Representative Concentration Pathway. Any one of seven climate change and socioeconomic scenarios adopted by the IPCC to describe future greenhouse gas concentrations. Each RCP pathway is suffixed by one of the descriptors 1.9, 2.6, 3.4, 4.5, 6, 7 and 8.5. The descriptors are power density (watts/cm^2) increases in radiative forcing from the year 1750 to 2100. RCP 1.9 is the target of the Paris Agreement. RCP 8.5 is the worst-case scenario.
Reserve area	An area additional to an LAA set aside and left otherwise undeveloped for the future application of effluent should the original LAA need replacing. In this report, there is no need to set aside such an area if the wastewater to be applied is treated to secondary level. The need to set aside a reserve area for primary treated wastewater is at the discretion of the regulator.
SAP	Specific Area Plan: A Local Provision Schedule generated by and for a particular municipal area in Tasmania, and which together with the statewide State Planning Provisions constitutes the Tasmanian Planning Scheme.
SB SAP	Southern Beaches On-site Waste Water and Stormwater Management Specific Area Plan.
Secondary treated greywater	Greywater treated to a level which has at least BOD_5 / SS / E coli at 20mg/l / 30mg/l / 10cfu/100mL.
Secondary treatment	Aerobic biological processing and settling or filtering of effluent from a primary treatment unit.
Separation distance	The distance between the downslope side of a wastewater land application area and a downgradient sensitive feature such as a building, a property boundary, surface water (creek, dam, coast), water bores, road cuttings, etc. The distance is in the horizontal plane and is measured at right angles to topographic contours. Separation distances can also be applied to stormwater land application areas. The term is usually synonymous with "setback distance" (but the latter is more likely to refer to vertical separation between a wastewater land application area and a limiting layer (such as bedrock, groundwater, or a low permeability, essentially impermeable, soil layer).
Setback distance	See Separation distance.
SLAA Stormwater Land Application Area	The area wetted by controlled stormwater to in-ground or raised trenches or beds.
SNDP	Sorell Council's Stormwater in New Development Policy (2023).

SS	Suspended solids (in a liquid); usually measured in mg/L.
Stormwater	Water from precipitation which runs over the land surface in a surface catchment, including runoff from house roofs, roads, driveways, etc.
Tertiary treated waste water	Secondary treated wastewater which has undergone further treatment, including nutrient removal and (depending on the degree of treatment), pathogen reduction and removal of trace contaminants.
TPS	Tasmanian Planning Scheme. The scheme is statewide, comprising State Planning Provisions common to all municipalities, and Local Provision Schedules for each municipal area. The latter include “zone and overlay maps, local area objectives, code lists, particular purpose zones, specific area plans, and any site-specific qualifications”
Uncontrolled stormwater	Stormwater which has not been collected and diverted to a storage or discharge point. This stormwater flows overland as sheet flow, and infiltrates the soil as seepage water; some of it reports to watercourses or the coast.
Wastewater	All wastewater generated in a domestic dwelling. It includes blackwater and greywater.
Wastewater treatment unit	Septic tank, greywater tank, AWTS, sand filter, and other units which treat wastewater to primary, secondary or tertiary level.

Table of Contents

List of Figures

List of Tables

1.0 Introduction

1.1 Background

The Southern Beaches in Sorell Municipality in south-eastern Tasmania include the coastal townships of Lewisham, Dodges, Ferry, Carlton, Primrose Sands and Connellys Marsh (Figure 1.1).

The district is not served by reticulated sewerage, and it is uncertain whether or when it will become available. The residential population of approximately 7,000 continues to rely on on-site wastewater management systems (OWMS). There is no reticulated water supply, and a limited public stormwater network, Development of the Southern Beaches, including the commercial centre at Dodges Ferry, is constrained by this lack of services.

Over a quarter of a century, Sorell Council has engaged consultants to provide advice on on-site wastewater and stormwater management. Some of these reports are now outdated, new regulatory requirements are in place, and community expectations may have changed.

In background comments to the Brief for the current report, Council has stated “that it requires further technical and community input to determine if the Southern Beaches is to remain an unserviced area or to plan for:

- reticulated sewerage and water; or
- small decentralised sewerage schemes for high priority areas; and
- expansion of Council stormwater infrastructure.

Transitioning to reticulated water will have a significant impact on Council’s stormwater infrastructure; roof water will no longer be retained in tanks for potable use and/or irrigation water. More stormwater will place greater demands on pipes and drains resulting in more stormwater being directed to receiving waters (marine and freshwater) further impacting on water quality. Good quality reticulated water will have positive benefits for the health of residents.”

On these bases, Council commissioned the current report in late 2024.

1.2 Scope of this report

The scope for this report is to:

- Prepare a strategy for how on-site wastewater and on-site stormwater will be managed in the Southern Beaches (low density, village and local business zones). The plan will guide the Southern Beaches Settlement strategy. Southern Beaches includes Lewisham, Dodges Ferry, Carlton, Primrose Sands and Connellys Marsh.
- Review existing strategies and reports and provide advice on the suitability of on-site wastewater and stormwater land application and include recommendations on design standards, mitigation and management measures.
- Evaluate the Southern Beaches On-site Wastewater and Stormwater Management Special Area Plan and provide advice on whether it is sufficient. Provide recommendations on possible changes to the plan, and

- Provide guidance of the suitability of on-site wastewater in the commercial area of Dodges Ferry. Evaluate if de-centralised wastewater scheme/s are required or feasible.

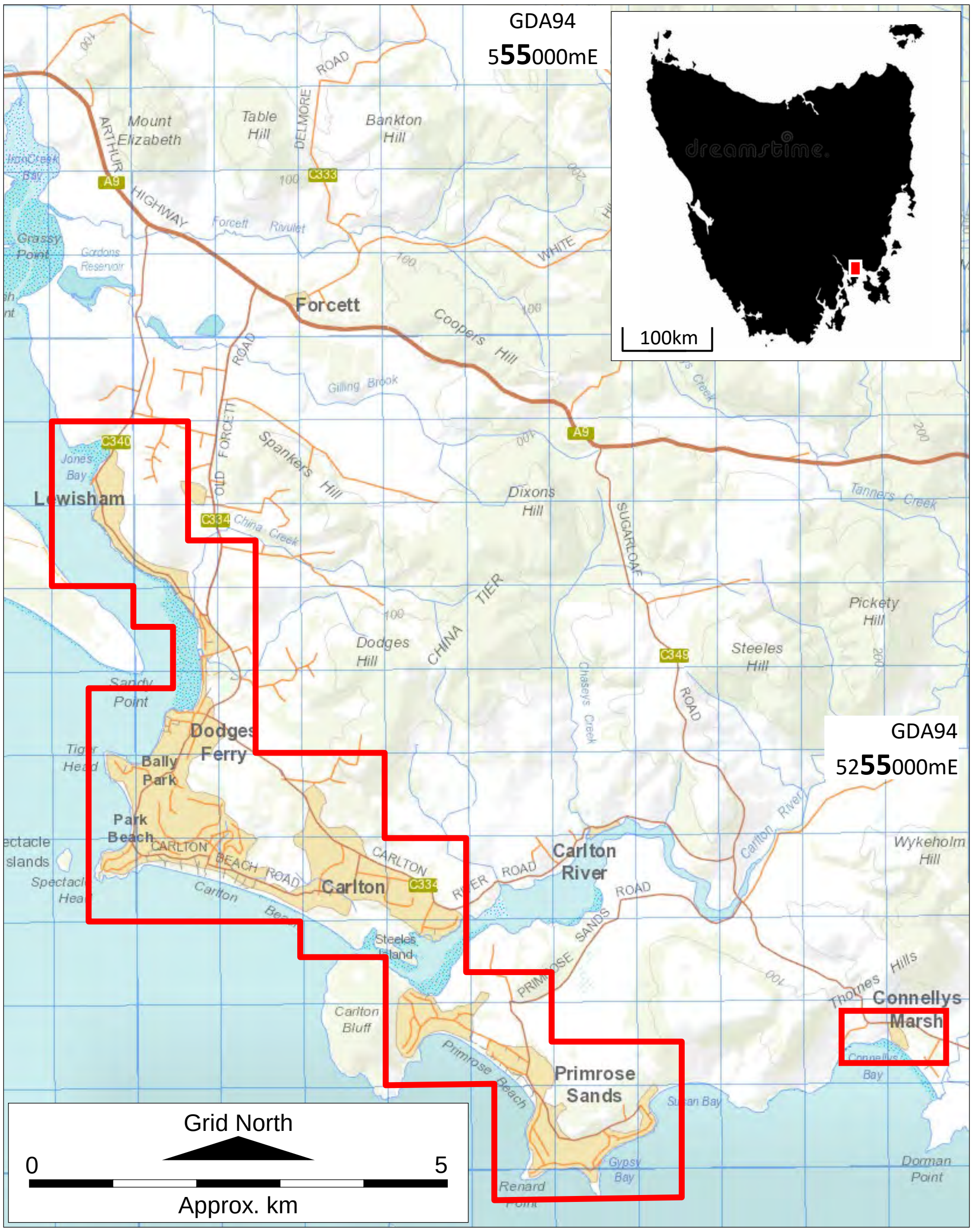


Figure 1.2. The study area for this report includes the built-up areas at Lewisham, Dodges Ferry, Carlton, Primrose Sands and Connellys Marsh in the Southern Beaches. Source of base map: www.thelist.tas.gov.au

The Scope included the following requirements:

- Undertake a desktop review of the following background reports:
    - Dodges Ferry Catchment Management & Groundwater Monitoring Programme;
    - Strategic Plan for Managing Southern Beaches Wastewater 2006;
    - Southern Beaches On-site Wastewater and Stormwater Specific Area Management Plan;

  - Tasmanian Planning Scheme - Sorell (relevant subdivision and development standards for low-density residential zone);
  - Survey of On-site Wastewater Management Systems – 2012;
  - Draft Development Proposal and Environmental Management Plan - Southern Beaches Wastewater Management Scheme - Effluent Re-use 2010;
  - Sorell Stormwater System Management Plan Vol 4 - 7 May 2020 (as it applies to the Southern Beaches only);
  - Sorell Stormwater in New Developments Policy 2023;
  - Visual assessment of the Foreshore around Lewisham, Dodges Ferry, Carlton and Primrose Sands with respect to inappropriate wastewater disposal 2005; and
  - Flood prone areas maps of the study area.
- Review stormwater infrastructure and flooding maps, provided by Council.
- Provide advice on:
  - Sustainable on-site site wastewater options for the Southern Beaches, focus on the Low-density, Rural Living D, village and local business zones. This includes, but is not limited to, acceptable design criteria for on-site wastewater management systems (OWMS), setbacks of wastewater land application areas (LAAs) from sensitive features, areas to be reserved for on-site wastewater, upgrading of failing systems, re-development of lots, suitability for subdivisions and ancillary dwellings;
  - Whether reticulated sewerage is required to service the Southern Beaches; and
  - The suitability of unserviced land for future subdivision and re-development of existing lots.
- Provide recommendations for on-site stormwater land application and/or retention requirements in areas not able to be connected to stormwater infrastructure, including areas prone to inundation and high seasonal water tables.
- Provide maps (taking into consideration, soils, groundwater and topography) outlining appropriate standards for on-site stormwater and wastewater land application where necessary tailored to small-scale drainage catchments and/or geological boundaries. The current Specific Area Plan and zone standards are the same irrespective of underlying conditions.
- Evaluate the need for small decentralised sewerage systems for priority areas, such as the commercial area of Dodges Ferry and indicate how this might be achieved.
- Formulate recommendations to guide the:
  - Southern Beaches Structure Plan; and
  - Special Area Plan for Southern Beaches Wastewater and Stormwater.

1.3 Desk-top studies, field inspections and community consultation

Most of the requirements for this report were completed by desk-top studies.

To complement the desk-top work, the authors conducted three days of field inspections of all townships in the Southern Beaches in early December 2024.

A Community Consultation meeting was held at Okines House in Dodges Ferry on 5 January 2025. The meeting was a follow-up to a community survey formulated by Council asking for comments on wastewater and stormwater issues in the Southern Beaches.

The survey responses to 9 questions presented in Appendix 1 are summarised in Table 1.3.

Comments are, not surprisingly;

- Two thirds of the 72 respondents were from the most populous townships of Carlton or Dodges Ferry;
- Respondents were overwhelmingly (92%) owner-occupiers;
- Slightly more than half of the respondents thought that OWMSs were adversely affecting the Southern Beaches;
- Slightly more than half of the respondents thought that on-site stormwater management was not being managed effectively:
- Half of the on-site wastewater systems were at least 10 years old, and a third were more than 20 years old;
- A clear majority (82%) of respondents said they knew how to manage the systems correctly,
- One in 7 stormwater systems discharges off-site to a public network; 80% of systems were on-site (47% to absorption trenches and 33% directly to ground); and
- Forty one respondents (57%) added comments to their questionnaire.

Table 1.3. Summary of the responses from participants in the December 2024 Sorell Council survey of wastewater and stormwater issues in the Southern Beaches. Some numbers have been rounded. See Appendix 1 for the full responses.

Question 1 of 9

What area of the Southern Beaches do you live in?	Carlton - Carlton River	Connellys Marsh	Dodges Ferry	Lewisham	Primrose Sands	Other
% of 72 responses	32	1.4	35	10	18	4

Question 2 of 9

Is your property	Owner occupied all the time?	Owner occupied part time?	Rented?	Used for business?	Other use?
% of 72 responses	92	3	3	0	3

Question 3 of 9

Do you agree or disagree the Southern Beaches is being impacted by septic tank systems and other types of on-site wastewater management systems failing and polluting surface and groundwater?	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	Don'y know or no opinion	If you strongly agree or somewhat agree, why?
% of 72 responses	35	19	14	10	10	11	1

Question 4 of 9

Do you agree or disagree that onsite stormwater (spilling from water tanks, driveways and buildings) is generally not managed effectively?	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree	Don'y know or no opinion
% of 71 responses	27	25	25	13	6	4

Question 5 of 9

How old is your on-site wastewater management system?	Less than 2 years old	2 - 5 years old	5 - 10 years old	10 - 20 years old	More than 20 years old	Don't know
% of 72 responses	8	15	13	19	33	11

Question 6 of 9

Do you know how to manage your on-site wastewater management system correctly	Yes	No	Unsure
% of 72 responses	82	6	12

Question 7 of 9

Does the overflow from your water tank/s discharge:	To a roadside drain or pipe?	To an onsite absorption trench?	Onto the ground?	Don't know
% of 72 responses	14	47	33	6

Question 8 of 9

Thinking about your water tanks, do you (select all that apply):	Clean your water tanks regularly?	Clean your gutters regularly?	Have a first flush diverter?	Treat your drinking water (via water...	None of the above
% of 72 responses	24	61	15	43	21

Question 9 of 9

Do you have any other comments you wish to make about wastewater or stormwater in the Southern Beaches?	There were 41 written responses. All are reproduced in Appendix 1.

2.0 Desktop review of previous reports (chronological)

2.1 Dodges Ferry Catchment Management & Groundwater Monitoring Programme (1998-2004)

This program was undertaken in three Stages by Whitehead & Associates Environmental Consultants Pty Ltd and Sloan Weldon Pty Ltd.

- Stage 1 comprised a review of recent literature on environmental impacts of failing on-site systems and outlined a methodology for both desktop and field investigation recommended for application to Dodges Ferry in Stage 2 of the study. Stage 1 recommended that Council proceed to Stages 2 and 3 of the study to undertake groundwater and surface water monitoring, investigate linkages between periods of heavy loading, heavy rainfall and water quality.
- Stage 2 investigated linkages between lot density, sub-catchment on-site wastewater disposal and water quality data and report on potential impacts of increased development density.
- Stage 3 comprised:
    - a review of groundwater and surface water usage in the catchment and the provision of advice on the potential environmental and public health risks;
    - determination of the design limitations of the study area;
    - determination of appropriate on-site disposal designs for properties in the study area;
    - collation of available physical catchment scale and water quality data into a series of hazard maps using a Geographic Information System (GIS); and
    - recommendations with respect to the management of existing development and future development in the area.

Stage 1 of the study concluded that:

- Shallow unconfined aquifers in the study area are susceptible to contamination from poorly performing or overloaded septic trenches;
- Surface seeps along the beach front are potentially linked to unconfined aquifers into which some poorly performing septic trenches discharge;
- Water quality in the coastal lagoons and surface water courses will reflect catchment activities and the potential for septic contamination will be linked to peak loadings, lot sizes and housing density;
- Groundwater quality is variable;
- Groundwater is generally not used for potable purposes but is, on occasions, used for domestic toilet flushing, laundry use and garden irrigation;
- Whilst iron levels in groundwater were generally low, some groundwater bores sampled indicated elevated levels of iron, the major implication of which is staining of toilet bowls and fences and paths where the water is used for toilet flushing and garden irrigation respectively;
- The majority of bore waters exhibited low or background concentrations of nitrate but some groundwater bores sampled indicated elevated levels of nitrate nitrogen (NO^{3-}-N). Nitrate can be an indicator of contamination by sewage effluent. Elevated nitrate levels appear to be associated with shallow bores and higher densities of development;

- Coliform indicator counts in bore water samples were low with one exception and this sample recorded a higher than background level for nitrate. Whilst bacterial contamination of groundwater in the study area is not considered a serious problem, bacterial die-off can be quite rapid and lack of bacterial contamination does not conclusively prove that septic effluent contamination is absent;
- Three areas of typically high densities of relatively small lots in the Third Avenue/Jetty Road catchment, Dodges Ferry, Gully Road catchment, Carlton and Lloyd/Meethanar Street catchment, Carlton Beach, show indications of septic contamination of shallow aquifers;
- Future development in areas where there are substantial numbers of undeveloped lots has the potential to increase impacts on surface and groundwater quality.

Stage 2 of the study concluded that:

- Prolonged dry periods, relatively infrequent storm events of limited duration and the sandy nature of the catchment make stormwater monitoring difficult, even in the constructed stormwater drainage system;
- First flush stormwater is contributory to reduced receiving water quality;
- Faecal contamination of stormwater is evident and is of concern where the receiving waters are used for contact recreation, but this study has not differentiated between human and animal sources for faecal material;
- Stormwaters sampled are typical of urban stormwaters elsewhere;
- There is evidence that groundwater exhibiting an elevated nitrate level is migrating along the line of a transect through the Third Avenue/Jetty Road catchment, Dodges Ferry, and is feeding seeps at the cliff backing Tiger Head Bay (Geary and Whitehead 2001);
- Groundwater sampling in the wider study area indicates that other parts of the study area are at risk of similar groundwater pollution;
- No association has been found between nitrate nitrogen and bacterial indicators in the groundwaters sampled;
- A wide and increasing range of tracer techniques is available for tracking effluent from failing on-site wastewater systems. The effectiveness of the methods varies and the more effective and conclusive methods tend to be relatively expensive. Methods suitable for consideration for more detailed studies are outlined in Geary (2003);
- Whilst concern has been expressed that on-site system densities >15/km^2 might be contributory to groundwater contamination elsewhere, far higher densities are noted in parts of Dodges Ferry and Carlton (Whitehead et al. 2001). Although these high densities do not automatically give rise to groundwater contamination, problem systems have been identified and a linkage has been made between high densities of residences on typically small lots and elevated nitrate concentrations in groundwater;
- Increasing system density with infill development can be expected to increase the likelihood of groundwater contamination;
- As on-site systems get older their performance commonly deteriorates and additional measures must be taken to upgrade and/or replace them;
- A number of upgrade and retrofit options are available;

- Standardised designs which take account of individual site limitations and which meet specific performance criteria should be required by Council for all new developments.

Stage 3 of the study recommended that:

- That Council does not provide a reticulated water service to the catchment whilst the area is serviced by on-site wastewater systems;
- That all new developments be serviced by on-site wastewater systems designed to comply with AS/NZS 1547:2000 and the Tasmanian Code of Practice (now the *Southern Beaches On-site Wastewater and Stormwater Management Special Area Plan;* SB-SAP);
- That Council consider community systems designed to treat wastewater to a high level (by use of fabric filters, recirculating sand or gravel filters and membranes) as appropriate alternatives to individual on-site systems, where they are satisfied that the managing agency can provide them with a satisfactory long-term management plan for the community system;
- That all new on-site systems be fitted with a septic tank outlet filter;
- That new developments not be approved if they cannot comply with the above design codes;
- That Council require failing and poorly performing systems be upgraded or replaced in accordance with the expectations of the above design codes;
- Where individual failing and poorly performing on-site systems cannot be upgraded or replaced so as to provide a wholly on-site solution for wastewater management, that Council investigate the possibility of community systems as an alternative, with acquisition of land for the specific purpose of construction of appropriate land application systems.

Some twenty years have passed since the completion of this program. The recommendations remain valid and the performance many on-site systems has most likely deteriorated over this time.

2.2 Visual assessment of the Foreshore around Lewisham, Dodges Ferry, Carlton and Primrose Sands with respect to inappropriate wastewater disposal 2005

This report was prepared by Marine Solutions for Consulting Environmental Engineers.

The study involved walking the foreshore at low tide and noting effluent discharge impacts in seeps including algal growth and channel erosion in soft sediment.

Points where algal growth and localised seeps were identified were recorded and photographed.

The report identified irregular and patchy impacts of on-site wastewater discharge along the foreshore, with Dodges Ferry and Lewisham showing the greatest evidence and lesser evidence at Primrose Sands and Carlton Beach.

2.3 Strategic Plan for Managing Southern Beaches Wastewater 2006

This report was prepared by Consulting Environmental Engineers.

The report identified with the rapid increase in population and potential for further future increase. It noted that water and sewer infrastructure has not kept pace with the change from rural to more urban form. It flagged that a long-term wastewater strategy for the Southern Beaches is required to provide adequate sewage treatment and to maintain, and where possible, to enhance the environmental values of the municipality. The report considered public health and environmental risks. It considered present and likely future development in the various townships, development options, recommended strategies, capital cost estimates and implementation and staging. It referred to hazard maps prepared as part of the Dodges Ferry Catchment Management & Groundwater Monitoring Programme and assesses risk. It developed a conceptual plan for a conventional sewerage scheme to serve the Southern Beaches and considers retention of existing septic tanks together with "small pipe" reticulation systems such as Common Effluent Drainage/Septic Tank Effluent Pump Septic Tank Effluent Gravity (CED/STEP/STEG) and compares their costs. It concluded that the best option was a single regional wastewater treatment plant in the Joseph Road area which would require some 100ha for irrigation and 45ML of storage. It also considered groundwater recharge at Seven Mile Beach and an ocean outfall at Frederick Henry Bay.

With the passage of time, alternative technologies have emerged and the viability, preference, acceptability and especially the estimated costs of the recommended options will most probably have changed.

2.4 Draft Development Proposal and Environmental Management Plan - Southern Beaches Wastewater Management Scheme - Effluent Reuse 2010

This report was prepared by Consulting Environmental Engineers.

The report describes a proposal by Southern Water to provide a centralised sewerage system for the main urban areas of Southern Beaches, consisting of the towns of Lewisham, Dodges Ferry, Carlton, Carlton River and Primrose Sands.

It considers various alternatives:

- Conventional wastewater reticulation system involving gravity and pressure sewers;
- Separate wastewater treatment plants for individual towns;
- Partial effluent reuse on land with effluent discharge to surface water each winter; and
- Do nothing.

The report draws together biogeographic background information. It describes a proposal for wastewater treatment, reuse and emergency effluent discharge to the marine environment, as part of the Southern Beaches wastewater scheme, consistent with the Tasmanian Government's plan to cease the discharge of all municipal wastewater into the State's waterways. The wastewater scheme would convert a previously unused waste product into an essential resource for future growth and development.

The intention of the proposed scheme was to use the reclaimed water in a sustainable way in intensive agriculture and agro-forestry. The scheme would be established in such a way as to ensure the development is sustainable and has safeguards to protect the environment in accordance with the Tasmanian Wastewater Re-Use Guidelines and the State Policy on the Protection of Agricultural Land.

The proposed reuse scheme was developed in accordance with Sorell Council's own environmental, economic and social outcomes as set out in their Strategic Plan. The proposed development would enable the achievement of improved environmental outcomes in the area, which were designed to benefit the whole community.

The major components of the proposed scheme were:

- Sewering of all existing and potential new residential zoned lots (3,850 lots) in Zone R1 (Residential serviced) and Zone R2 (Residential unserviced), with a design summer population of 11,000 persons;
- Wastewater from the urban areas to be conveyed to a regional wastewater treatment plant located on Joseph Road, north of Carlton;
- Wastewater to be treated in a biological secondary treatment plant with a design average summer flow capacity of 2.2 ML/d;
- Effluent (reclaimed water) to be pumped from the wastewater treatment plant in pipelines to storage lagoons located on at least two of the reuse sites. The storages to have a total capacity of 390 ML, which was sufficient to store all effluent flow during the non-irrigation season up to the 90th percentile annual rainfall year at the ultimate development design annual flow of 690 ML/yr;
- Effluent (reclaimed water) to be reused on a range of agricultural and commercial enterprises on five properties (four reuse areas) with a total irrigable area of 250 ha, which is adequate for sustainable reuse of the ultimate development design annual flow of 690 ML/year in the 90th percentile rainfall year;
- Excess effluent that could not be reused in very wet years (i.e. >90th percentile rainfall year) (emergency conditions) would be discharged via a submarine outfall at Dodges Ferry into Frederick Henry Bay. This emergency discharge would be undertaken in winter and on the ebb tide to minimise effluent entry into Pittwater. This emergency effluent discharge was not anticipated to occur unless all of the following occur; full development was approached, a reticulated water scheme was provided in the Southern Beaches, additional reuse applications were not found, and there was 100% regional treatment and no on-site disposal. Construction of the effluent outfall pipeline was not anticipated to be required until at least 2030;
- The estimated capital cost of the project was $50 million (January 2006), including $29 million on-site works (householder costs) and $21 million for off-site works (Southern Water costs) for construction of wastewater conveyance, wastewater treatment, effluent reuse and effluent outfall.

Over time, firstly Southern Water and more recently TasWater have determined not to proceed with such a scheme.

2.5 Survey of On-site Wastewater Management Systems 2012

This survey was carried out by Greg Robertson and Richard Mason (Sorell Council).

The survey gathered information on a random selection of 586 properties, approximately 11.6% of all properties in the Southern Beaches. It noted types of on-site system, location of systems, an estimate of available area for wastewater disposal on each property, details of failing systems and failure modes, pumpout records, soil types and estimates of the number of bedrooms at each property. The age of systems was noted. The survey benefited by the extensive local experience of the officers involved in the survey.

The survey concluded that:

- Approximately 90% of systems were septic tanks, with the balance largely aerated wastewater treatment systems (AWTS) and a small number of other types of system;
- Defects included odours, surface surcharge, surface irrigation of untreated greywater, downslope seepage and undersized land application areas at approximately 10% of properties;
- Small lots presented a major limitation;
- Soils were a limiting factor in some areas (e.g. Lewisham);
- The proportion of failing systems increased with increasing age of system;
- Both irrigation areas and trenches were represented amongst the failures.

The data recorded provided a useful snapshot of on-site system performance and is mirrored by the walk-over inspection of systems undertaken as part of the current study.

With a further 12 years having now passed since this survey was completed, the number of failing systems will most likely have increased.

Comments made by participants in the Community meeting and the survey undertaken as part of this study confirm that a similar picture of system performance and failure exists at the present time and that age of system, lot size and soil type remain significant factors.

2.6 Sorell Stormwater System Management Plan Vol 4 - 7 May 2020 (as it applies to the Southern Beaches only)

This report was prepared by the Hydro-Electric Corporation (trading as *Entura*).

Part of the study addresses the Southern Beaches – comprising the urban areas of Lewisham, Dodges Ferry, Carlton, Primrose Sands, Connellys Marsh and Dunalley.

The report described flooding problem locations and existing stormwater management for flood risk mitigation. Potential flood risk management measures were described. An economic assessment of flood risk measures was made as part of a multi-criteria assessment along with social and environmental factors. Water quality from the stormwater catchments was assessed and recommendations made in a Stormwater Management Plan which included:

- Flood modification and structural management measures;
- Property-scale management measures; and
- Community / catchment-scale management measures.

The report described known flooding and stormwater drainage issues and described their locations. It further described development trends and considered climate and the impacts of climate change, including rising sea levels, the changed nature and frequency of exceptional climatic events and an increased number of high rainfall events. Problem flood locations in the Southern Beaches were listed and described.

The plan made recommendations for specific works, prioritised them for attention over a 20-year period and estimated costs. The recommendations were largely for street drainage improvement works.

In the intervening time some measures have been put in place to address localised flooding issues:

- Road resurfacing, kerb and gutter and stormwater drainage works in Seventh Avenue from Carlton Beach Road to The Promenade; and
- Improved stormwater drainage around Boat Park, Kannah Street and Blue Lagoon.

In addition, recommendations were made for property-scale management measures and community/catchment-scale management measures. These were largely in the areas of raising and flood-proofing of buildings and emergency awareness and preparedness.

The report did not specifically address interactions of on-site stormwater and on-site wastewater, though street drainage is a potential receptor of drainage from individual residential lots where runoff from failing on-site systems may impact on overall stormwater quality.

2.7 Southern Beaches On-site Wastewater and Stormwater Specific Area Management Plan (SB-SAP; 2022)

The purpose of the Southern Beaches On-site Wastewater and Stormwater Management Specific Area Plan (SB-SAP) was:

- SOR-S2.1.1 That development requiring on-site wastewater management on lots zoned Low Density, Village or Local Business (mostly with an area of less than 1,500m^2) has sufficient land available for on-site wastewater management; and
- SOR-S2.1.2 That stormwater quality and quantity is managed to protect natural assets, infrastructure and property.

The SB-SAP outlined Acceptable Solutions and Performance Criteria designed to ensure that on-site wastewater management did not cause adverse public health or environmental impact.

Amongst the Performance Criteria was the requirement that the land application area was setback a sufficient distance from watercourses, property boundaries and groundwater. The suitability of the setback could be confirmed by risk assessment and/or by viral die-off modelling.

2.8 Tasmanian Planning Scheme - Sorell (relevant subdivision and development standards for low-density residential zone) (2022)

The State Planning Provisions included the administrative, zone and code provisions and the requirements for Local Provision Schedules that were to apply in the Tasmanian Planning Scheme. *Sorell Local Provisions Schedule* (LPS), the Tasmanian Planning Scheme – Sorell took effect on 21 December 2022.

Special provisions for Sorell included the abovementioned *Southern Beaches On-site Wastewater and Stormwater Specific Area Management Plan* which outlined special provisions for on-site wastewater, in particular that:

- Sufficient space was made available on individual lots for land application of on-site wastewater and similarly for on-site stormwater;
- That developments must be capable of connecting by gravity to a public stormwater system; and
- That stormwater quality and quantity was managed to protect natural assets, infrastructure and property.

2.9 Sorell Stormwater in New Developments Policy 2023

This policy, prepared by Council sought, inter alia, to provide a framework for the regulation of stormwater from new development through the Tasmanian Planning Scheme - Sorell and the *Urban Drainage Act 2013*, ensure stormwater from new development was of an acceptable quality and did not unreasonably impact downstream receiving waters, particularly waters where there were high conservation values and ensured that where on-site stormwater disposal was required that the site was suitable and would not impact OWMS or existing inundation issues.

The State Planning Provisions (SPPs) and the Local Provisions Schedule (LPS) included a Specific Area Plan (SAP) for stormwater and wastewater in the Southern Beaches area, which applied to unserviced areas in the Southern Beaches. It required both qualitative and quantitative assessment in design of on-site stormwater systems to manage stormwater discharge and to avoid adverse impacts on OWMS.

Ensuring implementation of these requirements was essential in managing on-site stormwater and wastewater, particularly on small lots with less favourable soils in close proximity to sensitive receiving environments.

2.10 Flood prone areas maps (undated)

Thirteen maps, prepared by Council show the extent of the 1 in 100 year flood event and identify individual properties which are potentially impacted.

These low-lying properties are often also affected by poor performance or failure of land application areas for on-site wastewater, particularly following periods of rain, when the water table is elevated.

The maps are included in this report in Appendix 3.

3.0 Zoning of the Southern Beaches

Predominant zonings in Southern Beaches are Low Density Residential and Rural Living Zone A and Rural Living Zone D and Rural; these zonings reflect the character of settlement in the area.

The SB-SAP area is entirely within the Low Density Residential Zone, (with the exception of small exclusions encompassing land listed below as minor area zonings); the purpose of this zone is to "provide for residential use and development in residential areas where there are infrastructure or environmental constraints that limit the density, location or form of development."

Minimum lot size for new subdivisions in this zone is 1,500m^2, however, while some lots exceed 1,500m^2, the vast majority of lots predating these provisions within the SB-SAP area are substantially smaller than this; the intention of the minimum lot size for this zone is primarily to ensure sufficient area for the establishment and operation of a sustainable OWMS for a typical single residence.

There are also minor area zonings of Village, Local Business, Light Industrial, Landscape Conservation, Community Purpose, Environmental Management, Utilities, Recreation and Open Space.

4.0 Current servicing of water, sewerage and stormwater

4.1 Reticulated water and Sewerage

There are no reticulated water or sewerage services within the Southern Beaches area; furthermore, TasWater have consistently advised that there is currently no intention to provide such services for the foreseeable future.

4.2 Stormwater

The *Sorell Stormwater System Management Plan Volume 4 - Stormwater System Management Plan Revision No: 2 ENTURA-136B7F* summarises the nature of stormwater systems in the Southern Beaches area:

> "*The existing stormwater drainage network typically extends from the higher elevations of the developed areas of the study area, providing drainage through to the receiving water. In addition to numerous stormwater outfalls, there are a number of watercourses across the study area, where some of these effectively form a major element of the stormwater system.*
>
> *Rain falling on the catchment initially flows as sheet flow until there is a concentration of runoff within the existing gullies and flow paths. In the upper regions of the study area catchment, flow continues along these gullies to the upstream limit of development which generally coincides with the upstream extent of the pipe drainage network. At these locations flow typically enters the pipe via either a headwall structure with the pipe laid at the base of the gully or low point, or via an inlet pit.*
>
> *Typically located within the road network across the developed portions of the study area, inlet pits have been built to intercept surface water runoff and convey the runoff to the pipe drainage. These inlet pits have a range of configurations typically composed of one of the following:*
>
> - *Grated inlet pit;*
> - *Side-entry inlet pit; or*
> - *Combination of grated and side-entry inlet pit.*
>
> *The dimensions of the grates and lintels associated with the side-entry pits vary across the entire study area.*
>
> *The drainage network generally follows the natural overland flow paths through the developed areas of the catchment, with the major trunk drainage pipes generally increasing in size with distance downstream as the contributing catchment increases. For the Sorell and Southern Beaches areas of interest, there are a number of formed open channels that convey flow in lieu of a piped drainage network.*
>
> *In instances when the capacity of the piped or channelised drainage network has been exceeded (i.e. during a given rainfall event), excess surface water is conveyed downstream as uncontrolled flow via overland flow paths, where some of these overland flow paths coincide with the road network. However, in some areas of the catchment the overland flow path passes through properties creating a flood risk with potential for flooding of buildings or areas of high hazard that pose a risk to the community*."

Stormwater from premises within the Southern Beaches area will typically flow via rainwater tanks (roof runoff) to overflow to a stormwater drainage connection, which may also collect driveway, patio and other hard surface runoff, with discharge via a dedicated stormwater connection to the Council system.

In many areas, even where there is a constructed Council stormwater drainage system, properties on the downslope side may be unable to connect to the stormwater system by gravity; this is common on the coast at Lewisham Scenic Drive, Lewisham; Carlton Bluff Road, Grevillea Street, Linden Road and Susans Bay Road, Primrose Sands and inland in the higher elevation areas of Dodges Ferry and Carlton where the Council road and stormwater system (if provided) run parallel with the contour.

Significant areas within the SB-SAP either have no or very limited provision for stormwater reticulation. These include:

- *The Tamarix Road area of Primrose Sands*
- *The back-dune area of Carlton Beach, following Carlton Beach Road, which largely comprises low lying flood-prone wetland with very limited drainage to Carlton River, in the vicinity of River Street*
- *The Kannah Street-Blue Lagoon area of Dodges Ferry*
- *The Lewis Court – Creek Street area of Lewisham*
- *The Jones Parade – Lewisham Scenic Drive area of Lewisham*

5.0 On-site wastewater and stormwater management

5.1 Wastewater management

5.1.1 Current process for assessing land for on-site wastewater systems

The design and location of an on-site wastewater management system (OWMS) on a particular property is focussed not only on appropriate treatment of effluent, but also retaining all of it within the land boundaries. Most existing systems comply with these requirements, but some don't. New developments bring their own potential risks: for example, retention within property boundaries may be at risk on some small properties where houses might be demolished to make way for larger ones, or where large houses are proposed on vacant small lots.

Any new development which increases the volume of wastewater to be disposed of on a property requires a Site and Soil Evaluation Report (SSER) and OWMS design by a Suitably Qualified Person (SQP)[1] engaged by the proponent of the development. The SQP exercises professional judgement, and the report and design is done in general accord with Australian/New Zealand Standard 1547:2012 *On-site domestic wastewater management*, and the Tasmanian Director of Building Control's *Director's Guidelines for On-site Wastewater Management v2, 2017*.

A complicating factor in sizing and locating an OWMS in existing and new developments has been and is the regulatory requirement for stormwater[2] from roofs and other hardstand areas on a property to also be retained within property boundaries – unless the stormwater can be discharged to an on-site or off-site watercourse, or off-site to an existing public stormwater drainage network.

In 2023, Sorell Council issued its own document for managing both on-site wastewater and stormwater in the Southern Beaches, as a Local Provisions Schedule in the Tasmanian Planning Scheme: *SOR – S2.0 Southern Beaches On-site Wastewater and Stormwater Management Specific Area Plan* (referred to in this report as the SB-SAP). This document specifically recognises that managing wastewater and stormwater for new developments go hand in hand. It allows for written management advice from wastewater SQPs (defined in footnote 1 below), and stormwater SQPs (which are not defined[3]).

Approval for the SSER and OWMS design, and the issuing of a plumbing permit for the installation of the system, rests with Environmental Health Officers (EHOs) at Sorell Council. The EHO may liaise with the SQP with respect to the SSER and design. After a plumbing permit is issued, the proponent engages a licensed

[1] **Definition of SQP**
In general terms, Table 3.1 *Planning Terms and Definitions* in Section *3.0 Interpretation* in the *Administration* section of the Tasmanian Planning Scheme State Planning Provisions lists a suitably qualified person as "…a person who can adequately demonstrate relevant tertiary qualifications (or equivalent) and experience in a recognised field of knowledge, expertise or practice with direct relevance to the matter under consideration. With respect to on-site wastewater matters, Part B – Plumbing work of the Tasmanian Director of Building Control's *Director's Determination – Certificates by Qualified Persons for an Assessable Item, 15 December 2021* lists a person qualified to do a "Site and soil evaluation and land application system design" as including and restricted to: a civil or environmental engineer, a soil scientist, or an environmental geologist.

[2] The *Urban Drainage Act 2013* (the Act), defines stormwater as: ***stormwater*** *means run-off water that has been concentrated by means of a drain, surface channel, subsoil drain or formed surface.* See also Sorell Council's *Stormwater Information Sheet.*

[3] In August 2021, Clarence City Council produced its draft *Stormwater Management Procedure for New Developments*, in which it defined a SQP as "A professional engineer practicing with relevant CPEng or RPEng or NER or RPEQ accreditation, or a person who in respect to the type of work to be undertaken can adequately demonstrate relevant academic qualification, suitable professional competency, and an appropriate level of professional indemnity and public liability insurance." This SQP is required to produce a report "demonstrating that the site is suitable for on-site soakage, re-use or pumping…"

plumber to install the OWMS. Before it can be used, the SQP must then certify that the as-installed OWMS accords with the requirements of AS/NZS 1547, and with the plumbing permit.

5.1.2 Types of existing on-site wastewater disposal systems

A range of OWMS is in use in the Southern Beaches, reflecting the history of development of both wastewater treatment units and the district:

- it is possible some older properties have no wastewater system at all (manual burial of toilet wastes in the back garden was a not uncommon practice half a century ago),
- most existing properties treat wastewater to primary level in septic tanks and dispose of the effluent in absorption trenches, and
- newer houses on more recent developments most commonly employ secondary wastewater treatment (typically in aerated wastewater treatment systems; AWTS), and dispose of effluent in shallow subsurface irrigation systems, or trenches and beds.

Table 5.1.2 summarises and comments on the range of OWMS operating in the Southern Beaches.

5.1.3 Likely non-compliance with current regulations of existing wastewater disposal systems

5.1.3.1 Non-compliance for historical reasons

Likely non-compliance of existing on-site wastewater systems with current regulations is summarised in Table 5.1.1.

As a general comment the older the wastewater system, the more likely it is to be non-compliant. This is because accepted ways of assessing soils and designing wastewater systems have evolved over the past several decades.

In the Southern Beaches, assessing sites and soils and designing on-site wastewater systems must be done according to:

- Australian-New Zealand Standard AS/NZS 1547: 2012 *On-site domestic wastewater management,* and
- the Tasmanian *Director's Guidelines for On-site Wastewater Management Systems v2; November 2017.*

On residential properties zoned Low Density, Village or Local Business, wastewater systems must also comply with the *Southern-Beaches On-site Wastewater and Stormwater Management Specific Area Plan* (SB-SAP; Section 7). A draft version of this was available in 2021, and it was formally adopted in 2023. The SB-SAP calls on both AS/NZS 1547 and the Director's Guidelines.

Earlier versions of AS/NZS 1547 were published in 1994 and 2000. Both of these described a standardised nation-wide approach to assessing soils and sites, and to sizing absorption trenches and beds for wastewater disposal. Before 1994, sizing absorption trenches throughout the country tended to be a "one-size fits all" approach, although in Tasmania in the 1980s, there were two early approaches to upgrading methodologies[4].

[4] The first was Patterson, R. M. C (1985). *Septic Tank Installation in Tasmania.* Unpublished Report Department of Health Services, Tasmania. The second was Cromer, W. C. (1988). *Code of Practice: Site Assessment for Septic Tank Absorption Trenches*. Australian

It is unsurprising, therefore, that most wastewater systems older than about 1994 will not likely comply with current regulations and guidelines, particularly with respect to the sizes of absorption trenches or beds.

Old Council-approved wastewater systems installed in accord with then-current regulations do not require upgrading unless (a) Council notifies a landowner that the system is now a risk to human health or is causing environmental harm, or (b) the landowner proposes to alter the original site conditions (for example, by adding an extra bedroom which increases the wastewater volume) to the extent that the wastewater system needs upgrading.

Institute of Environmental Health (Tasmanian Division). Later, in 2001 as an explanatory guideline to AS/NXZS 1547:1995, the Tasmanian Division of the Institute produced a *Code of Practice for On-site Wastewater Management* (authored by Cromer *et al*) which did not proceed past the 'draft for comment' stage, but the Institute's Tasmanian Division computer application *Trench 3 Land suitability and system sizing for on-site wastewater management (Cromer, 1999)* primarily designed for wastewater assessors and regulators, became a statewide industry standard and was well received nationwide. The application remains current.

Table 5.1.2. Types of on-site wastewater systems currently operating in the Southern Beaches

	Existing waste water systems	Estimated occurrence (% of all systems)	Likely compliance with current regulations and guidelines
1	Hand-burial or hand-mulching of toilet wastes, and greywater disposal directly to the ground surface, and/or to garden or vegetable beds	1	Non-compliant. Sorell Council would require any existing system of which it became aware to be upgraded to comply with current regulations.
2	Long-drop toilets, and greywater disposal directly to the ground surface, and/or to garden or vegetable beds	1	Non-compliant. Untreated greywater may be used only via manual bucketing onto garden plants (excluding fruit trees and vegetables).
3	Single-purpose septic tanks, blackwater disposal in trenches or beds, and untreated greywater disposal directly to the ground surface, and/or to garden or vegetable beds	10	The older the system, particularly if it predates the year 2000, the more likely it is to be non-compliant with respect to the size of the septic tank and blackwater trenches/beds, and greywater disposal. Untreated greywater may be used only via manual bucketing onto garden plants
4	Single-purpose septic tanks, and blackwater and greywater disposal in separate trenches or beds	10	If the system predates about 2015, it may be non-compliant with respect to the size of the septic tank and trenches/beds.
5	Composting, chemical or incinerating toilets, and greywater disposal directly to the ground surface, and/or to garden or vegetable beds, and/or trenches or beds	5	Waterless toilets and greywater trenches or beds are generally compliant. Untreated greywater may be used only via manual bucketing onto garden plants (excluding fruit trees and vegetables).
6	Dual-purpose septic tanks, and waste water disposal in trenches or beds	35	The older the system, particularly if it predates the year 2000, the more likely it is to be non-compliant with respect to the size of the septic tank and wastewater trenches/beds
7	Composting, chemical or incinerating toilets, and greywater disposal in separate trenches or beds	2	Waterless toilets and greywater trenches or beds are generally compliant.
8	Aerated wastewater treatment systems, and disposal of secondary-treated waste water in trenches or beds, or via shallow subsurface drip irrigation, mulch-covered drip irrigation, or low surface sprinklers.	16	Secondary above-ground treatment is relatively modern, and most systems would likely complywith the treatment method and size of the land application area
9	Dual-purpose septic tanks, secondary in-ground treatment and wastewater disposal in trenches or beds	20	Secondary in-ground treatment is relatively modern, and most systems would likely comply with respect to the size of the septic tank and wastewater trenches/beds

Current regulations and guideines

AS/NZS 1547: 2012 *On-site domestic wasteater management*

Director's Guidelines for On-site Wastewater Management Systems v2; June 2017

Southern-Beaches On-site Waste Water and Stormwater Management Specific Area Plan

5.1.3.2 Non-compliance for site-suitability reasons

The three fundamentals controlling the size and location of on-site wastewater systems are:

- the daily volume of wastewater to be treated and disposed of on-site, in-ground, within property boundaries,
- the soil profile and its capability to receive applied wastewater, and
- the required separation ("setback" distance) of the wastewater disposal area from sensitive features such as buildings, property boundaries, surface water (creeks, coastlines, dams, etc), in-ground stormwater disposal areas, water bores and groundwater.

The first two of these fundamentals determine the area required to dispose of the wastewater in-ground. This area is the land application area (LAA). The daily wastewater volume is calculated from the number of bedrooms in a house (any room which could reasonably be used as a bedroom – a study, a rumpus room, etc – is counted as such). The soil profile determines the soil category (one of six categories, from sand and gravel, to clay) which in turn determines the daily application rate of the wastewater.

Site-suitability reasons for non-compliance of an originally-compliant wastewater system include:

- extending the dwelling to include extra bedrooms. This increase in the calculated daily wastewater volume may also lead to overloading of the LAA, and system failure. Failure might also occur from extra water-using facilities (e.g. spa, swimming pool) even without additional bedrooms.
- Inappropriate location of the LAA with respect to setback distances. This situation might arise from the addition of sensitive features such as outbuildings, in-ground swimming pools or water bores, too close to the original LAA. Another example is subdividing the property for more intense residential use, with the new common lot boundary too close to the original LAA.

Site inspection in December 2024 revealed several instances of failing OSWMs too close to property boundaries and roads (with treated effluent seeping into table drains), and too close to the coastline (with effluent seeping onto or across the foreshore.

5.1.3.3 Non-compliance for environmental reasons

Environmental reasons for non-compliance of an originally-compliant wastewater system include:

- Rainfall (Section 5.4): in poorly drained areas, some rain events may cause localised flooding which could be prolonged; flooding can raise groundwater levels under LAAs and septic tanks, preventing adequate infiltration of wastewater, and failing systems. Risks to human health may arise, and some houses become uninhabitable because the wastewater systems are not working.
- sea level rise (Section 5.3.2)

5.2 Stormwater management

5.2.1 Current management of stormwater in the Southern Beaches

Stormwater in the southern Beaches is managed by Sorell Council's *Stormwater in New Development Policy (2023;* here called the SNDP*)*, which was reviewed in Section 2.9 of this report.

The decision tree on in Appendix 1 of the SNDP summarises how stormwater quantity is to be managed in the municipality. This and following Sections 5.2.2 – 5.2.4 discuss quantity. Stormwater quality is briefly discussed in Section 5.2.4.

The SNDP acts though the Tasmanian Planning Scheme – Sorell, and the *Urban Drainage Act 2013*. It distinguishes between three types of systems for stormwater management:

- Major public stormwater system: a combination of overland flow paths, including roads and watercourses, and the underground reticulation system designed to provide safe conveyance of stormwater runoff and a specific level of flood mitigation. Any new major system must be designed to safely cope with a 1% AEP event, with an allowance for climate change in accordance with Australian Rainfall & Runoff Guidelines[5] Scenario RCP 8.5 for the year 2090. The design of the system must consider the full development of the surface water catchment it serves. Examples of surface water catchments in the Dodges Ferry – Carlton area are shown in Figure 5.2.1.
- Minor public stormwater system: stormwater reticulation infrastructure designed to accommodate more frequent rainfall events in comparison to major stormwater drainage systems, having regard to convenience, safety and coast. Any new minor system must be able to convey stormwater from a 5% AEP event, or 2% AEP in an industrial area. Minor stormwater systems include roadside open table drains provided the drains are at least 1200mm wide and 450mm deep.
- Private stormwater system: an installation on a property that (a) is not part of a public stormwater system, (b) is used for collecting or disposing of stormwater, and (c) comprises any or all of the following: roof gutters and downpipes, rainwater tanks, surface channels, kerbs and gutters, subsoil drains and stormwater drains, and inlet pits (with or without pumps).

[5] Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, (Editors). Australian Rainfall and Runoff: A Guide to Flood Estimation, © Commonwealth of Australia (Geoscience Australia), Version 4.2, 2019.

Figure 5.2.1. Part of the Dodges Ferry – Carlton area, showing surface water (and therefore stormwater) catchments. The heavy black lines around the coast, and extending inland, are the boundaries of two CFEV river subcatchments – Forcett ($43km^2$) and Chaseys ($17km^2$). Within each of these are many smaller sub-subcatchments bounded by the thinner red lines. The largest two of these in the district are #26004 (46ha in area) containing the Dodges Ferry commercial centre and Bally Park, and #27025 (220ha in area) covering much of the built-up area of Carlton north of Carlton Beach.

Source of base map: www.thelist.tas.gov.au CFEV = Conservation of Freshwater Ecosystem Values.

Major and minor stormwater systems, including open drains, are public stormwater systems owned by Sorell Council.

Site inspections in December 2024 for this report suggest that some of the open roadside drains have dimensions smaller than the 1,200mm width and 450mm depth required to qualify as a public system. In any case most probably connect to a public system, with the remainder seemingly having to outlets.

5.2.2 Public stormwater systems in the Southern Beaches

Appendix 2 is a series of eleven maps (Maps 2.1 – 2.11) of the Southern Beaches, generated by Sorell Council for this report and showing colour-coded properties that:

- are connected, or could be connected, to public piped stormwater networks (but the network is at capacity),
- are not connected, but could be connected, to public piped stormwater networks (and the network has spare capacity), and
- discharge, or could discharge, stormwater to public roadside open drains.

In the last category, it is assumed that the open drains meet the minimum requirements for public open drains i.e. being at least 1200mm wide and 450mm deep.

These three categories all discharge stormwater off-site, or could do so, to public systems administered by Sorell Council.

Remaining properties left uncoloured on the maps manage stormwater privately. They fall into two categories:

- those which manage stormwater on-site[6], and usually in-ground, or to an on-site watercourse, and
- those which discharge stormwater off-site, to watercourses if an inland property, or indirectly or directly to the coast (if a coastal property).

Complementing the maps in Appendix 2, Appendix 3 is a series of eleven maps showing the distribution of piped major and minor stormwater networks, and open table drains. These maps should be compared to those in Appendix 2 showing the actual and potential connectivity of individual lots to the networks.

Table 5.2.2 (and its inset figure) tabulate the information presented Appendix 2. Figure 5.2.2 expands on Table 5.2.2 and shows in a series of pie diagrams how stormwater is variably managed across the Southern Beaches. Observations arising from these results are:

[6] It is expected that some properties – probably those with older houses – don't manage stormwater at all. It simply discharges from roofs and other hardstands to the ground surface. Without doing a door-to-door survey, it is not possible to identify these cases from maps and aerial imagery.

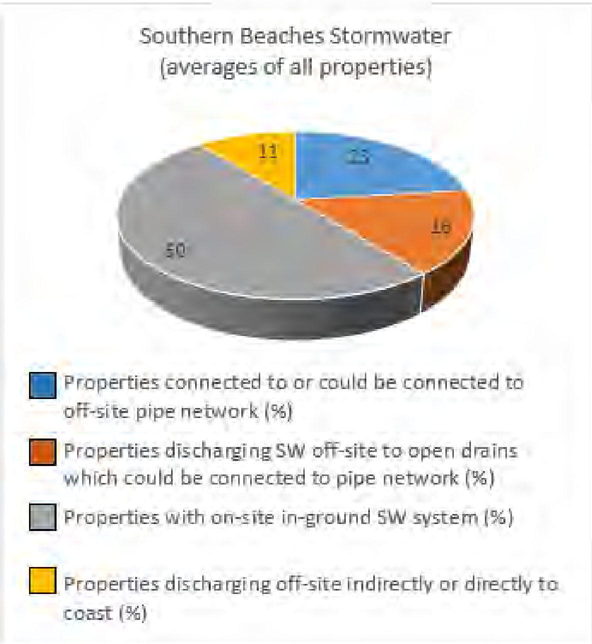
Table 5.2.2 (and inset pie chart). Stormwater management in the Southern Beaches.

		Public SW systems		**Private SW systems**	
	Maps in Appendix 2	**Properties connected to or could be connected to off-site pipe network (%)**	**Properties discharging SW off-site to open drains which could be connected to pipe network (%)**	**Properties with on-site in-ground SW system (%)**	**Properties discharging off-site indirectly or directly to coast (%)**
Lewisham	2.1	24	20	38	18
Lewisham – Dodges Ferry	2.2	13	0	47	40
Dodges Ferry	2.3	33	3	54	10
Dodges Ferry – Carlton	2.4	35	19	40	6
Dodges Ferry – Carlton	2.5	27	0	73	0
Carlton	2.6	14	0	86	0
Carlton	2.7	15	22	63	0
Primrose Sands	2.8	24	23	48	5
Primrose Sands	2.9	27	34	15	24
Primrose Sands	2.10	18	41	36	5
Connellys Marsh	2.11	0	0	92	8
	Average %	**23**	**16**	**50**	**11**
	Minimum %	**0**	**0**	**15**	**0**
	Maximum %	**35**	**41**	**92**	**40**

Notes

1. The % in this Table are visually estimated (not counted) from Maps 2.1 – 2.11 in Appendix 2.

2. % means % of total properties



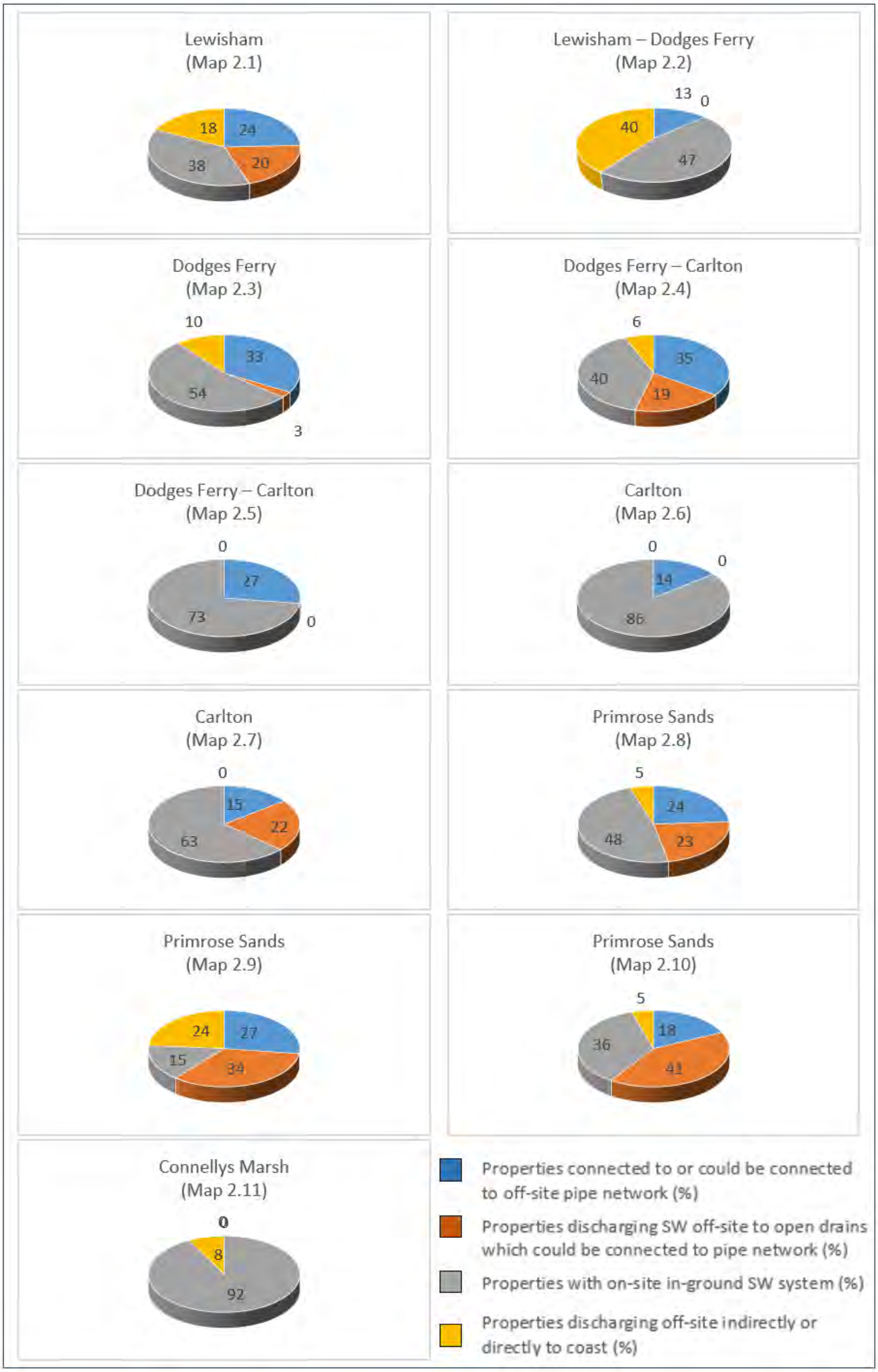


Figure 5.2.2. In the Southern Beaches, there is a wide variability in the proportions of properties connected to (or able to be connected to) an off-site public stormwater system, and those with private on-site systems. These pie charts are plotted directly from Table 5.2.2, which is in turn derived from the maps in Appendix 2.

- across the five townships, on average 39% of all properties are connected, or could be connected, to either a piped stormwater network or an open public drain which could in turn connect to a piped network; Connellys Marsh has no properties in this category, but most of the smaller, older lots in Dodges Ferry – Carlton district are;
- on average, private on-site stormwater systems are on half of all properties; they are most common (up to 100%) on larger inland properties, and are least common in parts of Primrose Sands (particularly in the vicinity of Renard and Primrose Points), and
- one in six properties discharges stormwater indirectly or directly to the coast.

5.2.3 Private stormwater systems on individual lots

5.2.3.1 Potential management choices

Stormwater on individual lots includes rain runoff from roofs and other hardstand areas (including concrete and bitumen driveways and pathways, and any other impervious surfaces).

Depending on site conditions and the availability of public stormwater services, stormwater on individual lots may be managed by:

- piped discharge off-site to existing reticulated buried mains pipework (SNDP Section 8B1); this is Council's preferred method of stormwater management, provided the piped system has the spare hydraulic capacity for the additional discharge.
- piped discharge off-site to an open roadside table drain (not all of these are managed by Council) provided the drain does not discharge to or flow through a known flood-prone area (SNDP Section 8B2),
- on-site retention and in-ground absorption – subject to a Site and Soil Assessment (SSER) and quantity stormwater modelling for 1% and 5% AEP rain events by a SQP[7], who also shall consider the effects of stormwater on an existing or proposed OWMS (SNDP Section 8B3), or
- on-site or off-site discharge to a natural watercourse (SNDP Section 8B4); in this report, natural watercourse includes the marine environment.

Stormwater re-use for garden watering/irrigation instead of in-ground retention is not covered by current guidelines, but should be encouraged.

The potential to discharge stormwater off-site from a new development may be locally restricted because:

- the reticulated main or open drain to which the stormwater might discharge is already at design capacity and is unable to safely cope with the increased hydraulic load, and/or
- the open drain to which a lot's stormwater might otherwise discharge flows to or through a recognised flood-prone hazard, and the extra load would exacerbate the flood risk. Flood prone areas in the Southern Beaches are shown in the eleven detailed maps in Appendix 4.

[7] The SQP for on-site in-ground stormwater management (including SSERs and modelling) in Sorell Municipality is defined identically to the SQP in Clarence City Council's *Stormwater Management Procedures for New Developments* (2021) cited above.

5.2.3.2 Coastal properties and landslide hazard bands

For coastal properties bordering NRE land, private stormwater pipes from existing and new developments discharging uncontrollably over land in a landslide hazard band should be extended fully across the band, preferably to high water mark. Some public coastal stormwater outfalls also discharge uncontrollably over landslide hazard bands.

Public and private stormwater systems impinge on landslide hazard bands on or adjacent to about 65 properties along Lewisham Scenic Drive at Lewisham, about 20 properties on Tiger Head at Dodges Ferry, approximately 50 properties on Spectacle Head and Carlton Beach at Dodges Ferry, about 20 properties on Carlton Bluff Road at Primrose Sands, almost all of the 50 or so properties on Linden Road and Grevillea Street around Renard Head at Primrose Sands, and no properties at Connellys Marsh (Figure 5.2.3.2).

5.2.3.3 Inland properties and landslide hazard bands

Where possible, existing houses or new developments on inland properties on landslide hazard bands should direct stormwater off-site to public systems including open table drains, or to on-site or off-site watercourses. The least-favoured choice with respect to slope instability is an on-site, in-ground retention system, but this will be unavoidable in many instances.

5.2.4 Stormwater quality

Table 3 in Section A2 of the SNDP sets out targets for stormwater quality for various types of new developments in the Southern Beaches. No quality targets are set for a new building on any vacant land size, provided the impervious surface created is less than 1,000m^2. Additions to existing development on land smaller than 2ha, and subdivisions of no more than two lots using an existing road, are also exempt from quality targets.

For subdivisions of more than two lots, and for vacant land where new impervious surfaces exceed 500m^2 or 1,000m^2 for lots less than or more than 2ha in size respectively, quality guidelines apply to stormwater. These are from the *State Stormwater Strategy 2010* and include 90% reduction in litter and gross pollutants, 80% reduction in TSS, and 45% reduction in nutrients, based on average annual loads for typical urban concentrations.

It follows that there are no required quality controls on stormwater from most existing properties in the Southern Beaches, irrespective of whether stormwater is retained on site, or diverted to a public system.

proportions of properties connected to (or able to be connected to) an off-site public stormwater system

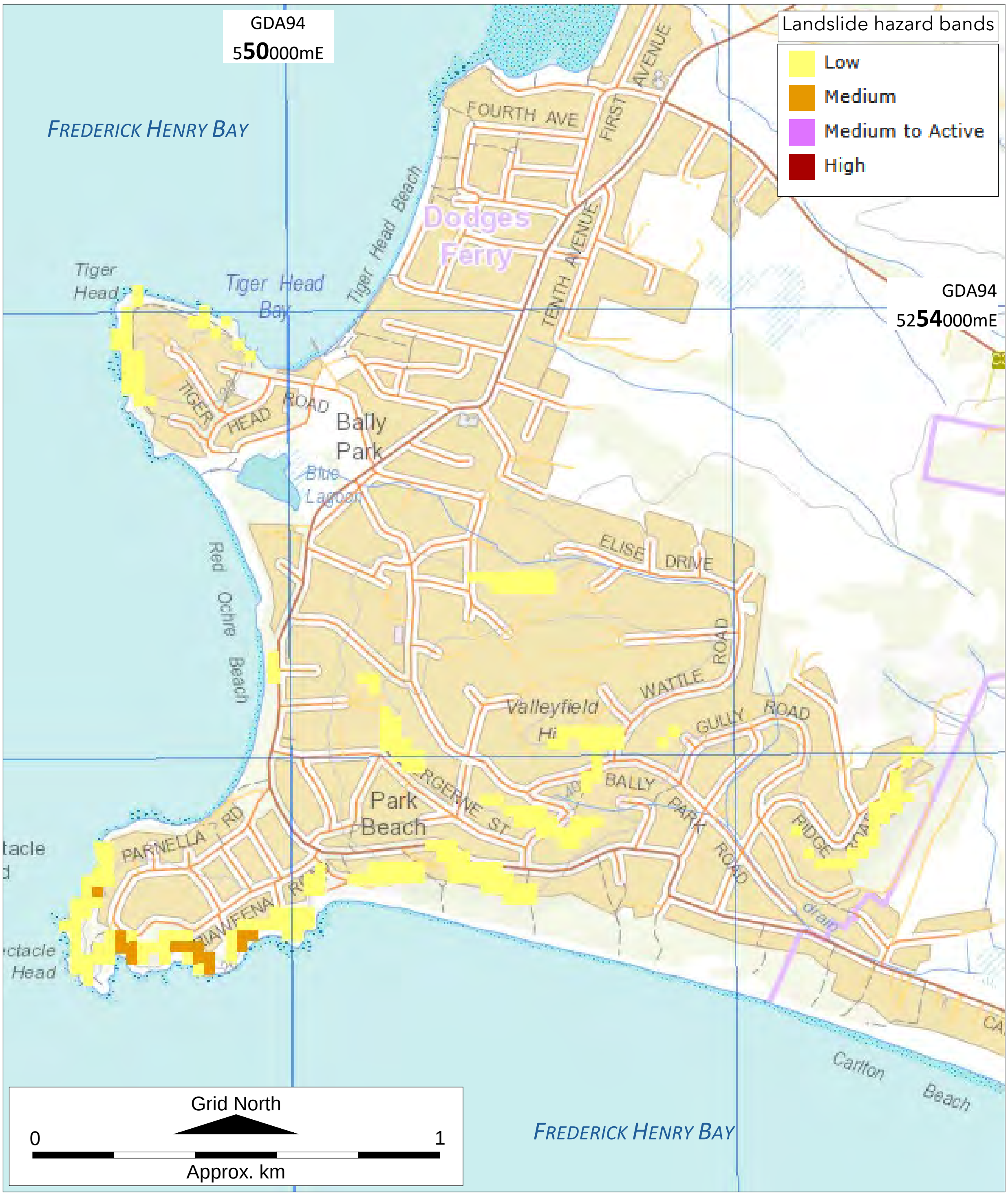


Figure 5.2.3.2. Part of the Dodges Ferry – Carlton area, showing published landslide hazard bands. All coastal properties I Southern Beaches discharge stormwater at their lower boundaries over foreshore land owned and administered by NRE. Some private properties and some NRE land are shown to be potentially at risk of slope instability, and uncontrolled stormwater discharge on this land may increase the risk of slope instability. Stormwater in these areas should be piped to high water mark.

Source of base map and bands: www.thelist.tas.gov.au

5.3 Climate change effects on on-site wastewater and stormwater systems

Climate change has always affected and is still affecting the operation of on-site wastewater and stormwater systems. In this respect, the climatic variables of most interest are rainfall, and (particularly in relation to on-site wastewater) sea level rise (SLR) and accompanying erosion and inundation in low-lying coastal areas.

5.3.1 Rainfall

In common with other areas of southern Australia, annual rainfall in Tasmania has declined since the 1970s, with the reduction being most obvious in Autumn (Grose *et al* 2010). The decline in Sorell Municipality was approximately 1.5 – 2.5% over the past half century.

Modelling suggests that in the next few decades annual rainfall in the Southern Beaches might reverse this trend with a modest increase (perhaps 5%), but an overall null effect over the century to 2100 (Figure 5.3.1).

In areas not prone to current tor future flooding, is not expected that the changing pattern of annual rainfall will be a significant influence on the behaviour of on-site wastewater systems in the Southern Beaches. However, modelling of extreme rainfall events towards the year 2100 suggests an “increase in the number of very wet days, more intense 1-day rainfall totals and significant increases in the 6-minute rainfall rates (particularly in eastern Tasmania)” (ARC CRC 2010, page 4).

In flood-prone areas, extreme rainfall events are likely to result in the temporary failure of some on-site wastewater and stormwater systems in the Southern Beaches. Typically, domestic wastewater systems are designed on the basis of average annual or seasonal rain, and most SQP’s designing OWMS make no allowance for extreme events. However, some available models for designing systems do permit high rain events and several-day high rain events to be included.

5.3.2 Rising sea levels

Rising sea levels, particularly if accompanied by high tides and storm surges, will result in increasingly frequent inundation and erosion of low-lying coastal areas[8] in the Southern Beaches. Sea level rise also causes a similar rise in coastal groundwater levels[9]. High groundwater levels might compromise the efficiency of on-site wastewater systems in these flood-prone areas.

Some of the on-site wastewater systems at Carlton and Primrose Sands, and most systems at Connellys Marsh, are potentially affected by higher groundwater levels directly or indirectly caused by sea level rise (Maps 2.1, 2.2 and 2.3 in Appendix 2). The low-lying areas identified as at risk contain groundwater in unconsolidated Quaternary/Tertiary sediments under unconfined conditions.

[8] The term “low-lying” is not strictly defined here. Generally, it is limited to townships where all or part of the built-up area is less than about 5mAHD. On-site wastewater systems at elevations greater than this will be considerably less affected by groundwater change due to climate change.

[9] The water table elevation is always higher than “sea level”. Water tables fluctuate daily, weekly, seasonally, annually and over longer periods. Groundwater conditions at several townships are currently known from on-going monitoring; others have been investigated in the past and are the subject of published and unpublished reports, and the others have been estimated from these monitoring data, reports, and unpublished investigations

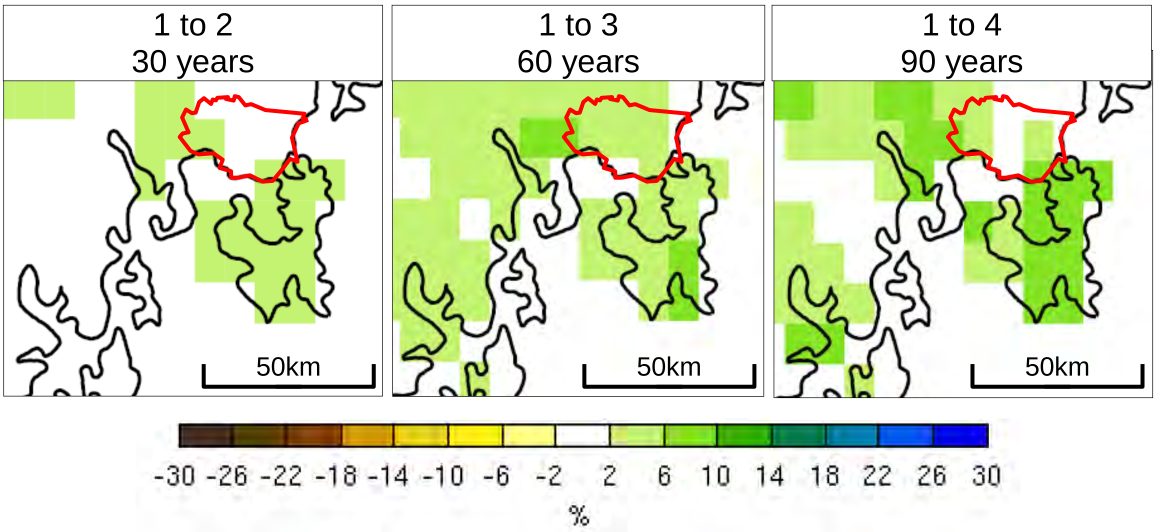


Figure 5.3.1. Modelled change in annual rainfall in southeastern Tasmania. The three maps show changes between 30-year periods indicated by the numbers 1,2 and 3: 1 = 1979-2007; 2 = 2010-2039; 3 = 2040-2069; 4 = 2070-2099. For example, The right hand map (Map 1 to 4: 90 years) shows the change in annual rainfall between 1978-2007 and 2070-2099. Sorell Municipality is bordered in red.
Source: Adapted from Figure 6.5 of Grose *et* al (2010)

6.0 Improving on-site wastewater and stormwater management in the Southern Beaches

6.1 Overview

In addressing Council's scope for this Southern Beaches report (Section 1.2), this Section brings together the reviews and discussions about the types and operation of existing OWMS, the regulations which control them, the public and private stormwater systems, and community feedback about wastewater and stormwater. Its intent is to make recommendations to improve the ways wastewater and stormwater are managed.

With respect to the Southern Beaches, this report recognises:

- TasWater has no plans to extend reticulated sewerage and water to the Southern Beaches in the short or medium term – probably measured in decades;
- The current systems of private, on-site wastewater management, and a combination of public and private stormwater management, will continue for the foreseeable future;
- Although failing OWMS occur throughout the Southern Beaches, most operate with no apparent effects on the environment and human health;
- Although failing private stormwater systems occur throughout the Southern Beaches, most operate satisfactorily;
- The regulatory controls (standards and guidelines) already in place are sufficient for appropriate site assessments and designs for OWMS and stormwater systems. The primary regulatory controls in the Southern Beaches are:
    - Australian / New Zealand Standard AS/NZS 1547 On-site domestic wastewater management;
    - The Tasmanian Director of Building Control's Director's Guidelines for On-site Wastewater Management Systems Version 2.0 July 2017 (It is understood that the Guidelines are currently being reviewed.);
    - Sorell Council's *Southern Beaches On-site Waste Water and Stormwater Management Specific Area Plan.* This SB-SAP calls on AS/NZS 1547 and on Appendix iii of the *State Stormwater Strategy 2010*;
- A part of the scope of the current report is to review the SB-SAP and if appropriate make recommendations for changes. This is canvassed in Section 7. The SB-SAP applies only to new developments on land zoned Low Density, Village or Local Business, typically on lots less than 1,500m^2 in size; for larger properties the controlling documents are AS/NZS 1547 and the Director's Guidelines;
- Although these regulatory controls have been and remain generally sufficient, their *application* by some stakeholders (including site assessors, designers and regulators) sometimes lacks professionalism and needs tightening up. This is most evident for wastewater and stormwater

management for new developments involving large houses on small lots where compliance with regulatory controls seems difficult to achieve;

- A corollary to the previous dot-point is that some of the community responses (Section 1.3 and Appendix 1) to Council's questionnaire about wastewater and stormwater are critical of both new landowners to the district who expect to be able to build large houses on small lots, and Sorell Council which tends to approve such developments without sufficient scrutiny;
- There is a need to educate residents and new landowners alike about the processes involved in the application of the regulatory controls – before any new developments are proposed;
- Some form of off-site community wastewater management for the commercial centre of Dodges Ferry is feasible and is discussed in detail in Section 8 of this report.

The following Sections elaborate on these issues.

6.2 On-site wastewater and stormwater management are inseparable

On-site wastewater is applied to a land application area (LAA) which is required to be set back:

- horizontally from sensitive downslope (i.e. downgradient) features like buildings, property boundaries, surface water, water bores, etc. and
- vertically from groundwater, bedrock and what are called limiting (i.e. impermeable) soil layers.

In the SB-SAP, set back distances are determined (i.e. estimated) on a risk-assessment basis.

Upslope cut-off drains may be necessary to divert surface water and shallow seepage water away from the LAA.

On-site stormwater is also generally disposed of in-ground. It requires its own stormwater land application area (SLAA).

On all properties, the LAA should be either crossslope (i.e. crossgradient) or upslope (and upgradient) from the SLAA.

Management of these two issues is inseparable.

Site and soil evaluations are required for OWMS designs and reports, and they should be required for stormwater designs and reports too. The site assessors for wastewater and stormwater designs and reports may be different people.

Recommendation

For all on-site situations, the wastewater report and OWMS design shall take precedence over the stormwater design, and the former shall be made available to the stormwater assessor and designer.

6.3 The suitably qualified person

In general terms, a suitably qualified person (SQP) is "…a person who can adequately demonstrate relevant tertiary qualifications (or equivalent) and experience in a recognised field of knowledge, expertise or practice with direct relevance to the matter under consideration[10].

With respect to on-site wastewater matters, a SQP for on-site wastewater management in the field of "Site and soil evaluation (and land application system design)" includes and is restricted to: a civil or environmental engineer, a soil scientist, an environmental geologist or geoscientist, or an environmental health professional[11].

In the SB-SAP, a SQP for stormwater management is not defined. It is considered appropriate to adopt the definition in Clarence City Council's 2021 *Stormwater Management Procedure for New Development (Operational Procedure)*: a SQP is" "A professional engineer currently practising with relevant CPEng or RPEng or NER or RPEQ accreditation, or a person who in respect to the type of work to be undertaken can adequately demonstrate relevant academic qualification, suitable professional competency, and an appropriate level of professional indemnity and public liability insurance.

It follows that a SQP for on-site soil evaluation for wastewater is also qualified to undertake similar site and soil evaluation for stormwater, and the SQP for wastewater design is also qualified to undertake stormwater design. This could involve up to four different people if the site evaluator does not do system design. Clearly, it would be advantageous if one person did all. It is recognised that a SQP for stormwater management may not be a SQP for wastewater management, but the reverse is not necessarily true.

Recommendation

The SQP for site evaluation and system design for wastewater on a property should, wherever appropriate, also undertake site evaluation and system design for stormwater management. As soon as practicable, Sorell Council should liaise with other state authorities as appropriate to clarify regulations so that a SQP licenced for wastewater design is also licenced for stormwater design.

Recommendation

For new developments requiring both a wastewater report and a stormwater report, the wastewater report should be completed before the stormwater report, and it should be provided to the SQP compiling the stormwater report. The stormwater system shall be located downgradient or crossgradient to the wastewater system.

6.4 Council's Environmental Health Officer

The Environmental Health Officer (EHO) reviews site and soil evaluations and designs for OWMS in applications by proponents of new developments. A Plumbing Permit for installation is issued if the OSWMS is approved.

[10] Table 3.1 *Planning Terms and Definitions* in Section *3.0 Interpretation* in the *Administration* section of the Tasmanian Planning Scheme State Planning Provisions

[11] Part B – Plumbing work of the Tasmanian Director of Building Control's *Director's Determination – Certificates by Qualified Persons for an Assessable Item, 15 December 2021.* The engineering qualifications are "Licensed as an Engineer – Civil; **or** Registered on the NER as a Civil Engineer and has PI insurance; **or** Registered on the NER as an Environmental Engineer and has PI insurance."

The EHO may seek informal or formal clarification of aspects of any report from a SQP dealing with site and soil evaluation and system design. The EHO may request amendments to such a report before electing to approve it. The SQP may refuse to amend the report, or the proponent of the development may refuse to amend the type of development. The EHO may refuse a report.

A difficult situation can arise where for large houses on small lots not only is the SQP under pressure to come up with a suitable wastewater design, but the EHO is under pressure to approve it. An even more intractable situation may arise where construction is about to start, or has started, on a large house on a small property before a site and soil evaluation has been done, or before an OWMS has been approved.

Recommendation

Site and soil evaluations should be done by a SQP before building design.

6.5 Council's "Stormwater Officer"

Currently, Sorell Council's Plumbing Surveyor approves via a plumbing permit on-site stormwater absorption trenches. It is not clear whether the approved trenches formed part of a formal stormwater management plan (SWMP), or whether the plumbing surveyor is suitably experienced and/or qualified to assess soil infiltration capability and trench sizing.

Recommendation

Sorell Council should ensure that its employees assessing wastewater and stormwater applications are appropriately trained and skilled to do so, thus providing them with confidence to critically review substandard designs.

Recommendation

Separate SQPs involved in the design of OWMSs and OSWMSs should liaise closely to ensure that each has considered the design of the other in completing their design and they are both are satisfied that adequate consideration has been given to the combined demands of stormwater and wastewater on the site.

6.6 Wastewater management systems

6.6.1 Fundamentals of OWMSs

There are three fundamental aspects to consider for OWMSs for new developments:

- the daily volume of wastewater to be managed (and contained within property boundaries),
- the size of the LAA which will received the daily wastewater without failure, and
- the location of the LAA with respect to setbacks from sensitive features.

The daily wastewater volume for domestic-scale residential developments is determined by the number of bedrooms in the house. Rooms not designated on plans as bedrooms but which could be used as bedrooms (e.g. studies, rumpus rooms) are considered bedrooms. The number of bedrooms determines the number of persons. The house is assumed to be fully and permanently occupied. The volume of wastewater generated by a person is set out in AS/NZS 1547 and the Director's Guidelines as 120L/day or 150L/day depending on whether the house relies on rainwater tanks or a reticulated town water or pumped supply respectively. This approach is acceptable.

The size of the LAA is determined by the infiltration capability of the soil profile to receive the specified wastewater volume. The infiltration rate (measured in Litres per day per square metre; L/day/m^2) is called the Design Loading Rate (DLR) for trenches and beds, and the Design Irrigation Rate (DIR) for surface or shallow subsurface irrigation. Both vary depending on the soil type[12], soil depth, and degree of wastewater treatment. DLRs and DIRs for different soil types and wastewater treatment levels are specified in AS/NZS 1547.

The choice of DLR or DIR is sometimes critical, particularly for Category 5 and 6 clays, and this is acknowledged in the Notes accompanying Table L1 in AS/NZS 1547. For many clayey soils in Tasmania, experience has demonstrated that DLR's or DIR's of more than about 3L/day/m^2 are excessive, causing seasonal failure of the LAA.

6.6.2 Levels of wastewater treatment

Many OWMS for new developments involve secondary wastewater treatment (for example, in an aerated wastewater treatment system; AWTS) instead of primary treatment in a septic tank. The advantages of the former are more flexibility in the location of a LAA with respect to setback distances, lower human health risks if exposed, and less environmental effects.

On the other hand, some householders object to the chemical additives in some treatment systems, and to regular maintenance costs.

From the perspective of the SQP, designs for secondary treatment are usually (but not always) simpler than for primary treatment, and regulatory approval is usually more readily obtained (regulators prefer secondary treatment).

Recommendation

The level of wastewater treatment in an OWMS should be determined by the SQP in consultation with his or her client, having regard to site conditions and the proposed new development, and in accord with AS/NZS 1547 and the SB-SAP.

6.6.3 Land Application Areas for wastewater disposal

In the SB-SAP, the Land Application Area (LAA) is defined as "…an area of land used to apply effluent from a waste water treatment unit and reserved for future waste water application."

The Director's Guidelines definition is almost identical. The LAA is "… an area of land used to apply effluent from a wastewater treatment unit and reserved for future wastewater application (where required)".

AS/NZS 1547 does not define a "Land Application Area". However, its definition of a reserve area is "An area set aside for future use as a land application area to replace or extend the original land application system." It elaborates on this concept several times in the Standard. Allocating a reserve area is a risk management procedure, but it could be replaced by an "equivalent mitigation measure" (Section 5.5.3.4 of the Standard).

[12] There are six categories in AS/NZS 1547, from Category 1 "Gravels and sands", to Category 6 "Medium to heavy clays".

Section C5.5.3.4 states: "On small sites, it may not be possible to provide a reserve area" and leaves open the possibility of replacing an existing failing system on its own LAA without requiring a reserve area.

Recommendation
In the SB-SAP, the definition of a land application area should be: "the area wetted by effluent from a wastewater treatment unit applied to ground via trenches, beds, raised beds or irrigation. It excludes a reserve area."

Recommendation
Sorell Council should be flexible in requiring a reserve area be set aside for a new or upgraded OWMS, recognising that on some sites the reserve area is likely to be unnecessary and/or overly risk-averse.

6.6.4 Setback distances

Setback distances applied to a suitably-sized LAA are intended to mitigate on-site and off-site "adverse environmental impact or impact on public health" (SB-SAP S2.6.1). Setback distances should be based on site-specific risk assessment[13] (rather than prescriptive separation distances). This approach is adopted in the SB-SAP for properties zoned Low Density, Village or Local Business (mostly less than 1,500m^2 in area). AS/NZS 1547 uses the same approach, where Tables K1 and K2 provide general guidance, and Table R1 and R2 in Appendix R include prescriptive ranges for setbacks coupled with a risk assessment approach. On the other hand, Section 3 in the Director's Guidelines relating to Acceptable Solutions for LAAs contain specific setback distances irrespective of site conditions, but adopts a risk assessment approach for Performance Criteria.

Recommendation
In the Southern Beaches, the risk-based approach to setback distances adopted in the SB-SAP for lots smaller than 1,500m2 should be extended to all lots.

6.6.5 Recommendations from previous wastewater reports

Section 2 of the current report reviewed previous investigations and reports relating to wastewater and stormwater management in the Southern Beaches. Some of the recommendations from those reports and investigations remain valid, and should be adopted.

Recommendation
An outlet filter shall be fitted to all septic tanks in all new developments.

[13] In appropriate site conditions, and used wisely, the viral die-off technique is available to estimate setback distances for downgradient movement of subsurface wastewater from an LAA. See, for example, Cromer, W. C., Gardner, E. A. and Beavers, P. D. 2001. An improved viral die-off method for estimating setback distances. *Proceedings of On-site '01 Conference: Advancing On-site Wastewater Systems* by R.A. Patterson & M.J. Jones (Eds). Published by Lanfax Laboratories, Armidale ISBN 0-9579438-0-6, 400 pages. See also Cromer, W. C. 2013. A defensible way to estimate setback distances using Trench 3.0's viral die-off method.

Recommendation
New developments shall not be approved if their OWMS cannot comply with AS/NZS 1547, the Director's Guidelines, and/or the SB-SAP.

Recommendation
Council shall require existing failing and poorly performing OWMSs be upgraded or replaced in accordance with AS/NZS 1547, the Director's Guidelines, and/or the SB-SAP.

6.7 Stormwater management systems

6.7.1 Fundamentals of private on-site system design and location

For a typical residential property where stormwater must be retained on-site, management involves (a) collection of rain from hardstand runoff in one or more rainwater tanks to provide potable water, and (b) release of excess water from tanks overflowing during rain events to in-ground trench(es) or bed(s). The trench(es) or bed(s) are the stormwater land application system; SLAA).

Hardstand includes not only the roofs of dwellings, but any other impervious surface including concrete and bitumen driveways.

It is a mistake to assume (as most regulatory guidance does) that this simple method works all the time. It is obvious (and unavoidable) that there will be some combinations of rainfall intensity, frequency and duration (IFD), and storage capacity in the tank(s), so that the tank overflow rate exceeds the infiltration rate of the soil, and the trench(es) or bed(s) fail.

An acceptable approach to this problem is a compromise which accepts that failure will occur, but takes reasonable steps to minimise the number of times it does. This approach involves:

- installing sufficient tank capacity to meet:
  - potable water needs, and
  - a proportion of the stormwater volumes from the roof and other hardstand areas generated during <u>one</u> of an acceptable range of IFDs, and
- releasing from the tank or tanks excess stormwater in two ways:
  - having a small-diameter, permanently-open outlet halfway up a tank (or connected tanks) to slowly discharge stormwater <u>between</u> rain events to the SLAA, thus creating additional storage capacity in the tanks to accept all or part of the next rain event, and
  - permitting overflow from full tanks during rain events.

In both instances, the stormwater discharges via gravity (and/or from pumps collecting some of the runoff from driveways, etc) to appropriately-sized trenches or beds.

The size (absorptive or wetted area, m^2) of the trenches or beds in the SLAA is calculated by dividing (a) the selected and controllable daily volume (L/day) of stormwater slowly released from the tanks, by (b) the infiltration rate[14] (L/day/m^2) of the soil in the trench or bed. This sizing creates and maintains storage capacity in the trenches or beds for all or some of the overflow from full tanks during a rain event, thus reducing the risk of failure.

In determining sufficient tank capacity (first dot point above), site-specific IFD rain data from the Bureau of Meteorology is used to estimate the volume of rain produced for a given roof+hardstand area during a selected IFD event. Section B3.3(f) of the SNDP specifies that the stormwater design report must consider (among other things) the "Period of time that the site will be inundated by a 1% and 5% AEP event…" but the time period for any % AEP can be any length. Instead, in this report, a 5% AEP event is recommended as a reasonable compromise (Table 6.7.1).

Recommendation

In Sorell Council's SNDP, Section B3.3(c) should be changed from "Rainfall intensity and duration" to "Rainfall intensity and duration for a 5% AEP", and B3.3(f) should be deleted.

6.7.2 Stormwater reuse

Stormwater reuse means using stormwater retained in rainwater tanks to water garden and vegetable beds instead of, or in combination with, discharge to in-ground absorption trenches. This should be encouraged in the Southern Beaches, where relatively low rainfall means water for gardens is often at a premium. SQPs involved in designing private stormwater systems should include re-use designs, and Council assessors should favourably regard suitable designs.

Recommendation

Stormwater reuse including irrigation, watering of garden beds, etc. separate from or in conjunction with discharge to in-ground trenches, should be encouraged and be included as an alternative in stormwater designs by SQPs.

[14] The infiltration rate for stormwater to a soil profile should be similar to its permeability, measured in the field, on-site, using a constant head permeameter. Infiltration rates from similar soils at other sites, or in published literature, should not be used because of the wide range in permeabilities typically found.

Table 6.7.1. Stormwater volumes (m^3) generated from a range of hardstand areas (from $10m^2$ to $2000m^2$) for different rain durations (1 minute to 168 hours) of various rain depths at the 5% AEP frequency level. Each of the 5% AEP rain depths is the average of five locations in the Southern Beaches, and each has an equal, roughly 1 in 20 year chance of occurring.

Example 1: the red box shows that a house with a roof area of $200m^2$ generates $4.7m^3$ of stormwater after 23.3mm of rain falls over one hour. All of this volume would be retained in (say) a half-full 10,000L tank without overflow, but about half would overflow from a half-full 5,000L tank.

Example 2: the red column lists the range of increasing stormwater volumes which would be generated from $300m^2$ of hardstand for the full range of rain durations and 5% AEP depths. The hardstand could include, for example, $200m^2$ of roof and $100m^2$ of concrete driveway. Each of the stormwater volumes has an equal 1 in 20 year chance of occurring. In practice, it would be unreasonable for a landowner to be required to provide retention capacity for (say) the bottom half of volumes (these durations and rain depths would probably cause widespread soil saturation, runoff and flooding, making the whole concept of on-site stormwater management futile in such conditions).

		Stormwater volume (m^3)													
	5% AEP rain	Hardstand area (m^2)													
Duration	**mm**	**10**	**20**	**30**	**40**	**50**	**75**	**100**	**200**	**250**	**300**	**400**	**500**	**1000**	**2000**
1 min	2.36	0.02	0.05	0.07	0.09	0.12	0.18	0.24	0.47	0.59	0.71	0.94	1.18	2.36	4.72
2 min	3.75	0.04	0.08	0.11	0.15	0.19	0.28	0.38	0.75	0.94	1.1	1.5	1.9	3.8	7.5
3 min	5.07	0.05	0.10	0.15	0.20	0.25	0.38	0.51	1.0	1.3	1.5	2.0	2.5	5.1	10.1
4 min	6.24	0.06	0.12	0.19	0.25	0.31	0.47	0.62	1.2	1.6	1.9	2.5	3.1	6.2	12.5
5 min	7.26	0.07	0.15	0.22	0.29	0.36	0.54	0.73	1.5	1.8	2.2	2.9	3.6	7.3	14.5
10 min	10.94	0.11	0.22	0.33	0.44	0.55	0.82	1.1	2.2	2.7	3.3	4.4	5.5	10.9	22
15 min	13.34	0.13	0.27	0.40	0.53	0.67	1.0	1.3	2.7	3.3	4.0	5.3	6.7	13.3	27
20 min	15.12	0.15	0.30	0.45	0.60	0.76	1.1	1.5	3.0	3.8	4.5	6.0	7.6	15.1	30
25 min	16.58	0.17	0.33	0.50	0.66	0.83	1.2	1.7	3.3	4.1	5.0	6.6	8.3	16.6	33
30 min	17.82	0.18	0.36	0.53	0.71	0.89	1.3	1.8	3.6	4.5	5.3	7.1	8.9	17.8	36
45 min	20.8	0.21	0.42	0.63	0.83	1.0	1.6	2.1	4.2	5.2	6.3	8.3	10.4	21	42
1 hour	23.3	0.23	0.47	0.70	0.93	1.2	1.7	2.3	4.7	5.8	7.0	9.3	11.6	23	47
1.5 hour	27.3	0.27	0.55	0.82	1.1	1.4	2.0	2.7	5.5	6.8	8.2	10.9	13.7	27	55
2 hour	30.8	0.31	0.62	0.93	1.2	1.5	2.3	3.1	6.2	7.7	9.3	12.3	15.4	31	62
3 hour	36.9	0.37	0.74	1.1	1.5	1.8	2.8	3.7	7.4	9.2	11.1	14.8	18.5	37	74
4.5 hour	44.8	0.45	0.90	1.3	1.8	2.2	3.4	4.5	9.0	11.2	13.4	17.9	22	45	90
6 hour	51.6	0.52	1.0	1.5	2.1	2.6	3.9	5.2	10.3	12.9	15.5	21	26	52	103
9 hour	63.1	0.63	1.3	1.9	2.5	3.2	4.7	6.3	12.6	15.8	18.9	25	32	63	126
12 hour	72.6	0.73	1.5	2.2	2.9	3.6	5.4	7.3	14.5	18.2	22	29	36	73	145
18 hour	87.4	0.87	1.7	2.6	3.5	4.4	6.6	8.7	17.5	22	26	35	44	87	175
24 hour	98.3	0.98	2.0	2.9	3.9	4.9	7.4	9.8	19.7	25	29	39	49	98	197
30 hour	107	1.1	2.1	3.2	4.3	5.3	8.0	10.7	21	27	32	43	53	107	213
36 hour	113	1.1	2.3	3.4	4.5	5.7	8.5	11.3	23	28	34	45	57	113	226
48 hour	122	1.2	2.4	3.7	4.9	6.1	9.2	12.2	24	31	37	49	61	122	244
72 hour	131	1.3	2.6	3.9	5.3	6.6	9.9	13.1	26	33	39	53	66	131	263
96 hour	135	1.4	2.7	4.1	5.4	6.8	10.1	13.5	27	34	41	54	68	135	270
120 hour	137	1.4	2.7	4.1	5.5	6.8	10.3	13.7	27	34	41	55	68	137	274
144 hour	137	1.4	2.7	4.1	5.5	6.9	10.3	13.7	27	34	41	55	69	137	275
168 hour	137	1.4	2.7	4.1	5.5	6.9	10.3	13.7	27	34	41	55	69	137	275

Notes

AEP = Annual Exceedance Probability

5% AEP rain = 5% AEP rain averaged for central parts of Lewisham, Dodges Ferry, Carlton, Primrose Sands and Connellys Marsh

5% AEP rain for the five locations from Bureau of Meteorology Design Rainfall Data System (2016)

6.7.3 Stormwater discharge from coastal properties

Discharging to natural watercourses includes discharging to creeks and the coast.

All coastal land in the Southern Beaches is owned and administered by the Department of Natural Resources and Environment (NRE). All lots with coastal frontages, and there are hundreds, discharge stormwater over NRE land. This situation avoids pumping stormwater to upslope public mains or open table drains and at the same time alleviates hydraulic capacity pressure on the existing public system.

6.7.4 Uncontrolled stormwater discharge over land in landslide hazard bands

Landslide hazard bands[15] in the Southern Beaches occur on sloping land and are scattered throughout the district (Figure 5.2.2.2). They are common on relatively steep coastal slopes at Lewisham, on Tiger and Spectacle Heads, behind Carlton Beach, on Carlton Bluff, and around Renard and Primrose Points at Primrose Sands. Uncontrolled stormwater discharge onto land in a landslide hazard band may increase the risk of slope instability.

Recommendation

Any stormwater from a public system or private system discharging in an uncontrolled manner over land in a coastal landslide hazard band shall be controlled (piped) over the hazard band, unless the geotechnical risk in not doing so is stated to be acceptable in a report prepared by a SQP in landslide risk assessment.

6.8 Flowchart for improving wastewater and stormwater management

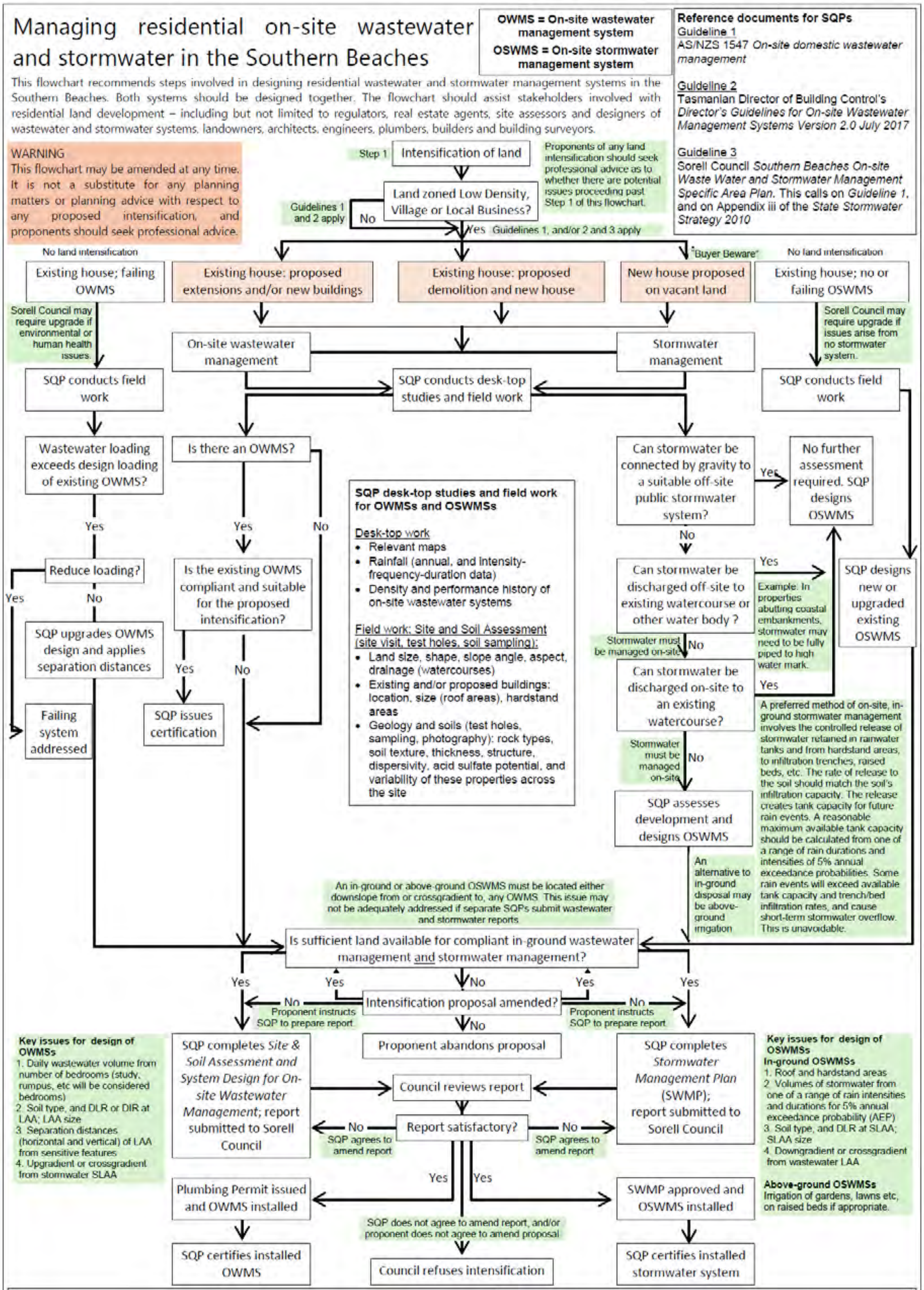
The flowchart in Figure 6.8 addresses all the recommendations in the preceding Sections. It is intended that it be adopted by all stakeholders as a guiding document for improved wastewater and stormwater management in the Southern Beaches. The stakeholders specifically include:

- existing landowners who propose no new developments on their properties but may have failing wastewater or stormwater systems;
- existing landowners who propose new developments – especially those like new bedrooms or similar rooms that increase the volume of wastewater generated, and which may require a site inspection and redesign of existing OWMSs or stormwater systems;
- real estate agents selling land in the Southern Beaches – particularly relatively small lots with or without houses on them. The agents should be aware by using the flowchart that the small lot size may limit the type and scale of any new development, and that some intended developments may not be approved because of restrictions on wastewater and/or stormwater management;

[15] Landslide hazard bands are planning overlays that divide Tasmania's landscape into five hazard bands: Acceptable, Low, Medium, Medium-Active and High – based on known landslide evidence and susceptibility, geology and slope angle. In the Southern Beaches, Low and Medium bands exist. In a Low band, no known landslides exist, but the area is identified as being susceptible to landslides by Mineral Resources Tasmania. Controls on development may be necessary to reduce risks. In a Medium band, there are also no known landslides, or the area is within a susceptible zone, or legislative controls on development are in place to limit disturbance of adjacent unstable areas. See Kain et al (2024). Landslide Planning Map Update 2024 Technical Report. Mineral Resources Tasmania and the Department of Premier and Cabinet, October 2024.

- purchasers of land (with or without existing houses), particularly of relatively small lots, for the same reasons as in the previous dot point,
- designers, architects, builders, building surveyors etc involved with proposed new developments; these stakeholders should use the flowchart to be able to inform their clients whether on-site wastewater and/or stormwater management may be a problem, and whether SQPs should be consulted, and
- Sorell Council: the flowchart should be included on Council's website as advice to stakeholders; enquirers to Council relating to land purchase and/or new developments should be informed of the existence of the flowchart.

Recommendation
The flowchart in Figure 6.8 shall be adopted as a formal guiding document by Sorell Council for improving wastewater and stormwater management in the Southern Beaches.



This flowchart forms part of Whitehead, J. H., Cromer, W. C. and Mason, R. (2025). *Southern Beaches On-site Wastewater and Stormwater Strategy*. Unpublished report for Sorell Council. 15 July 2025

Recommended definitions

Suitably qualified person

A suitably qualified person (SQP) is a person who can adequately demonstrate relevant qualifications, experience, expertise or practice in undertaking either or both (a) OWMS design in accordance with AS/NZS 1547, and (b) OSWMS design. An SQP must be engaged for each of wastewater and stormwater assessment and management. It may (and preferably should) be the same person.

Intensification is development, usually requiring regulatory approval. With respect to wastewater it means an increase in the number of persons occupying or potentially occupying a residential dwelling, or an increase in the number of persons visiting or working at a business premises. **Intensification** with respect to stormwater means an increase in the roof area of one or more buildings, and/or an increase in the area of other hardstand surfaces.

A **land application area** (LAA) means an area of land used to apply treated wastewater.

A **stormwater land application area** (SLAA) means an area of land used to apply stormwater.

Design Loading Rate (DLR) or **Design Irrigation Rate** (DIR) is the rate at which wastewater is applied to an LAA. Both are based on soil type and are measured in Litres per day per square metre (L/day/m²). The DLR and DIR are usually lower than the application rate of in-ground or above-ground stormwater.

7.0 Southern Beaches On-site Wastewater and Stormwater Management Special Area Plan

7.1 Background

The SB-SAP was adopted to ensure a minimum level of provision for appropriately sized OWMSs and SLAAs, for developments in areas of high lot density.

Consideration of previous planning codes relating to OSWMs is provided to ensure context of the current SB-SAP.

The SB-SAP is the successor to former Code E23.0 *On-Site Wastewater Management Code* (Code E23) of the Sorell Interim Planning Scheme 2015 and prior to that, Schedule 12 *Criteria for On-Site Wastewater Management Systems,* Sorell Planning Scheme 1993 (Schedule 12).

Schedule 12 was adopted as an interim measure, in the light of the Strategic Plan for Managing Southern Beaches Wastewater 2006 by CEE, which envisaged the near-future implementation of a sewerage scheme servicing the Southern Beaches locale, after which Schedule 12 would become redundant.

Following the migration from Councils of responsibility for water and sewerage under the Water and Sewerage Industry Act 2008, consistent advice from Southern Water and its successor TasWater is that sewerage in the Southern Beaches area does not feature in its multi-decadal strategic plan.

Given that no off-site, centralised option is available for addressing continuing local environmental health impacts from OWMSs, responsibility devolves to Council and the local community to minimise such impacts into the future.

The replacement of Schedule 12 with Code E23 and E23 with the SB-SAP were involuntary requirements imposed by State-level regulatory changes to Planning Schemes (i.e. Interim Planning Scheme and then the Tasmanian Planning Scheme), it is therefore considered beneficial to review not just the operation of the SB-SAP, but also both predecessor documents in detail to identify the historic utility (or otherwise) of various provisions.

7.2 Schedule 12 - Sorell Planning Scheme 1993

7.2.1 Historical context

Schedule 12 had no preamble to specify its intent or purpose.

It was the first Planning Scheme provision in Tasmania to include detailed requirements for the sizing and location of OSWMSs for all unsewered developments which required a Planning Permit.

In common with most planning scheme components at the time, Schedule 12 was largely a prescriptive regulatory document.

Prior to Schedule 12, the Sorell Planning Scheme in common with all others simply required that applicants demonstrate that any proposed development could be provided with a suitable septic tank or other OWMS.

This led to frequent conflict at Planning Application stage, where no clear guidelines with regard to on-OWMSs were available to assist either developers or regulators; the then AS/NZS 1547.2000 had little to no official status within either LUPA/EMPCA or the contemporary Tasmanian Building and Plumbing regulations.

The adoption of Schedule 12 into the Planning Scheme followed recommendations in Part 3 of the *Dodges Ferry Catchment Management & Groundwater Monitoring Programme (1998-2004)* to the effect that:

- all new developments be serviced by on-site wastewater systems designed to comply with AS/NZS 1547:2000* and the Tasmanian Code of Practice;
- new developments not be approved if they cannot comply with the above design codes;
- Council consider community systems designed to treat wastewater to a high level (by use of fabric filters, recirculating sand or gravel filters and membranes) as appropriate alternatives to individual OWMSs, where they are satisfied that the managing agency can provide them with a satisfactory long-term management plan for the community system;
- all new OWMSs be fitted with a septic tank outlet filter; and
- Council require failing and poorly performing OWMSs be upgraded or replaced in accordance with the expectations of the above design codes.
- Following regulatory changes under the Building Act, Plumbing Regulations and the then Tasmanian Plumbing Code, compliance with AS/NZS 1547:2000 became the default design requirement, thus requiring no further action by Council.

Schedule 12 introduced several new concepts for consideration in on-site wastewater management design and regulation. These are discussed the following Sections.

7.2.2 Section 12.2 of Schedule 12

The Hierarchy of Waste Management was applied, based on the 1979 Ladder of Lansink principles adopted by the Tasmanian Environment Protection Authority and other State and Federal Regulatory authorities. In practice this set out a preference in descending order, for composting toilets, the use of treated effluent for toilet flushing, secondary treated effluent irrigation, secondary treatment of effluent and finally, discharge of effluents to inground absorption systems.

7.2.3 Section 12.3 of Schedule 12

The definition of OWMS land areas was to include a land application area of sufficient size to accommodate the physical dimensions of effluent absorption structures with a 1-metre-wide all-around buffer, plus provision the on-site wastewater treatment unit (septic tank or AWTS).

The minimum sizing of OSWM land management areas was to be calculated per-bedroom based on the predominant soil category (as per AS/NZS 1547) in the upper 1.5m of the soil profile.

There was a permitted reduction in OSWM land management area sizing requirements where a secondary treatment system was proposed.

7.2.4 Section 12.4 of Schedule 12

This clause required developers to consider both risk and consequences of failure of an on-site wastewater management system, including demonstrating a feasible means of rectifying any such failure. Issues of consequence would include off-site runoff of effluent into proximate roadside drains, public areas or nearby residencies.

7.2.5 Section 12.5 of Schedule 12

Provision of a range (Prohibited, Discretionary and Permitted) of minimum horizontal separations (i.e. setback distances) of OSWM land management areas from sensitive features, such as surface water, property boundaries and buildings.

Where an OSWM land management area setback distance fell within the Discretionary range from a sensitive feature, guidance was provided on factors relevant for determining appropriate setback distances, including (but not limited to) the following:

- Slope;
- Soil permeability;
- Soil profile;
- Groundwater characteristics;
- Nature of downslope land – e.g. bushland, pasture, hard stands, excavations etc.;
- Protected Environmental Values (PEVs) of downslope water – e.g. potable, agriculture, aquaculture, industrial, aquatic ecosystems;
- Land stability; and
- Sensitive features – e.g. swimming pools, water bores, surface and sub-surface drains, land use etc.

7.2.6 Section 12.7 of Schedule 12

Apartments and multiple buildings using OSWMs were limited to a maximum density of 1 bedroom per 500m^2 of site area, effectively precluding such developments on the small lots typical of most subdivisions in the Southern Beaches area.

There was general prohibition of construction of structures, driveways or similar over or in close proximity to land application areas.

Intensification of site use (e.g. additional bedrooms, additions or relevant activities) capable of increasing potential wastewater loadings required assessment and if necessary, system improvements.

There was prohibition of works which added to building footprints where the works might compromise the size and location of LAAs.

7.2.7 Section 12.8 of Schedule 12

This Section provided specific criteria for development, requiring applicants to demonstrate soil profile suitability, ground water protection, landslide risk management, protection of surface waters, dispersive soils management, site drainage capability and flood risk management.

If the necessary measures were not satisfied, the development was defined as Prohibited as per Clause 3.2 of the Planning Scheme.

7.2.8 Advantages and disadvantages of Schedule 12

7.2.8.1 Advantages of Schedule 12

- Advantages of Schedule 12 were:
- The requirement for the reservation of minimum per-bedroom land application area for new buildings was particularly effective in reducing building and driveway footprints on smaller sites with poorly permeable soils (i.e. Category 5 and 6 clays, or areas with shallow bedrock).

- Some sites were unable to be developed; however, these were relatively few, were mainly limited to lots which were well-known as problem sites and which had historically been refused permits to install OWMSs, due to known site and soil capability issues.
- Schedule 12 benefited both Council and developers by provided an improved level of formal guidance as to on-site wastewater management requirements and considerations, resulting in an increased level of confidence amongst developers that compliant proposals would receive council approval; there was also a corresponding reduction in costly planning appeals.

7.2.8.2 Disadvantages of Schedule 12

Disadvantages of Schedule 12 were:

- Schedule 12 made several wide-ranging requirements and statements of principle. In practice, however, observance of these was largely limited to reservation of appropriately sized LAAs and horizontal setback distances from vulnerable features (watercourses, boundaries and buildings).
- Without specific criteria to determine appropriate horizontal setbacks within the discretionary ranges (i.e. 20-50m to surface water, 5-50m to boundaries and 1-5m to buildings) designers almost always defaulted to the minimum setback, rather than applying a value within the discretionary range and implementing risk assessment to justify the selected distance. Designers rarely gave any consideration to issues such as water quality protected environmental values in nearby surface water, or sensitive features across downslope boundaries, unless required to do so by Council. Council could question the use of minimum setbacks and require these to be increased, but in practice this rarely occurred and minimum setbacks became default setbacks.
- Beyond soil profile suitability and presence of groundwater, consideration by developers of Specific Criteria for Development as also required by Schedule 12 was haphazard. For example, in the absence of flood and landslide mapping, matters such as flooding and slope stability were rarely assessed, unless prompted to do so by Council.
- Similarly, potential impacts of on-site wastewater management on soils and vegetation, or on off-site surface waters, were, in practice not considered by most developers.
- The focus of Schedule 12 was to improve provision of on-site wastewater management for single lots and in new subdivisions, minimising off-site impacts from potential failures.
- While improvement to design and siting of individual OWMSs would likely see a reduction in broadscale off-site impacts due to failed or poorly performing OWMSs, this was not an overtly stated intention of this provision. It was not clearly linked to any other overarching strategy to address diffuse off-site impacts, such as Council's prior *Dodges Ferry Catchment Management & Groundwater Monitoring Programme* (1998-2004).

7.3 E23.0 On-site Wastewater Code ("Code E23.0")

7.3.1 Historical context

Schedule 12 was replaced by Code E23.0 under the Sorell Interim Planning Scheme 2015. The intent pf Code E23.0 was similar to that of Schedule 12, but it differed fundamentally in that it was written as a Performance Based code rather than a prescriptive provision, to be consistent with the overall format of the Interim Planning Scheme 2015.

Code E23.0 was adopted in most Council Interim Planning Schemes in the Southern Region of the State.

The stated Purpose of Code E23.0 was to "*ensure that development or use requiring on-site wastewater management will have access to sufficient land area necessary for the satisfactory and sustainable on-site treatment of that wastewater*."

The Code applied to both residential and non-residential development (where wastewater is domestic in nature), including both subdivision and building works, where, broadly speaking, lot areas were less than 5,000m^2, less than 3m AHD or could not accommodate a 50m diameter circle.

Code E23.0 did not apply to or consider management of stormwater.

Acceptable Solutions and Performance Criteria were provided as means of compliance with the various Code objectives.

Code E23.0 retained the concept of sizing of land application areas based on number of bedrooms and with setbacks from limiting, vulnerable or protected features such as buildings, boundaries, surface water, limiting layers, groundwater and water bores.

Setback distances from such features provided in both the Acceptable Solutions and Performance Criteria were derived in large part, from interpretation of Code R of AS/NZS 1547:2012.

The Code provided for reduced setback distances from limiting, vulnerable or protected features where effluent was treated to secondary standard, where the site was not affected by high rainfall, steep slopes and nearby surface water or groundwater was not of high resource or environmental value.

Code E23.0 was intended to have been revised and updated in the light of operational experience with its implementation, approximately 12 months after first coming into force, (2016-2017). However, the revision was abandoned in the light of provisions contained in S9 Building Act 2016 which basically state that no conditions relating to the technical requirements of the design or construction of a building, building work or plumbing work can be imposed on a permit issued under the *Land Use Planning and Approvals Act 1993*, without Ministerial approval.

In the light of this regulatory restriction, the principal features of Code E23.0 are no longer regulated by any planning scheme provision. Instead, they were incorporated into the Director's Guidelines, applying to Plumbing Permit applications to OWMSs.

7.3.2 Advantages and disadvantages of Code E23.0

7.3.2.1 Advantages of E23.0

Advantages of E23.0 were:

- Code E23.0 retained the requirement for minimum land application area sizing on a per-bedroom basis as an Acceptable Solution, and it provided compliance with land application area sizing requirements as per AS/NZS 1547 as a Performance Criterion and inevitably, most OWMS designs used the Performance Criteria and called up AS/NZS 1547.2012 sizing requirements as a default approach.
- Code E23.0 provided a more sophisticated method of determining minimum setback distances from downslope vulnerable features, such as boundaries, surface water, groundwater, limiting layers and

buildings, based on a combination of slope (where applicable) and level of treatment (i.e. primary or secondary).

- As a performance-based Code, it provided an opportunity for developers to select from an Acceptable Solution or use of Performance Criteria for sizing and location of LAAs for OWMSs.
- Designs consistent with the Acceptable Solution would meet the Performance Requirements of the Code. Where a design relies upon Performance Criteria, it was considered to be consistent with the operation of the Interim Planning Scheme that a level of discretion is provided to Council in the acceptance (or not) of the proposal. Despite this, however, it was very rare for a Council to refuse or require significant amendment of a proposed OWMS which relied upon the exercise of such discretion.

7.3.2.2 Disadvantages of E23.0

Disadvantages of E23.0 were:

- Several of the Performance Criteria provisions were essentially prescriptive in nature and relied on the drafters' own interpretations of Appendix R of AS/NZS 1547.2012 (a notoriously complicated provision). This was later addressed in the Director's Guidelines, which effectively replaced Code E23.0 in the transition to the Statewide Planning Scheme.
- Code E23.0 was essentially a regional provision adopted under the Interim Planning Scheme; as such it provided no opportunity to address issues of specific concern to Sorell Council.
- Similar to Schedule 12, the primary focus of Code E23.0 was to ensure adequate sizing and appropriately location of OWMS land application areas for developments on single lots and in new subdivisions; it did not provide any overt strategy for addressing catchment-wide issues arising from high densities of on-site wastewater management systems on sub-minimal lots.

7.4 Sorell LPS - SOR-S2.0 Southern Beaches On-site Waste Water and Stormwater Management Specific Area Plan (SB-SAP)

7.4.1 Purpose of the SB-SAP

The SB-SAP was adopted as part of Local Provisions Schedule in the Sorell – Tasmanian Planning Scheme.

Like its predecessor E23.0, it is intended as a Performance-Based provision, where a development may meet Acceptable Solutions, and where non-compliance triggers the use of Performance Criteria to determine on-site wastewater management requirements.

The SB-SAP also provides for both Acceptable Solution and Performance Criteria with regard to on-site stormwater management (OSWMS) requirements and replaces the former Interim Planning Scheme Code E7.*0 Stormwater Management Code*.

7.4.2 Use and Development standards in the SB-SAP

The SB-SAP provides use/development standards for on-site wastewater management and on-site stormwater management in four situations:

- avoiding adverse environmental health impacts from change of use, expansion, or intensification of residential or business use and requirements to ensure sufficient suitably located land area for the installation of an OWMS

- ensuring that a development site has suitable and sufficient land area for OWMSs to service the proposed development, having regard to potential site limitations such as topography, soil permeability constraints, site configuration, build-out, landscaping, access and parking, private open space and potential environmental impacts on water, air quality, acoustic environment etc.
- ensuring that outbuildings, driveways, parking areas do not encroach onto existing land application areas or if so, that there is sufficient suitable area to install a new OWMS,
- where a development cannot be connected to a public stormwater system, it is required to be capable of accommodating an OSWMS which is adequate with regard to several considerations, including topography, site configuration, soil profile, existing buildings etc, impervious surfaces, watercourses on the land, stormwater quality and volume targets, and advice on groundwater, inundation risk, land stability or coastal erosion.

7.4.3 Advantages and disadvantages of the SB-SAP

7.4.3.1 Advantages of the SB-SAP

Advantages of SB-SAP were:

- The SB-SAP was carefully drafted to avoid including any technical criteria which could potentially fall into non-compliance with the general prohibition on including technical provisions in a Planning Scheme or Code, without Ministerial consent as per S9 Building Act 2016.
- This has made the SB-SAP provisions rather vague and something of a collection of non-specific motherhood statements. However, there is a general understanding that a site and soil evaluation and OWMS design report and OSWMS design report compliant with Building Act requirements will generally satisfy the Performance Requirement provisions of the SB-SAP. This works quite smoothly because in almost all cases developers provide full documentation to ensure an integrated Development and Building Approval process.
- Importantly, it reduces recurrences of the pre-Schedule 12 situation where developers could apply for a Planning Permit for a development but the Permit could not subsequently be issued with the relevant Plumbing Permit due to non-compliance with on-site wastewater management or on-site stormwater management requirements.

7.4.3.2 Disadvantages of the SB-SAP with respect to wastewater management

Like Schedule 12 and Code E23.0, the primary focus of the SB-SAP is to improve provision of on-site wastewater management for developments on single lots and in new subdivisions. However, it does not provide or form part of a clear strategy for addressing catchment-wide issues arising from high densities of OWMSs on sub-minimal lots.

The *Dodges Ferry Catchment Management & Groundwater Monitoring Programme (1998-2004)* identified likely contamination of Council stormwater drainage systems by faecal/wastewater contaminants from OWMSs, particularly following rainfall, with likely impacts on receiving waters, which are recreational waters, highly valued by the local community.

Council has historically recommended the exercise of caution following periods of heavy rain and against swimming or other primary contact recreation at beaches around Dodges Ferry, Lewisham and more recently the northern end of Primrose Sands Beach where testing has identified the presence of human faecally derived bacteria.

The most likely route of wastewater contaminants from failing OWMSs is via overland flow (or by surreptitious direct connection by landowners) to stormwater drains. Overland flow is more likely to occur with failing traditional septic tank systems. The discharge is likely to be a highly contaminated wastewater stream with E. coli levels at source in the 10^5-10^6 cfu/100m range, presenting a significant downstream risk to public health upon discharge to a receiving water, or when lying exposed in a publicly accessible stormwater system.

These systems are essentially unmanaged; there is no system of monitoring to provide warning to Council of failure and off-site discharge from either traditional septic tank systems or passive secondary treatment systems[16].

Secondary treatment systems such as AWTS and associated LAAs are less likely to suffer failure and off-site discharge. In the event of discharge, they present a lower risk to public health if correctly managed and maintained and final effluent is disinfected. Disinfected AWTS effluents, when treated to accreditation specification will typically reduce E. coli loadings (and hence other pathogens) by a factor of 99.99% (a 4-log reduction) from a raw effluent containing 10^5 cfu/100mL.

Passive secondary treatment systems, although undisinfected, can be expected to reduce E. coli levels from raw effluent to 10^2-10^3 cfu/100mL (a 3-log reduction) through physical filtration by the filter sand and biomat. Amending the SB-SAP to require the installation of secondary treatment systems in new developments, or existing developments with significant intensification prior to application to land, would reduce the risk of off-site discharges to stormwater, and also significantly reduce the impacts of such discharges.

Recommendation
Table SOR-2.6.1 in the SB-SAP is revised to ensure secondary treatment for new developments and or significant intensifications of existing uses

AWTS systems are monitored and serviced on a 3-monthly to 6-monthly basis by an independent service provider, who reports on the system to Council. Reporting includes LAA failures and/or off-site discharges, enabling Council to require necessary rectification works.

Passive secondary treatment systems are unmonitored, however given that in practice in-ground installations would mainly occur in deep sands, risk of failure and overland flow is considered to be acceptably low.

7.4.3.3 Disadvantages of the SB-SAP with respect to stormwater management

The SB-SAP provides objectives for both on-site wastewater management and on-site stormwater management, but it fails to recognise that in the absence of a public stormwater system (as per Clause S2.7.2A1), not only wastewater but also stormwater will be managed within the same property, resulting in potential for conflicting requirements and competition for limited suitable land area.

For example, the requirements of the Director's Guidelines for OWMSs (which calls on Appendix R of AS/NZS 1547.2012) will frequently require a significant separation of the LAA from downslope boundaries. This provides an opportunity for siting a SLAA downslope of the LAA, but overcrowding of the two absorption areas may cause hydraulic overloading of soil profiles, particularly in duplex soils, resulting in linear loading failure of one or both systems.

[16] Passive secondary treatment systems include, for example, the Advanced Enviro-Septic (AES) and the Elgin systems.

Recommendation
Table SOR-S2.7.1 in the SB-SAP is amended so that Clause A1 is consistent with corresponding provisions in the Director's Guidelines, and that Clause P1 is revised to include consideration of on-site stormwater management

Another example is the potential for undesirable off-site impacts, or interactions (Clause S2.7.2 does not recognise or address this issue). A situation may arise where a SLAA on a steeply-sloping property may be installed close to its lower boundary, and buildings and land on the adjoining lower property may be affected by subsurface seepages, or (if a system is failing) by overland flow.

Finally, parts of Clause SOR-S2.7.1 A1 are inconsistent with the corresponding provisions of the Director's Guidelines.

Recommendations in this Section to change aspects of SB-SAP are highlighted in Tables 7.4.3.1(a) – 7.4.3.1(c).

Recommendation
Table SOR-S2.7.2 Clause P1 in the SB-SAP is revised to include consideration of requirements for on-site wastewater management in addition to stormwater management

7.5 Additional considerations for managing OWMSs

Amendments to SB-SAP in Tables 7.4.3.1 (a) – 7.4.2.1 (c) only address potential discharges from on-site wastewater management systems subject to the requirements of Development Applications under LUPA and the TPS.

The SB-SAP cannot provide any controls on the installation of new OWMSs where no development subject to DA requirements is proposed, such as replacing a failed OWMS.

The SB-SAP comprises an area where approximately 80% of properties have been developed (visual estimation from aerial photo observation), and it follows that the proposed controls on installing OWMSs will not effectively address issues with existing developed sites, if installation of new primary treatment systems is permitted to continue.

Table 7.4.3.1(a). Recommended amendments (highlighted in yellow) to Section SOR-S2.6.1 of the SB-SAP to ensure secondary wastewater treatment for new developments and or significant intensifications of existing uses

Objective:	That on-site waste water management for residential or business use does not cause any adverse environmental impact or impact on public health.
Acceptable Solutions	Performance Criteria
A1 No change, expansion or intensification of residential business use on the site.	**P1** The change, expansion or intensification of a residential or business use on the site does not cause any adverse environmental impact or impact on public health, having regard to: (a) the extent and nature of the land available on the property to accommodate an on-site waste water management system (including the land application area) for the proposed development; and (b) the land application area is setback a sufficient distance from watercourses, property boundaries and groundwater.
A2 Wastewater is to be treated to secondary standard.	**P2** There is no change, expansion or intensification of a residential or business use; or the change, expansion or intensification is minor in nature, comprising the addition of no more than one bedroom or equivalent and/or the addition of no more than 25% building footprint or hard surface, including building additions, outbuildings, decks, patios, driveways etc, subject to P1(a) above.

Accordingly, Council should consider developing a policy to minimise or effectively prohibit installation of new primary treatment systems as replacements for existing failed systems. Such a policy could then provide clear guidance to Council's EHOs when deciding to issue or withhold written consent for a new OWMS for the purposes of Building Regulation 37(5). This policy direction also avoids possible accusations of arbitrary decision making by Council's EHOs.

Given that a large proportion (likely significantly exceeding 60%) of existing OWMSs within the SB-SAP area are septic tank/primary treatment systems (along with some septic tank/passive secondary treatment systems) – all of which are unmanaged and not subject to any routine monitoring – Council may wish to consider implementing a policy of undertaking periodic inspections of all known septic tank systems located within the SB-SAP area, ensuring that each lot/house site is visited at least once every three years. Inspection requirements would be fairly narrow in scope, being limited to checks for evidence of system failure and overland/surface flows and whether these appear to be discharging off-site.

Table 7.4.3.1(b). Recommended amendments (highlighted in yellow) to Section SOR-S2.7.1 of the SB-SAP to minimise conflict between on-site wastewater management and on-site stormwater management and that provision is to be made for access to OWMSs to allow for future maintenance, repair or improvements:

Objective:	That the site has a sufficient and suitable area of land available for on-site waste water management.
Acceptable Solutions	Performance Criteria
A1 Development must: (a) not cover more than 20% of the site; (b) not be located on land shown on an overlay map in the relevant Local Provisions Schedule, as within: (i) a flood-prone hazard area; (ii) a landslip hazard area; (iii) a coastal erosion hazard area; (iv) a waterway and coastal protection area; or (v) a coastal inundation hazard area; (c) be located on a site with a natural soil depth c at least 1.5m; (d) be located on a site where the average ~~gradient~~ slope of the land does not exceed ~~10%~~ 5°; and (e) in the case of a dwelling, provide ~~65m²~~ 90m² land for wastewater land application area per bedroor	**P1** The site must provide sufficient area and be appropriately configured for management of on-site waste water, having regard to: (a) the topography of the site; (b) the capacity of the site to absorb wastewater; (c) the size and shape of the site; (d) the existing buildings and any constraints imposed by existing development; (e) the area of the site to be covered by the proposed development; (f) the ability to access those areas of the site to enable future repair, maintenance or improvements tc the on-site wastewater management system; (g) any on-site stormwater management system, including those on adjoining land; (h) the provision for landscaping, vehicle parking driveways and private open space; (i) any adverse impacts on the quality of ground surface and coastal waters; (j) any adverse environmental impact on surrounding properties and the locality; and

which is located at least 1.5m from an upslope or side slope boundary and ~~5m~~ 6.5m from a downslope boundary.	(k) any written advice from a suitably qualified person (on-site waste water management) about the adequacy of the on-site waste water management system.
A2 An outbuilding, driveway or parking area or addition o alteration to a building must not encroach onto an existing land application area.	**P2** An outbuilding, driveway or parking area or addition o alteration to a building must demonstrate that there is sufficient suitable area of land available for a new on-site waste water management system.

Council could choose to finance such a programme from existing revenues. Alternatively, an additional rate could be levied on all properties known to host an OWMS which is not a monitored/maintained AWTS unit. This work could be undertaken by a Council employee or a part-time contractor provided with suitable authorisations under S20A Local Government Act or similar.

Table 7.4.3.1(c). Recommended amendments (highlighted in yellow) to Section SOR-S2.7.2 of the SB-SAP to minimise conflict between on-site wastewater management and on-site stormwater management and that provision is to be made for access to OWMSs to allow for future maintenance, repair or improvements:

Objective:	That development provides for adequate on-site stormwater management.
Acceptable Solutions	Performance Criteria
A1 Development must be capable of connecting by gravi to a public stormwater system.	**P1** Development must be capable of accommodating an on-site stormwater management system adequate fo the development, having regard to: (a) topography of the site; (b) the size and shape of the site; (c) soil conditions; (d) any existing buildings and any constraints imposed by existing development on the site; (e) any area of the site covered by impervious surfaces; (f) any on-site wastewater management system including those on adjoining land; (g) any watercourses on the land;

	(h) stormwater quality and quantity manageme targets identified in the State Stormwater Strategy 201 and (i) any advice from a suitably qualified person the seasonal water table at the site, risks of inundatio land instability or coastal erosion.

8.0 On-site wastewater in the commercial area of Dodges Ferry

8.1 Overview

The commercial centre of Dodges Ferry lies on Carton Beach Road near the junctions with Lukeekah Street, Signal Hill Road and Webb Street. The commercial centre comprises a number of shops and other businesses which provide essential services to the community. In common with the rest of the Southern Beaches study area, premises in the commercial centre are serviced by on-site wastewater systems. The commercial centre is shown in Figure 8.1.

Figure 8.1 Dodges Ferry commercial centre
Source: www.thelist.tas.go.au

Over the years, as individual businesses and the commercial centre as a whole have grown, the demands on their wastewater systems has grown. Several systems are, most likely, the original systems installed to service the premises when first built, others will have been altered or expanded to provide increased capacity as premises have grown, and some have been replaced with more modern systems in recent years. Nevertheless, all systems are constrained by limited space on individual lots, particularly where the commercial function puts pressure on available space and land has to be given over to other functions, for example parking. Some systems are of domestic type or size yet are subject to non-domestic or commercial wastewater loads, particularly those at food premises. Consequently, treatment systems are often of limited size, are located in relatively less accessible locations on the lots which may impede access and ease of servicing, or are buried or partially buried beneath other infrastructure, and land application areas are typically relatively small or difficult to access.

On-site wastewater provision is limited and some systems are at or beyond their ideal capacity. Many systems are old and undersized by current standards and few systems have any capacity for growth should the demands placed on them increase due to increased usage or patronage of the premises they serve.

This review has not comprised a detailed audit of individual systems, but it is recommended that a detailed audit of individual systems be undertaken to provide baseline data for subsequent review of the on-site wastewater provision in the Dodges Ferry commercial area. Such a review should comprise collation of all Council held data on historically installed systems and subsequent modification to systems, records of inspections and identified problems or complaints, and identification of data gaps where Council records are not complete.

Recommendation
A detailed audit of individual systems be undertaken to provide baseline data for subsequent review of the onsite wastewater provision in the Dodges Ferry commercial area.

This should be followed by individual system inspections to identify the current status and capacity of systems and meetings with property owners and occupiers to confirm or ascertain the typical occupancy and usage of premises and loadings on wastewater systems. This discussion should also confirm seasonal and peak loading patterns, particularly for premises that service holidaymakers and visitors to the area.

Recommendation
Individual system inspections be undertaken to identify the current status and capacity of systems and meetings with property owners and occupiers conducted to confirm or ascertain the typical occupancy and usage of premises and loadings on wastewater systems.

Such an audit will identify any under-provision or shortfall in system capacity and will identify the extent to which additional capacity is required to meet current standards or for projected future growth.

It is most likely that a need for both additional treatment capacity and land application areas will be identified.

Premises in the Dodges Ferry commercial centre identified by site walkover include:

1. Dodges Ferry Meats – Butcher
2. The Richmond Bakery – Bakery and Café
3. Go Pizza and Takeaway – Pizza caravan, open Wednesday to Sunday evenings
4. Dodges Ferry Medical – Doctor’s Surgery
5. Art Gallery
6. Jazz Hairdressing, Beauty Salon and Gift Shop
7. Terry White Chemmart – Pharmacy
8. Hill Street Grocer – IGA Supermarket, Post Office and Ampol Service Station
9. Vacant shop premises (recently opened as bottle shop)
10. Vacant shop premises

Whilst the specific details of the on-site wastewater systems servicing these premises is in many cases not confirmed, it is likely that some premises combine their wastewater flows to be managed by a single treatment and land application system e.g. the Hill Street Grocer; supermarket, service station and Post Office which are together provided for by a septic tank and Advanced Enviro Septic system located beneath the car park.

There is limited space for upgrades of treatment systems and particularly of land application systems on many of the existing lots.

To address the shortcomings of current individual on-site systems, to allow for upgrades to meet compliance with current standards and to make provision for future expansion, either with some surplus capacity or with potential for incremental growth, consideration might be given to a decentralised or community system which caters for several or all of the premises in the Dodges Ferry commercial centre.

The estimated total daily hydraulic load for the above premises is approximately 4,000L/day.

8.2 Decentralised wastewater feasibility

A variety of decentralised wastewater system options are available:

8.2.1 Decentralised (Community) Wastewater Solutions

Historically, centralised (conventional) wastewater management has been the most common option considered for providing sanitary wastewater (sewage) servicing residential and commercial areas. It typically refers to large-scale municipal sewerage systems where individual premises are connected to a gravity driven reticulated collection network (sewer) which transfers combined (black and grey) wastewaters to a central treatment facility for processing (or transfer to another network). Disposal/reuse of the treated effluent and other by-products usually occur remote from the point of wastewater origin. Such a system is not available in the Southern Beaches and does not provide an alternative in the foreseeable future for the Dodges Ferry commercial centre.

Decentralised, non-conventional wastewater management refers to the collection and treatment of wastewater from individual homes, clusters of homes, isolated communities, industries or institutional facilities and disposal/reuse at or near the point of wastewater generation. Apart from the proximity of disposal/reuse, a key point of differentiation between centralised and decentralised wastewater management systems is the frequent use of alternative collection networks and treatment systems. These may include reduced pipe size or grade sewers, pressure or vacuum sewers, waste stream separation and recycled water systems. Such systems offer a possible alternative for the wastewater servicing of premises in the Dodges Ferry commercial centre.

Over the last twenty years or more, innovative wastewater service providers have increasingly adopted a more decentralised approach that draws technology from a wide spectrum of options. Such systems have been implemented by water authorities in a number of Australian States. Private operators are also active service providers in the space with a number of greenfield and brownfield developments underway or in planning with non-conventional sewerage and recycled water solutions. These types of wastewater management systems are well established, with excellent success, in various countries including the United States and New Zealand and are being increasingly adopted in Australia.

Decentralised wastewater servicing solutions may involve partial (primary) treatment of generated wastewater on each lot, or maceration (slurrying), before conveyance of effluent via a reticulated sewer network to a common treatment facility.

Effluent sewer systems utilise smaller diameter, flexible reticulation pipes that can be laid at shallower depths and without the need for uniform or minimum grades for self-cleansing. This leads to greater ease of installation and substantially reduced construction costs, especially when working with challenging ground conditions (e.g. undulating country, shallow soils, and high watertables). By design, they greatly reduce or even eliminate stormwater inflow and groundwater ingress (I/I) in wet weather. These factors impact heavily on traditional gravity sewer design, resulting in frequent wet weather overflows that pollute the environment, requiring network designers to use much larger pipes and additional storages to manage the increased flows.

The following section does not consider land ownership for the location of treatment and land application systems for the Dodges Ferry commercial centre. Access to land would be required and this would necessitate purchase or long-term lease arrangements which are outside of the scope of this report as are detailed cost estimates.

8.2.2 Reticulation (Collection) Options

A wide variety of sewer reticulation options are available for a decentralised servicing approach. These differ in terms of their general mode of operation, infrastructure requirements, construction methods, maintenance procedures and frequency. These factors affect the suitability of the different options for different physical and socioeconomic settings, as well as the life cycle costs of installing, operating and maintaining the sewer network.

Aside from conventional gravity sewers (CGS), a number of alternatives are now available. Alternative collection systems have historically been defined as any system other than conventional gravity reticulation and can be broadly broken down into three categories: pressure sewers (PS); vacuum sewers (VS); and common effluent systems (CES) or effluent sewers. The categories are based on the primary force behind conveyance. However, each type of collection system can utilise different configurations and technologies.

PS and CES are often used in combination rather than isolation, such as in septic tank effluent pump/septic tank effluent gravity (STEP/STEG) systems. Some common design principles for these systems include:

- Additional on-lot storage and in some cases preliminary on-lot treatment infrastructure (e.g. septic tank with outlet filter in STEP/STEG systems);
- The use of lightweight, flexible, small diameter polyvinyl chloride (PVC) or polyethylene (PE) pipe buried at shallower depths with fewer joints than conventional gravity sewers (socketed and glued or welded joints limit infiltration); and
- Remote monitoring. It is common practice in the USA and New Zealand to install remote monitoring systems throughout the collection system that allow the efficient monitoring and manipulation of individual interceptor tank operation and the reticulation system.

This last principle is an important one when considering alternative collection systems. Just like a conventional sewer, a centralised management program is a vital component of alternative collection systems. Alternative collection systems have demonstrated that they require significantly less maintenance than conventional systems, but still require some maintenance and supervision.

The perception of some system designers and operators is that 'scattered' interceptor tank and/or pump units have the potential to create increased maintenance and supervision requirements. However, any resulting disadvantage is outweighed by having greater control over the system, reduction of dry / wet weather overflows (and their associated environmental impacts), and the reduced need for cleaning of the large, deep pipes associated with conventional systems.

8.2.3 Conventional (Gravity) Reticulation Systems

8.2.3.1 Description of Technology and Costs

CGS are the traditional method of sewer reticulation. Raw sewage is delivered via a (typically 100mm) property drain line to a reticulated sewer network (typically located in the road reserve) that relies on gravity drainage supplemented with lift (pumping) stations where pipes are too deep or need to traverse topographic rises.

Modified gravity sewer (MGS) (may also be referred to as low infiltration gravity sewer) works similarly to CGS but can achieve savings in cost and construction by relaxing traditional design standards, such as by reducing minimum cover requirements and having fewer inspection points. MGS usually require greater maintenance than CGS because of the reduced redundancy in network design (i.e. fewer manholes). MGS are usually only applicable to small rural communities where the costs of CGS are prohibitive and a reduced level of service is acceptable to the community.

Unit rates for installation of CGS and MGS systems are difficult to approximate given the inherent complexity of subsurface construction (e.g. rock) and the need for detailed hydraulic design and network analysis. However, general rule-of-thumb pricing ranges from **$250-$375** per metre installed (including pipes, fittings, manholes and house connections). Pump station and rising main costs (if required) would be additional.

8.2.3.2 Limitations / Disadvantages

CGS systems can be relatively expensive and difficult to install, particularly in areas of shallow soils, heavy rock, undulating terrain and high groundwater. This is due to the need for deep trenching to maintain the minimum grades required for self-cleansing. Large pipes are required to convey peak wet weather flows as pipes have a tendency to crack and leak, often allowing substantial groundwater and stormwater ingress during wet weather. Shallow bedrock will increase installation costs and make such systems difficult to install.

Both CGS and MGS require significant upfront costs which include reticulated services (mains, sub-mains, manholes, pump stations etc.) as well as a treatment system capable of managing both current and expected (future) loads. Additionally, this type of system would be subject to a much larger hydraulic load due to required design allowances for storm inflows and groundwater infiltration (I/I), adding substantially to upfront capital costs.

Such a system is not a realistic option for Dodges Ferry commercial centre.

8.2.4 Pressure Sewer Systems (Vacuum and Low-Pressure)

8.2.4.1 Description of Technology and Costs

Vacuum sewers and low-pressure grinder pump (GP) sewers overcome some of the limitations of traditional gravity sewers by providing a driving force to convey wastewater, allowing shallower, smaller diameter pipes. They require more on-lot infrastructure than CGS and MGS systems as both options temporarily store sewage on-lot before transfer to the reticulation system.

In the case of grinder pump systems, each lot contains a small tank (commonly referred to as a 'pot') with a grinder pump and level sensors/controls that collect sewage. The grinder pump breaks up the gross solids and converts sewerage to something more akin to a slurry that possesses different physical and hydraulic properties to raw sewage. The macerated effluent is then pumped through low pressure reticulation lines to a central location for storage and treatment. The on-lot and reticulation pipes are lightweight, flexible and small diameter, constructed of polyvinyl chloride (PVC) or high-density polyethylene (HDPE). The pipes are installed at shallower depths than CGS and can closely follow the ground surface profile, removing the need for deep trenching. Furthermore, they have significantly fewer joints than CGS, and the joints are socketed and glued to limit infiltration. Figure 8.2 presents a schematic of a 'typical' household low-pressure sewer connection. Generally, household ownership and management obligation extends to the property boundary (upstream of the boundary kit).

In the case of vacuum sewers, vacuum pumps provide the conveyance force by sucking sewage through the lines under a negative-pressure (vacuum). A small collection chamber (pot) is placed either on or near the lot to receive wastewater from the household – in some designs small clusters of houses are linked to a single collection chamber. When liquid levels in the collection chamber rise to a pre-determined level, a normally closed valve is opened that connects the collection chamber to the vacuum sewer and as a result the liquid (with some air) is sucked into the sewer. When the collection chamber is empty the interface valve closes and the cycle is repeated. Flushing velocities are taken care of by the vacuum applied and pipelines do not have to be laid to achieve minimum grades. On-lot infrastructure for a vacuum sewer looks very similar to that presented in Figure 8.2 for grinder pump applications, with the exception that no pump is fitted within the 'pot'.

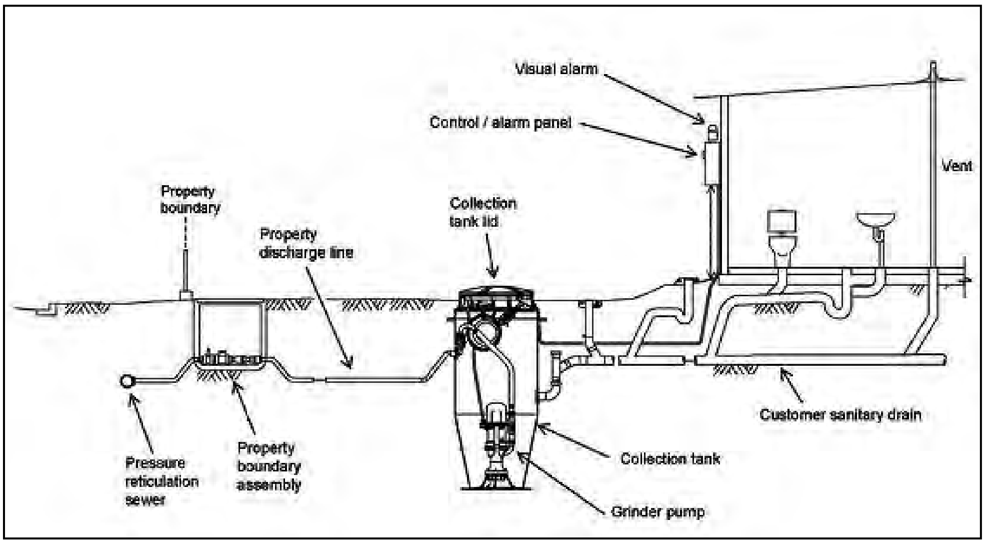


Figure 8.2: On-lot components of low-pressure sewer (Sydney Water)

Depending on the size of the reticulation scheme, most or all of the pumping pressure is provided by the on-lot grinder pumps or centralised vacuum facility. However, in larger schemes additional pumping stations may be required. The system is designed so the pressurised pipes are self-cleaning; however, maintenance ports are installed along the system at predetermined locations.

Unit rates for installation of pressure sewer systems range from **$240-$275** per metre installed (including pipes, fittings, service laterals and project management). On-lot storage vessels (pots) vary in price depending on supplier and number of installations (volume). Typical pricing (per unit) is **~$7,500-$10,000** including the boundary kit.

8.2.4.2 Limitations / Disadvantages

Generally speaking, pressure sewerage systems can overcome many of the limitations of traditional (conventional) gravity reticulation systems. However, there are still situations or design considerations that may become limiting for the application of pressure sewer (reticulation) systems, these may include:

- Grinder pump systems require higher energy macerating/grinding pumps with typically higher servicing and maintenance requirements.
- On-lot storage vessels (pots) have limited storage capacity (typically <1,000L) to cope with adverse service conditions such as power loss, pump failure or blockage.
- Availability of service/maintenance personnel in regional areas can cause delays in operational support.
- Grinder pump and vacuum sewer systems transport all solids and liquids (slurry) and therefore are limited by minimum velocity requirements and can be more susceptible to crowning solids than effluent sewer systems.
- Due to full-strength organic (BOD) and suspended solid (TSS) concentrations within the macerated effluent, treatment requirements are generally larger scale and more complex than those required for effluent sewer schemes.

Pressure sewer systems are suited to staged implementation assuming sufficient hydraulic design has been completed to include ultimate design flow conditions Pressure sewer reticulation systems can reduce (or delay) some upfront capital costs by staging the installation of on-lot components (i.e. pots) as buildout occurs. This would remain the responsibility of the individual property owner for the proposed dwellings or premises and the developer for other facilities. However, a proportion of the off-lot infrastructure would require construction at the outset. This would include the variable-grade reticulation network, boundary (connection) kits, pressure (booster) stations and wastewater treatment/land application system(s). Note these can also be staged to meet growing demand as development proceeds.

Finally, pressure sewer systems require ongoing monitoring, management and control. This is typically undertaken by a central body such as a water authority or private provider. Remote monitoring using telemetry is often used with pressure sewer systems, and local alarms are normally fitted on-lot to alert the occupant of problems.

8.2.5 Common Effluent Systems (Effluent Sewers)

8.2.5.1 Description of Technology and Costs

Common effluent systems utilise partial on-lot treatment and conveyance of (primary) treated effluent only away from the individual connections to a centralised location for further treatment (or in some cases disposal). This type of system has been adopted widely in the USA and New Zealand and also in South Australia for servicing isolated villages that cannot practically or economically be connected to a municipal wastewater treatment plant using conventional gravity sewers.

Common effluent systems collect and convey treated effluent (not raw wastewater) loads from individual residences/premises to a central location for further handling. Primary treatment facilities (i.e. septic/interceptor tanks) servicing each allotment provide partial treatment and most solids are retained within the tanks, creating the opportunity for substantial savings in cost and infrastructure of the reticulation and centralised treatment. Many of the harmful and corrosive elements of domestic sewage (i.e. solids, gases) that cause major wear and tear on concrete sewer pipes are eliminated from the reticulation system. Common effluent systems often combine pressure sewer and small diameter gravity sewer technologies. A STEP/STEG system is identified as the preferred technology for the Dodges Ferry commercial centre.

Septic Tank Effluent Pump (STEP) and Septic Tank Effluent Gravity (STEG) systems are variable-grade effluent sewer systems. STEG systems may also be referred to as small diameter gravity sewers or effluent drain systems.

STEP systems are used for premises below the hydraulic line of the sewer, while STEG systems are used where a gravity drain is achievable to the sewer. In some cases a single STEP/STEG tank may be installed to treat and convey effluent from multiple lots in localised areas.

STEP/STEG systems offer many advantages over larger diameter, deep, conventional gravity sewers. Installation involves substantially less disturbance due to smaller diameter pipes and shallower depths. They require smaller hydraulic gradients and do not employ manholes. These characteristics result in significant cost savings. Effluent sewer mains are buried at a shallow depth following the contours of the terrain (variable-grade). The vertical and horizontal alignment requirements are not as stringent, removing the need for time consuming and expensive surveying. Typically, effluent sewers can be installed using standard shallow trenching techniques or horizontal directional drilling (HDD). There is no need to consider minimum velocities and gradients. Figure 8.3 provides a diagrammatic representation of a typical STEP/STEG system arrangement.

STEG collection systems operate like conventional gravity sewers and are employed where gravity drainage is achievable from the property to the effluent sewer. STEP collection systems incorporate a pump vault that is either enclosed within the septic tank itself or outside the tank in a separate pump basin. Liquid level sensors (or float switches) in the pump vault turn the pump on and off as levels rise and fall, or signal an alarm if levels become too high. STEP system effluent pumps are typically 0.4kW (0.5 horsepower) and use minimal electricity.

Due to the use of pressurised conveyance of primary treated effluent, STEP systems provide for the greatest flexibility in design, materials (i.e. pipe) and construction when considering alternative collection systems. They are used to service lots below the hydraulic line of gravity mains.

Each property is connected to the effluent main line via a service connection. This service connection protects the premises from back-pressure and allows the premises to be isolated from the effluent sewer in an emergency. These connections are an important part of the system and it is normal for the service connections to be installed at the same time as the main sewer line, even on vacant lots.

Remote monitoring (using telemetry) can allow a system operator to control pump operation from an office or workshop without having to access the site unless some form of manual repair is required.

A summary of the key features of on-lot components include:

- The wastewater from each property (or clusters of premises where appropriate) is plumbed into an on-lot septic tank (also known as an interceptor tank), with a recommended (minimum) operating capacity of 4,500L.
- Each interceptor tank is connected by small diameter flexible pipeline to the reticulated effluent sewer pipeline at the property boundary (service connection).
- The interceptor tank can be constructed of concrete, fibreglass or plastic, and provides primary treatment, with the solids accumulating at the bottom of the tank and the liquid effluent passing through a screened outlet before being discharged to the effluent sewer.
- The majority of retained solids are degraded (anaerobic digestion) over time, thereby significantly reducing pump-out frequency (typically 7-10 years, depending on occupancy).
- The on-lot interceptor tanks are relatively large (compared to traditional septic tanks in Tasmania) and thereby provide several days' emergency wastewater storage, if required.

Figure 8.3: Diagrammatic STEP/STEG arrangement (Orenco Systems Inc.)

Advantages of the STEP/STEG system include:

- Only liquid effluent is being pumped which means the energy required to pump is low, therefore reducing electricity costs.

- Small-bore (50mm - 100mm) pipe sizes for the effluent sewer, using lightweight, flexible polyvinyl chloride (PVC) or high-density polyethylene (HDPE).
- It is common practice to install remote monitoring systems throughout the collection system that allow the efficient monitoring and manipulation of individual interceptor tank operation and the broader reticulation system.
- A reduction and, in most cases, elimination of the need for manholes and pump stations within the system.
- Fewer joints than conventional gravity sewers (socketed and glued/welded joints) and provision of a largely watertight collection system thereby reducing (or effectively eliminating) infiltration and inflow (I/I). This means the treatment plant can be considerably smaller since it doesn't have to cope with large wet weather flows. Similarly, sewers and pump stations do not need to be sized for wet weather flows.
- The cost and maintenance of all on-lot equipment is taken care of by the owner and disposal of food premises waste and chemicals will only affect the individual lot and not the whole system.

Unit rates for installation of common effluent systems range from **$265-$300** per metre installed (including pipes, fittings, service laterals and project management).

8.2.5.2 Limitations / Disadvantages

Effluent sewer systems have one minor disadvantage when compared to conventional and pressure/vacuum sewerage systems; that is, the need for on-site treatment (interceptor) tanks on individual lots. With proper design, installation and management, this should not pose a problem for the overall system. Effluent sewer systems almost exclusively include external management of the system by a responsible entity. Remote monitoring technology is often incorporated into on-lot and community components of effluent sewer systems to facilitate third-party management.

An important factor in the efficient operation of a reticulated effluent sewerage system is the need to take large scale management decisions out of the property owners' hands. Reducing the responsible management entities from large numbers of property owners to one (water authority/private operator) has many benefits. The advent of remote monitoring technology for application in decentralised, non-conventional wastewater treatment has ensured a considerable level of risk control exists. In most cases this risk control is far greater than that provided for centralised systems.

In Dodges Ferry commercial centre, application of a (STEP/STEG) common effluent system would significantly reduce the risk of contamination of sensitive receptors such as creeks, stormwater drains, wetlands, estuaries and coastal waters along with groundwater.

STEP/STEG effluent sewers are suitable for staged implementation or incremental growth. Because of their relative freedom from minimum velocity requirements, system hydraulics are not often limiting and the effluent sewer can absorb large fluctuations between initial and ultimate design flow conditions (volume and velocity). Combination STEP/STEG systems provide positive pressure throughout the reticulation network and, combined with modern jointing techniques, substantially reduce the risk of inflow and infiltration.

8.3 Community Treatment System Options

Regardless of the reticulation option selected, collected wastewater (either raw or primary) will require additional treatment to achieve a standard suitable for land application (as a minimum) in line with regulatory standards and community expectations.

This presents a number of considerations when selecting an appropriate treatment technology because the quality and consistency of the wastewater stream can have a significant bearing on the size of the wastewater treatment system required, as well as the reliability and performance of the treatment processes employed. Therefore, not all treatment systems are suitable for the range of reticulation options considered. Common treatment technologies/systems are discussed here along with the applicability for the system with a selected reticulation option.

8.3.1 Treatment System Positioning

A logical position for a local treatment plant is close to the development, at an elevation which is below the premises and will allow the reticulation network to utilise gravity design.

Thus, at Dodges Ferry commercial centre a suitable location would be in the lower lying land to the rear of the car park behind the main group of shops. This area, however, offers less potential for land application, as it is both low lying and of limited extent.

An appropriate treatment option for the identified treatment and reuse site would be a small-scale (package) sewage treatment plant (STP) which may use a combination of physical and biological treatment processes. Many options for wastewater treatment are available and it is beyond the scope of this study to consider them all in detail.

A number of suitable systems are described here including extended aeration systems, sequencing batch reactors and textile filter systems.

8.3.2 Extended Aeration Systems

Extended aeration, suspended growth (activated sludge) treatment systems are one of the most common types of small-scale wastewater treatment systems installed throughout Australia. They have been shown to achieve high organic load (BOD) and SS reductions of 85-95% and up to 50% phosphorus removal (principally through solids capture). As for most other wastewater treatment systems, nitrogen reduction is more difficult due to the complex chemical reactions in the nitrogen cycle; however, these types of systems can achieve up to 75% nitrification, through the conversion of ammonia to nitrate, which is biologically available for plant uptake in the land application (irrigation) area.

8.3.2.1 Applicability

Extended aeration treatment systems are suitable for receiving raw wastewater loads from community reticulation (CGS, GP and VS) systems, as designs tend to be sufficiently robust to accommodate the expected fluctuations in wastewater quality (strength) and volume. A typical design for the proposed development would comprise:

- primary treatment capacity (~10kL) to provide a minimum 24-hr residence period for the peak (dry-weather) flow from the commercial centre, allowing sufficient sludge storage volume;

- an (aerated) treatment reactor (~7.5kL) to provide reliable treatment to a 'secondary' effluent quality, including >80% nitrification;
- secondary settling (clarification) capacity (~4kL) to provide reliable effluent clarity (SS <30mg/L) suitable for restricted land application (irrigation) of treated effluent; and
- (if required) disinfection or pathogen control facilities suitable to achieve desired control limits (as determined by consent authority).

With an increased storage requirement (i.e. tanks) the land area (footprint) for this type of treatment system would be **~50-100m^2**. This area would be expected to be accommodated within the identified STP location.

8.3.2.2 Limitations / Disadvantages

A major limitation for this type of system is a reduced opportunity for 'scalability'. In most cases, the majority of the treatment system will need to be designed for ultimate capacity (buildout condition) of the development on initial construction, with little opportunity to defer costs for later stages of growth or expansion. Separately, the setup of a STP under reduced loading conditions can also cause ongoing operational difficulties.

Also, for common effluent sewer (i.e. STEP/STEG) applications, extended aeration treatment systems can perform less well because of the decreased organic loading (as solids are retained on-lot). This does not need to be problematic; however, care must be taken to ensure that this has been considered in the design and selection of the preferred treatment system.

8.3.2.3 Costs

Capital cost estimates for extended aeration treatment systems are varied, given the range of technologies, processes and providers available in the Australian market. Based on recent experience, a preliminary estimate of cost for such a system would be in the range of **$10,000 - $15,000** per kL treated. Therefore, based on the design loading values presented, the cost of a community (extended aeration) STP for the commercial area would be in the vicinity of **$40K-$60K** (4kL/day). This cost would be borne by the developer (proponent) or individual business or property owners.

Expected operational costs are also heavily dependent upon the system selected. Typically, extended aeration treatment systems require some operator input (management/maintenance). As a minimum, such a system might require quarterly attendance by a service technician for up to one half-day per visit at an annual cost of **$4K-$6K**. This cost would be borne by the developer (proponent) and/or management entity and most likely passed on to individual businesses at Dodges Ferry commercial centre as part of their rental or management fee.

8.3.3 Sequencing Batch Reactor

8.3.3.1 Description

Sequencing Batch Reactors (SBRs) also use the activated sludge treatment process, but in a 'fill-and-draw' process (from a balance tank) in order to provide all of the wastewater treatment steps in sequential order within the same reactor vessel. This technology requires a smaller footprint than traditional suspended growth systems. However, SBRs can be more sensitive to shock loads as the microbiological populations within the reactor vessel become conditioned to the background sewage inflows. An SBR variant, known as Intermittently Decanted Extended Aeration (IDEA), which continually feeds raw wastewater to a baffled compartment of the reactor is also available. This system can remove the need for flow equalisation and make the system less susceptible to shock loads.

8.3.3.2 Applicability

SBR (and IDEA) treatment systems are also suitable for receiving raw wastewater loads from community reticulation (CGS, GP and VS) systems for the same reasons as extended aeration systems. However, because treatment occurs as a discrete volume ('batch'), additional flow equalisation (balancing) facilities may also be required.

The land area requirement (footprint) for this type of treatment system would be marginally reduced **~40-80m^2**. This area would be expected to be accommodated within the identified STP location.

8.3.3.3 Limitations / Disadvantages

SBR systems overcome some of the 'scalability' issues associated with extended aeration systems by allowing for multiple treatment reactors, which could be constructed in a staged approach were development to expand. Thus, upfront capital expenditure can be minimised, with additional treatment capacity only added as needed until the ultimate condition is reached. This approach would also address the potential under-loading problem identified earlier.

As with extended aeration systems, SBR systems can also struggle when used with common effluent sewer (i.e. STEP/STEG) applications. Again, this issue can be readily addressed with cautious consideration in the design and selection of the preferred treatment system.

8.3.3.4 Costs

The capital cost estimates for a SBR (or IDEA) treatment system for the subdivision would be similar to the extended aeration values (**$10,000 - $15,000** per kL treated). Therefore, based on the design loading values presented, the cost of a community (SBR/IDEA) STP for the development would be in the vicinity of **$40K-$60K** (4kL/day). Expected operational costs for such a system might require quarterly attendance by a service technician for up to one half-day per visit at an annual cost of **$4K-$6K**. This cost would be borne by the developer (proponent) and/or management entity, but similarly passed on to individual business owners.

8.3.4 Textile Filters

8.3.4.1 Description

Media or 'textile' filters use proven packed bed reactor (PBR) technology to treat domestic wastewater to better than secondary effluent standards. In addition to proving highly effective at the single lot scale, this technology has been found to be highly suitable to cluster (community) scale wastewater treatment, particularly on sites with limitations to construction and land availability or requiring staged development.

Figure 8.3 illustrates examples of Textile Filter STP's in community situations. Note that compact design and enhanced odour control allow for the STP to be directly integrated into the development setting with minimal impact.

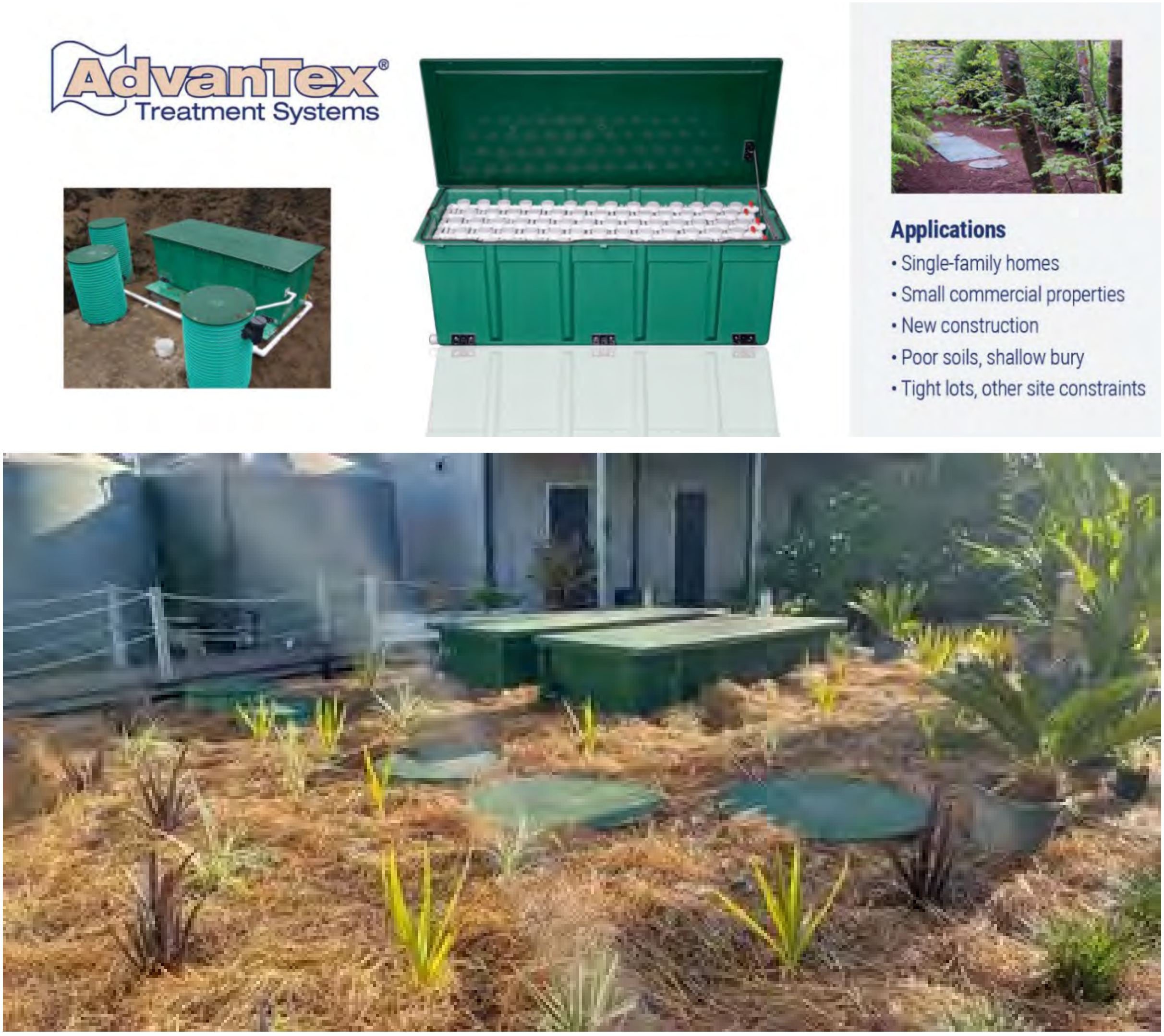


Figure 8.3.4 Modular Textile Filter arrangement for a Community System (Orenco Systems Inc.)

Recirculating textile filters can be loaded at rates much higher than traditional PBRs (e.g. sand or gravel filters) and do not have the same issues associated with sourcing consistent quality media materials as sand or gravel filters. The loading rate depends on the organic loading and the required effluent quality, which means that such systems are appropriate for commercial food premises. The filters are lightweight and modular in form allowing systems to be expanded when required with minimal difficulty. Textile filters have a small footprint when compared to other treatment system options and do not smell or produce potentially harmful aerosols, so buffer requirements from residences and other types of development are minimal.

Recirculating textile filters generally comprise a watertight fibreglass basin filled with suspended vertical sheets of an engineered textile material. Recirculated wastewater is distributed evenly over the end surface of the hanging sheets by a pressure distribution manifold.

The textile material has a complex fibre structure that provides a high water holding capacity, porosity and surface area for biomass. Porosity of the textile media is several times greater than that of sand not only increasing hydraulic conductivity, but also allowing the passive input of oxygen into the system and providing more space for solids retention and breakdown by the biomass. Surface area of the various textile media is approximately 4 to 8 times greater than a recirculating sand or gravel filter. The high water holding capacity of the media provides high retention times when coupled with timed, pressure dosing and enables consistently high treatment.

8.3.4.2 Applicability

Whilst textile filter treatment systems can be designed for receiving raw wastewater loads from community reticulation (CGS, GP and VS) systems, usually incorporating large primary treatment and flow equalisation (balancing) facilities, they are ideally suited to common effluent sewer (i.e. STEP/STEG) applications.

The use of on-lot primary treatment (interceptor) tanks greatly reduces the need for large primary facilities at the centralised treatment location and utilising a 'recirculating' treatment process results in exceptional treatment performance (high quality effluent) and significant flexibility in nutrient removal. Long term monitoring of many domestic and community-scale textile filter systems indicates that effluent quality as described in the table below is consistently achievable. Additional treatment processes can be incorporated to provide enhanced treatment (e.g. further nutrient stripping or active disinfection).

Table 8.3.4 Typical performance of textile filter systems

Parameter	Concentration	% Reduction
Biochemical Oxygen Demand (BOD)	<5mg/L	90-99
Suspended Solids (SS)	<5mg/L	90-99
Total Nitrogen (TN)	10-15mg/L	65-90
Total Phosphorus (TP)	5-10mg/L	25-75
Faecal Coliforms (FC)	<1,000cfu/100mL	99.99

Textile filter systems can overcome most of the scalability issues associated with other 'fixed-capacity' systems. A commercial AX20 treatment pod can treat wastewater flows of up to 2,250L/day, meaning that treatment capacity can be incrementally expanded as development proceeds. For the Dodges Ferry commercial system, preliminary estimates of wastewater generation are of 4,000L/day. This equates to approximately two AX20 pods.

Alternately, were the development to expand in the future, the larger AX-100 treatment system can treat wastewater flows of up to 19,000L/day.

The land area requirement (footprint) for this type of treatment system is also significantly reduced (**~20-50m^2**). This area would be expected to be accommodated within the identified STP location.

8.3.4.3 Limitations / Disadvantages

On-site pre-treatment still requires individual property owners/occupants to be educated about the system, particularly to be mindful of preventing harmful substances from entering the system. However, if a contamination event were to occur, the impact would be localised to the subject premises, with minimal impact on community treatment system integrity.

8.3.4.4 Costs

Capital costs for a textile filter (PBR) treatment system for the subdivision would be split between on-lot costs (interceptor tanks) and off-lot costs (STP). Depending on hydraulic requirements, on-lot costs would range from **$10,500 - $13,500** per lot, which is borne exclusively by the property owner. Off-lot (STP) costs, comprising fixed infrastructure (flow balancing/recirculation tanks, pumping etc.) and treatment units (pods) would be ~**$8,500** per kL treated. This cost would be borne by the developer (proponent) and/or management entity or defrayed amongst tenants.

Therefore, based on the design loading values presented, the cost of a community (textile filter) STP for the Dodges Ferry commercial centre would be in the vicinity of **$160K** for on-lot works and **$34K** (4kL/day) for the off-lot components.

To aid in system/network management, remote monitoring capability for each new (on-lot) connection is also recommended. The capital cost for this additional item is ~**$1,500** per lot.

Operational costs for a textile filter treatment system are expected to be substantially lower than both extended aeration and SBR options. This is due in part to shifting part of the maintenance requirement to the property owner, but also due to an increased level of automatic monitoring of system operational conditions (remote monitoring). This allows for the timely identification, reporting and resolution of system problems (both on and off-lot) before they cause serious fault or damage. Also, remote monitoring and management requires less on-site time for a system operator, meaning annual running costs can be significantly reduced.

Textile filter (PBR) technology is very robust and maintenance requirements are substantially reduced. Studies of operational systems in the USA, New Zealand and Australia have demonstrated combined operational and maintenance costs of **~$750** per connection, or **$5K** per annum for a cluster/community system equivalent of the size required at Dodges Ferry commercial centre. These costs would be borne by the tenants and/or management entity.

8.4 Community Effluent Management Options

Treated wastewater can pose a threat to human health and the quality of the natural environment. Accordingly, various standards, guidelines and other publications, produced at both state and national levels have been developed to improve our understanding of the risks and to promote a best management approach to design, operation and management of community effluent management systems. Several of the more important guidelines relating to recycled water use at a community scale are listed below:

- Australian Guidelines for Water Recycling (AGWR): Managing Health and Environmental Health Risks (Phase 1) (Natural Resource Management Ministerial Council and Environment Protection and Heritage Council, 2006).
- ANZECC Guidelines for Fresh and Marine Water Quality (Australia and New Zealand Environment Conservation Council, 2000).
- NSW Guidelines for Recycled Water Management Systems (NSW Department of Primary Industries – Office of Water, 2015).
- Environmental Guidelines – Use of Effluent by Irrigation (NSW Department of Environment and Conservation, 2004).

- Interim NSW Guidelines for the Management of Private Recycled Water Schemes (NSW Department of Water and Energy, 2008).
- These guidelines provide important information that would be used in designing and then assessing any proposal to reuse water from a community wastewater treatment system.

8.5 Matching Water Quality to Reuse Options

The guidelines present water quality targets for different reuse applications according to the level of risk associated with reuse. These targets are generally specified in terms of physical, chemical and microbial water quality parameters.

Where the general public is unlikely to come into contact with recycled water (e.g. subsurface application, agricultural irrigation), lower levels of treatment may be used in combination with appropriate controls and safeguards (e.g. controlling access to the reuse area). Conversely, for reuse applications where there is a relatively high risk of contact (e.g. residential garden watering, irrigation of public open space and sports facilities) a higher quality of recycled water is required and similarly, the testing and monitoring required to validate and maintain quality control over the recycled water supply are expected to be more rigorous. The table below presents the water quality and monitoring requirements for recycled water that will have a high level of human contact.

Table 8.5 Validation monitoring requirements for various recycled water end uses

Exposure Risk Level	Potential End Use	Validation (and Verification) Monitoring			
		Parameter	Effluent Compliance Value	Influent Monitoring Frequency	Effluent Monitoring Frequency
	End uses with a high level of human contact, including: - Residential dual reticulation. - Multi-unit dwellings, internal reuse and external irrigation. - Agricultural irrigation – unprocessed foods (e.g. salad crops). - Urban irrigation with unrestricted access and application.	E. coli	<1cfu/100mL	Weekly	2 times/week

Interim NSW Guidelines for the Management of Private Recycled Water Schemes (NSW Department of Water and Energy, 2008)

The major risk to human health from contact with treated wastewater, or recycled water is infection from micro-organisms such as viruses, bacteria, protozoa and helminths that may remain in the water. It is not practical to specify water quality targets completely in terms of all micro-organisms and so indicator organisms have been selected that are expected to be representative of the microbial population within a water sample. Thermotolerant coliforms (or faecal coliforms) are most commonly used.

For high risk reuse applications there may be a requirement to also demonstrate compliance with target levels set for viruses and other parasites, for example "<2 virus' per 50L for unrestricted residential use".

Chemical and physical water quality targets are also specified that may vary depending on the proposed reuse application. For example, it may be important to establish minimum criteria for turbidity and colour to ensure a high level of public acceptance where recycled water reuse is proposed for domestic non-potable purposes. Such criteria may be irrelevant for lower level uses like irrigation of parks and playing fields.

Acceptable criteria for other parameters such as SS, BOD, nutrients (nitrogen and phosphorus), salinity and pH are important, to manage risks associated with environmental pollution and soil degradation.

For a community system at Dodges Ferry commercial centre, secondary treatment with disinfection would be an appropriate level of treatment. Consideration of the levels of nutrient reduction to be achieved is significant given the sensitivity of groundwater in the receiving environment. Possible land application options include surface irrigation or subsurface application of effluent.

8.6 Buffers

Buffer zones (setbacks) from irrigation areas are recommended as they provide a form of mitigation against unidentified hazards and minimise risk to public health, maintain public amenity and protect sensitive environments. The AGWR (2006) guideline recommends restricted access and 25-30m (Table 3.5 & 3.8) buffer zones from irrigation areas to the nearest point of public access for spray irrigation of high-quality recycled water suitable for agricultural irrigation.

The application of the recommended buffer zones will provide a minimum 1-log (equivalent) reduction in pathogen loads from the irrigation areas. Recommendations to prevent off-lot discharge also include the use of low-throw sprinklers, part-circle (180º inward-throwing) sprinklers and/or tree or shrub screens.

The following environmental buffers for spray irrigation are considered appropriate;

- 250 metres from domestic groundwater bores;
- 50-100 metres from permanent watercourses; and
- 40 metres from intermittent watercourses and dams.

It should be noted that relevant setbacks from dwellings, in accordance with AGWR (2006), will need to be applied.

As these buffers might be difficult to achieve, subsurface application of effluent might be considered preferable.

8.7 Recycled Water Management

One potential recycled water management option is identified:

Agricultural irrigation e.g. for fodder crops or grazing pasture. A suitable location for the establishment of an irrigation scheme is identified on rural land to the east of the Site at the end of Lukeekah Street and off Signal Hill Road. The relative position of this potential irrigation area to the Dodges Ferry commercial centre is shown in Figure 8.7. (This study has not involved any discussion or negotiation with landowners, which would need to take place for this option to progress further.)

Agricultural irrigation would require as a minimum secondary treatment.

Figure 8.7 Proximity of potential irrigation areas to the east of the Dodges Ferry commercial centre.
Source: www.thelist.tas.gov.au

8.8 Agricultural Irrigation

This option would comprise the controlled irrigation of (minimum) secondary treated effluent within a dedicated irrigation area.

Soils investigations and the preparation of preliminary water and nutrient balances would be required to determine the area required to be set aside for irrigation for the development assuming recycled water generation of approximately 4,000L/day. Depending on soil type this might be of the order of 800-2,000m^2.

Based on the available area on the adjacent land, surface spray irrigation would likely be a suitable solution for the Site. Whilst the exact details of the most appropriate irrigation system is presently unknown and will likely be determined based on both financial and operational factors, it is considered most likely that medium scale surface spray or drip irrigation would be the preferred method. Given the area that might be required for irrigation, fixed (pop-up or impact) sprays would be amongst suitable options for this Site. Each option is described further below.

8.8.1 Surface Irrigation using Fixed (Pop-up) Sprays

A ‘fixed’ (pop-up) irrigation system would comprise the installation of a subsurface (buried) distribution manifold beneath the entire irrigation zone to be serviced. The manifold would be constructed PVC pressure pipe or HDPE, with final pipe sizing determined following detailed hydraulic design. For optimal performance the manifold would be divided into manageable units (zones) to reduce pumping requirements and allow for better control of irrigation rates.

Hydraulically operated 'pop-up' sprinklers would be fitted at determined locations throughout each zone (depending on distribution radius and coverage requirements) with the ultimate aim of delivering consistent and complete coverage to the area serviced. There are a large number of sprinkler types available on the market suitable to this type of 'agricultural' application.

There are some issues with pop-up sprays that can be potentially problematic, particularly when used in areas with high maintenance needs. Pop-up sprays raise under hydraulic pressure and fall below the ground surface on completion of each irrigation cycle, however, experience notes that the extension tubes often "stick" after they have worn in and can be easily damaged by maintenance machinery (mowers) if not properly re-seated. Also, animal contact with exposed fittings can be troublesome; therefore, it is important to ensure that sprinklers are adequately protected from damage.

8.8.2 Surface Irrigation using Fixed (Impact) Sprinklers

The use of fixed impact sprinklers on a raised tripod is a much more traditional method of open space irrigation on sites such as golf courses and public parks. Similar to the pop-up arrangement, the system would comprise the installation of a buried (PVC/HDPE) distribution manifold beneath the entire irrigation zone to be serviced. Because impact sprinklers generally operate at 'relatively' higher pressures and generate a larger throw-radius, the sprinkler intervals would be larger (less sprays), but would still require detailed hydraulic design.

Impact sprinklers typically comprise a one or two nozzle arrangement allowing for both long and short throw coverage. They typically operate in a 360° configuration, but can easily be limited to other arrangements (e.g. 180° or 90°) for edge or corner operations. Even irrigation application is marginally more difficult with impact sprinkler systems and careful irrigation design is required to ensure optimal performance.

Other than controlling coverage, the main issue associated with impact sprinkler systems is spray-drift. Because of the style of discharge, impact sprinklers are prone to generating fine sprays or aerosols which can be readily captured in wind current. This presents a risk for off-site impacts (including unintended contact risk). These risks can be managed by ensuring adequate buffers are maintained between the irrigation area(s) and receptors, or by increasing the droplet size and reducing the throw radius of the individual sprinklers.

Surface irrigation of treated effluent has the potential to create public health impacts via direct or indirect contact with contaminated surfaces. The AGWR (2006) and NSW DEC (2004) guidelines provide recommendations for irrigation of recycled effluent based on treated effluent quality and the intended end use of the land being irrigated. For agricultural food production (pasture and/or fodder) for grazing animals (excluding pigs and dairy animals), both guidelines recommend:

- Secondary effluent quality (20/30 standard) as a minimum.
- Disinfection using chemical control methods (i.e. chlorine) or detention (i.e. lagoon).
- Helminth (worm) reduction controls comprising >25 days detention (i.e. lagoon) or other management controls.
- Additional (on-site) preventative measures are also recommended, these include:
- No public access during irrigation.

- 25-30m buffer to nearest point of public access.
- Spray-drift controls (sprinkler selection, wind-speed shut-off etc.).
- Excluding grazing animals for >5 days after last irrigation cycle (withholding period).
- Implementation of these recommended controls will be sufficient to manage any residual risk associated with the irrigation practice.
- Finally, surface irrigation of treated effluent (recycled water) is not considered appropriate during periods of excessive rainfall; therefore, additional wet-weather storage (nominally >5 days) is required to retain treated effluent during those periods.

8.9 Preliminary Assessment of Servicing Options

8.9.1 Assessment Criteria

The Sections above detail the strengths and limitations of potential servicing options for the proposed Dodges Ferry commercial centre. Particular reference has been made to a number of key assessment criteria for each alternative. These are reproduced below along with additional supporting information.

8.9.1.1 Relative Cost

Preliminary costs have been derived from recent information for similar sized systems in Australia and overseas. Functional and concept design costings represent +/-30% possibility for variation from standard costs.

8.9.1.2 Deliverability

Cursory examination was given to the likely capability for delivering each of the identified options within the context of available technology/service provider experience, expertise and project history. Consideration is also given to the difficulty associated with construction and the suitability for options to integrate successfully with existing or proposed management frameworks.

8.9.2 Suitability to Staged Development and Growth

Considerations as to whether the options will be suitable and capable to service a staged development, include:

- Likely upfront costs for on-lot, reticulation, treatment, storage and irrigation/reuse;
- Ability to cope with fluctuations between current and ultimate design flows;
- Economies of scale; and
- Relative number of premises likely to be serviced.

8.9.3 Suitability to Proposed Development Layout

The options have been assessed to determine if they will fit within the constraints of the proposed development without making any changes to the layout.

8.9.3.1 Option 1 – On-site Wastewater Management (Do nothing option)

Option 1 involves continuing to treat wastewater produced by individual premises in individual or a number of domestic/small commercial wastewater treatment systems. The preferred solution for individual premises in the Dodges Ferry commercial centre is a compliant on-site wastewater management system meeting the standards outlined by State legislation. It is likely that many, if not all, systems fall short of meeting current regulatory requirements and subject to the findings of detailed system audits, consideration should be given to upgrading systems to a complaint standard. Meeting the necessary requirements for land application areas might be challenging and additional subsurface application similar to that provided for the supermarket complex might be required.

8.9.3.2 Option 2 – Common Effluent Sewer + Community Treatment

Option 2 involves the use of common effluent systems as outlined above to collect the wastewater produced by the Site. The wastewater would then be treated by a community treatment system to produce a water quality suitable for surface irrigation on a suitable land application area for which an arrangement for purchase or lease would be required.

8.9.4 Options Assessment

To determine the suitability of options, available options would be typically assessed both qualitatively and quantitatively. Assessment would consider the strengths of both limiting constraints and positive opportunities. Capital costs and operating costs would be considered, along with mechanisms by which costs would be apportioned. Sustainability and deliverability should also be considered.

Whilst it is not the purpose of this report to make determinations, but rather to flag possible options, it is important to recognise that the current servicing situation is somewhat constrained, falls short of meeting current regulatory standards in some regards and offers little opportunity for future expansion. It is, nevertheless, confined to the available land and as a consequence, has limited off-site impacts and operates at modest cost.

In consideration of whether a decentralised wastewater scheme is required or feasible for the Dodges Ferry commercial centre it might be concluded that, for the current state of development and demand, decentralised wastewater is most probably not required and that conformance could be achieved by individual system upgrades. As most systems are close to capacity, decentralised wastewater would be required to cater for future expansion including increased number of premises and increased patronage. Decentralised wastewater is feasible, but would require both expanded provision of treatment and land application infrastructure and adoption of a suitable management model.

8.10 Recommendations

It is recommended that:

- An audit comprising a desktop investigation of Council held data on the current wastewater systems servicing the Dodges Ferry commercial centre be undertaken and a gap analysis determine where data is incomplete.
- Following the desktop audit, site inspections and meetings with individual business owners be held to determine a more complete picture of the current systems and a picture of future needs be identified.
- Where necessary, existing systems be upgraded to compliant standards required by State legislation.
- Wider consideration be given by council, business owners and operators and the wider community to the likely future expansion of Dodges Ferry commercial centre and the associated wastewater servicing needs.

9.0 Conclusions

9.1 General comments

In keeping with the Brief from Sorell Council (Section 1.2), this report has been wide-ranging.

First, it recognises that reticulated water and sewerage will not be connected to the five townships in the Southern Beaches for the foreseeable future, so that OWMSs and OSWMSs are here to stay. Accordingly, the report:

- has reviewed the history of investigations into on-site wastewater and stormwater management in the precinct over the past quarter of a century,
- has examined the ways statewide and local regulations governing the subject have continued to evolve over the same period, and their advantages and shortcomings,
- has studied the results of the Council-generated community-wide survey about the current wastewater and stormwater situation in the Southern Beaches, and noted the opinions of responding residents,
- has made recommendations about: tightening the roles of Council EHOs and private SQPs in on-site wastewater and stormwater management, the need to consider wastewater and stormwater management as a single issue, changing some aspects of the SB-SAP, limiting the use of septic tanks in future developments, considering the need and types of decentralised wastewater systems for the commercial centre of Dodges Ferry, and the need for regular audits and inspections of existing and future OWMSs and OSWMSs.

The authors of the report have over a century of collective wastewater investigation and system design, including in the Southern Beaches, and on both the regulatory and consultancy sides of the subject. This experience, combined with their recent inspections of OWMS and OSWMS in the five townships, form the basis of the recommendations in this report.

9.2 Main conclusions

The main conclusions are:

- half of the 72 or so respondents to the community survey thought that OWMS were adversely affecting the Southern Beaches, and half thought that stormwater was not being managed effectively,
- despite these views, most OWMS in the Southern Beaches are operating satisfactorily with respect to current regulations, and do not appear to be causing unacceptable environmental harm or human health risks;
- localised adverse effects on the Southern Beaches are due to stormwater discharge, some of which may be contaminated with wastewater originating from failing OWMSs or their unauthorised connections to stormwater mains;
- the small minority of existing OWMSs that are failing are usually old or poorly maintained (or both), and are mostly located on small properties with unfavourable soil types;
- some of the recommendations from previous reports originating in or commissioned by Council remain valid and should be adopted;
- a common concern of residents responding to the Council survey related to the increasing trend of building large houses on small existing lots; this report supports the concern with respect to OWMSs

and OSWMSs: it seems unavoidable that on-site wastewater management for new large houses on small lots will struggle to meet regulatory requirements; it is worrying that some SQPs submit what amount to sub-standard non-conforming designs for these lots, and just as concerning that Council has approved most (if not all) of them;

- particularly with respect to the previous dot point, but also in general with respect to assessing OWMS designs by SQPs, some Council EHOs may feel unqualified to do the job properly; this issue can be addressed in Council by in-house training;
- managing on-site wastewater and stormwater requires separate areas of land on the property, and neither should overlap or interfere with the other; the former should be assessed first, and located upslope from the latter; ideally, the same SQP should do both assessments, at the same time, and the stormwater assessment could be incorporated into the wastewater report;
- unfortunately, this approach is rare: there is regulatory confusion about what constitutes a SQP for stormwater assessment, and it does not include the wastewater SQP; this report argues that a SQP for wastewater management ought to also qualify as a SQP for stormwater management; clarification and redefinition of this important issue requires liaising with state government;
- improvements are needed, and several recommended are made, for the existing SB-SAP, the governing Council-generated document for OWMSs and OSWMSs in the Southern Beaches;
- it is technically feasible to install a decentralised wastewater system for the Dodges Ferry commercial area; sufficient vacant land is available nearby, but it first needs to be acquired by Council.

10 Recommendations

Table 10.1 summarises the recommendations of this report.

Table 10.1 The recommendations of this report, grouped into broad categories and cross-referenced to the relevant Sections.

Subject	Section # in this report	Recommendation
General flowchart for wastewater and stormwater management	6.8	The flowchart in Figure 6.8 shall be adopted as a formal guiding document by Sorell Council for improving wastewater and stormwater management in the Southern Beaches.
Wastewater and stormwater management are inseparable	6.2	For all on-site situations, the wastewater report and OWMS design shall take precedence over the stormwater design, and the former shall be made available to the stormwater assessor and designer.
	6.3	For new developments requiring both a wastewater report and a stormwater report, the wastewater report should be completed before the stormwater report, and it should be provided to the SQP compiling the stormwater report. The stormwater system shall be located downgradient or crossgradient to the wastewater system.
	6.5	Separate SQPs involved in the design of OWMSs and OSWMSs should liaise closely to ensure that each has considered the design of the other in completing their design and they are both are satisfied that adequate consideration has been given to the combined demands of stormwater and wastewater on the site.
Stormwater	6.7.2	Stormwater reuse including irrigation, watering of garden beds, etc. separate from or in conjunction with discharge to in-ground trenches, should be encouraged and be included as an alternative in stormwater designs by SQPs.
	6.7.4	Any stormwater from a public system or private system discharging in an uncontrolled manner over land in a coastal landslide hazard band shall be controlled (piped) over the hazard band, unless the geotechnical risk in not doing so is stated to be acceptable in a report prepared by a SQP in landslide risk assessment.
	6.7.1	In Sorell Council's SNDP, Section B3.3(c) should be changed from "Rainfall intensity and duration" to "Rainfall intensity and duration for a 5% AEP", and B3.3(f) should be deleted.
Role of SQPs	6.3	The SQP for site evaluation and system design for wastewater on a property should, wherever appropriate, also undertake site evaluation and system design for stormwater management. As soon as practicable, Sorell Council should liaise with other state authorities as appropriate to clarify regulations so that a SQP licenced for wastewater design is also licenced for stormwater design.
	6.4	Site and soil evaluations should be done by a SQP before approval is given to commence construction.
	6.6.2	The level of wastewater treatment in an OWMS should be determined by the SQP in consultation with his or her client, having regard to site conditions and the proposed new development, and in accord with AS/NZS 1547 and the SB-SAP.

Continued next page

Table 10.1 (continued)

Subject	Section # in this report	Recommendation
Sorell Council	6.5	Sorell Council should ensure that its employees assessing wastewater and stormwater applications are appropriately trained and skilled to do so, thus providing them with confidence to critically review substandard designs.
	6.6.5	New developments shall not be approved if their OWMS cannot comply with AS/NZS 1547, the Director's Guidelines, and/or the SB-SAP.
	6.6.5	Council shall require existing failing and poorly performing OWMSs be upgraded or replaced in accordance with AS/NZS 1547, the Director's Guidelines, and/or the SB-SAP.
	6.6.5	An outlet filter shall be fitted to all septic tanks in all new developments.
SB-SAP	6.6.3	In the SB-SAP, the definition of a land application area should be: "the area wetted by effluent from a wastewater treatment unit applied to ground via trenches, beds, raised beds or irrigation. It excludes a reserve area."
	7.4.3.2	Table SOR-2.6.1 in the SB-SAP is revised to ensure secondary treatment for new developments and or significant intensifications of existing uses
	7.4.3.3	Table SOR-S2.7.1 in the SB-SAP is amended so that Clause A1 is consistent with corresponding provisions in the *Director's Guidelines,* and that Clause P1 is revised to include consideration of on-site stormwater management requirements
	7.4.3.3	Table SOR-S2.7.2 Clause P1 in the SB-SAP is revised to include consideration of requirements for on-site wastewater management in addition to stormwater management
Setback (separation) distances	6.6.4	In the Southern Beaches, the risk-based approach to setback distances adopted in the SB-SAP for lots smaller than 1,500m^2 should be extended to all lots.
Relaxed requirement for reserve LAAs	6.6.3	Sorell Council should be flexible in requiring a reserve area be set aside for a new or upgraded OWMS, recognising that on some sites the reserve area is likely to be unnecessary and/or overly risk-averse.
Inspections and adults of OWMS and OSWMSs	8.1	A detailed audit of individual systems be undertaken to provide baseline data for subsequent review of the onsite wastewater provision in the Dodges Ferry commercial area.
	8.1	Individual system inspections be undertaken to identify the current status and capacity of systems, and meetings with property owners and occupiers conducted to confirm or ascertain the typical occupancy and usage of premises and loadings on wastewater systems.

Appendices

1 Community Consultation

2 Stormwater connectivity for properties in the Southern Beaches

3 Stormwater pipes and open drains in the Southern Beaches

4 Flood-prone areas in the Southern Beaches

5 On-site wastewater systems potentially at risk of sea level rise in the Southern Beaches

Appendix 1

(14 pages including this page)

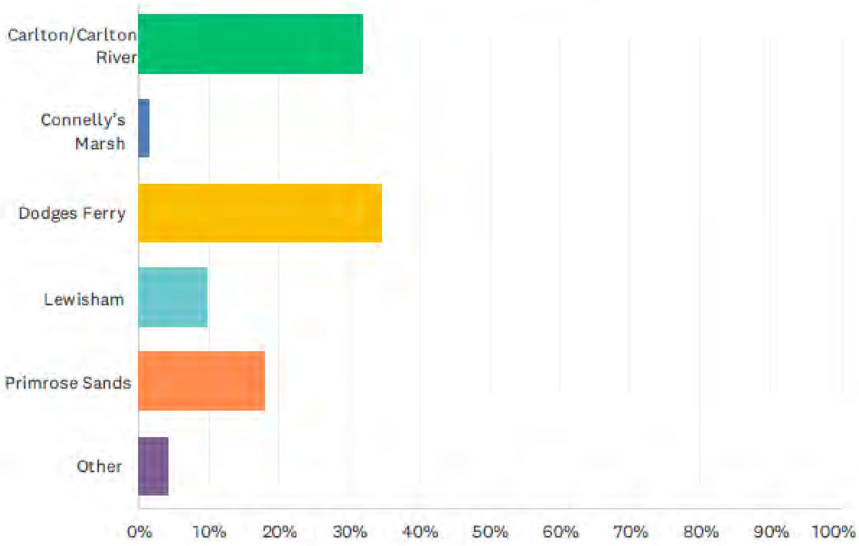
Community Consultation

Survey responses of the December 2024 wastewater and stormwater questionnaire prepared by Sorell Council for residents of the Southern Beaches

Onsite wastewater and stormwater in the Southern Beaches

Q1 What area of the Southern Beaches do you live in?

Answered: 72 Skipped: 0

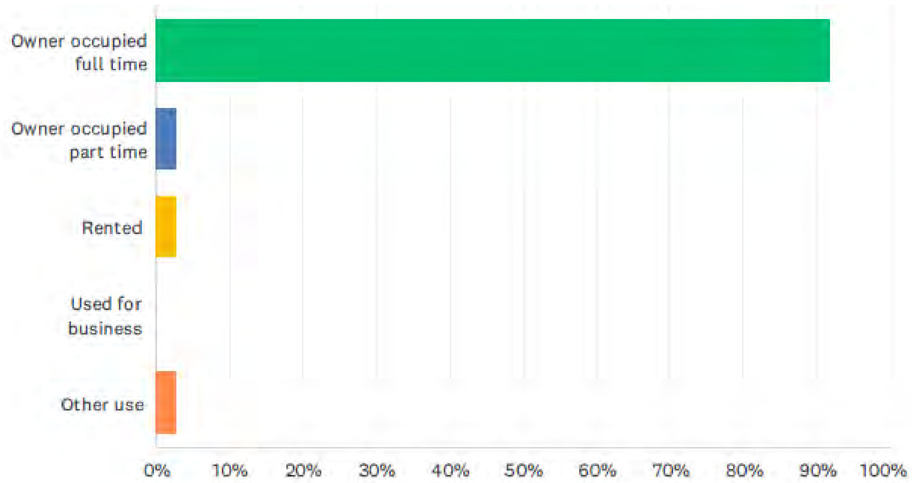


ANSWER CHOICES	RESPONSES	
Carlton/Carlton River	31.94%	23
Connelly's Marsh	1.39%	1
Dodges Ferry	34.72%	25
Lewisham	9.72%	7
Primrose Sands	18.06%	13
Other	4.17%	3
TOTAL		72

Onsite wastewater and stormwater in the Southern Beaches

Q2 Is your property

Answered: 72 Skipped: 0

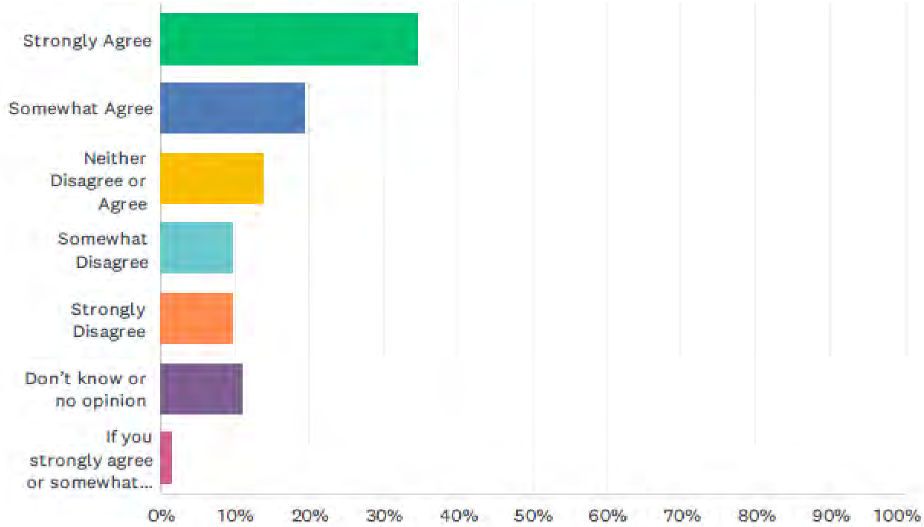


ANSWER CHOICES	RESPONSES	
Owner occupied full time	91.67%	66
Owner occupied part time	2.78%	2
Rented	2.78%	2
Used for business	0.00%	0
Other use	2.78%	2
TOTAL		72

Onsite wastewater and stormwater in the Southern Beaches

Q3 Do you agree or disagree the Southern Beaches is being impacted by septic tank systems and other types of on-site wastewater management systems failing and polluting surface and groundwater?

Answered: 72 Skipped: 0



ANSWER CHOICES	RESPONSES	
Strongly Agree	34.72%	25
Somewhat Agree	19.44%	14
Neither Disagree or Agree	13.89%	10
Somewhat Disagree	9.72%	7
Strongly Disagree	9.72%	7
Don't know or no opinion	11.11%	8
If you strongly agree or somewhat agree, why?	1.39%	1
TOTAL		72

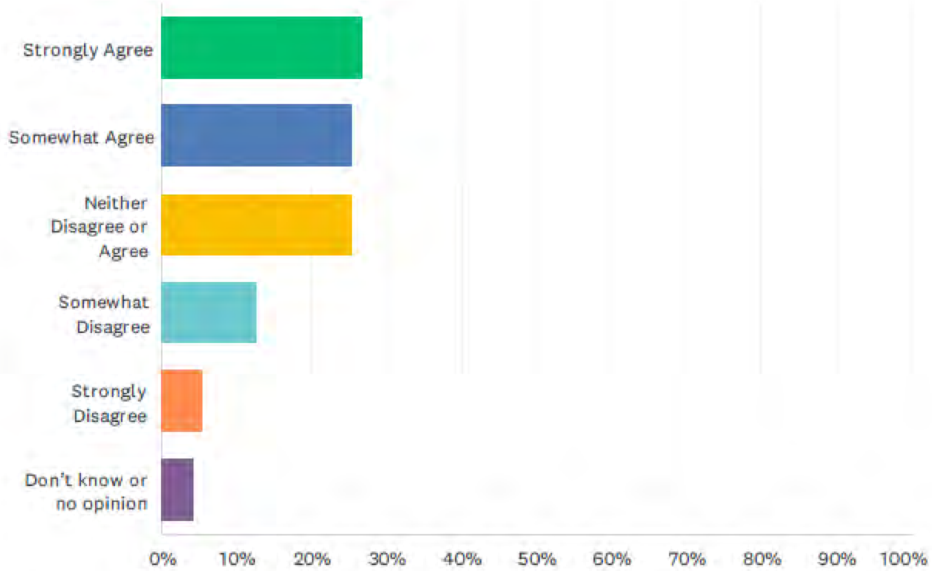
#	IF YOU STRONGLY AGREE OR SOMEWHAT AGREE, WHY?	DATE
1	Some people (e.g. AirBnBs and large households) buy a lot of water. Some people are removing trees and shrubs and concreting a lot of their yard without realising how they impact groundwater	12/24/2024 9:31 PM
2	After significant rainfall there is usually a pungent sewerage smell. There is visual evidence during the dry periods of the year where absorption trenches aren't suitable	12/10/2024 9:52 PM
3	I strongly DISAGREE because so often the concerns are based more on urban myth than real evidence. Yes there are some instances and where that occurs it is being managed by households, better education on how to use tanks and septics and by Council stepping in if needed. How do the actual stats compare with these perceptions? What are the benefits of on-site waste/storm water? Where are they failing and why, what is being done about them?	12/10/2024 12:29 PM
4	I think the installation of curb and guttering,bitumen roads concrete footpaths has more of a in pact. And this is what we would have every where if it was changed	12/10/2024 9:34 AM
5	Over the 70+ years I've been associated with the Dodges Ferry area having a family shack to becoming a permanent resident I have noted an influx of more permanent residents, as more services and subdivisions have been approved in the area. This progress has shown to be putting a huge strain on old septic systems as shacks become more permanent residences, and only new homes have envirocycles.	12/9/2024 3:19 PM
6	I hav proof that the stormwater is polluted and changing the vegetation.	12/7/2024 9:50 PM
7	I agree because I've heard people say that when their arches are full they try to get enviro cycle but it's like 20grand so they just let it spill out over ground until they do new arches.	12/5/2024 7:36 PM
8	Identified the issues first hand.	12/5/2024 1:51 PM
9	I agree, and also strongly support the need for more data to understand the extend of the impact. A clear example is Blue Lagoon and the properties that surround the lagoon, those properties shouldn't be having a special solution with a small onsite wastewater management system? Something like a mini sewage treatment plant? Something that even the Federal gov would fund to protect the red handfish population.	12/5/2024 6:22 AM
10	You only need to smell and see the "water" in the open roadside drains around Primrose to know that the Council have drastically failed in their duty to ensure this does not occur.	12/4/2024 3:09 PM
11	There is evidence of what seems to be septic leaks in the area	12/2/2024 11:02 AM
12	You can see it running down driveways on Carlton beach rd into the gutter and then to sea or lagoon	11/30/2024 9:23 AM
13	When walking around the area there is evidemce if failing septic systems (e.g., green growth in areas where there is no irrigation and where near vwgetation is not lush, smelly and slimy runnoff from some properties even when no recent rain). If theseimlacts are visible, then there must be other non visible impacts).	11/29/2024 7:49 PM
14	I've had several friends with seepage issues and worked in aquaculture having constant closures in Boomer Bay because of overflow	11/29/2024 4:12 PM
15	Water testing has not identified issues where on-site waste water systems are installed properly and maintained accordingly.	11/29/2024 10:57 AM
16	I think the outcomes are obvious	11/25/2024 10:03 AM
17	Parts of the southern beaches not all	11/25/2024 8:18 AM
18	Septic water leaking into the water ways is very easy to observe	11/20/2024 2:45 PM

19	People don't empty their septics regularly; Trenches aren't installed correctly or at all; Too many people are now living in the area in small residential blocks.	11/19/2024 11:15 PM
20	No understanding of how septic works for some residents/tenants and also cost prohibitive to maintain properly for most.	11/19/2024 6:57 PM
21	Because I know these old shack sewerage systems are failing when it's extra wet	11/19/2024 6:27 PM
22	Most houses salon the area are old shacks built prior to current standards. Most are worn and leaching is inevitable. There is frequently septic odours in the area.	11/19/2024 6:20 PM
23	Swimming after heavy rain not recommended and environmental concerns	11/19/2024 8:56 AM
24	I believe a number of existing older waste water treatment systems are ineffective at keeping pollutants out of our environment.	11/18/2024 10:40 AM
25	More full time residents in old shacks with old systems. Wet weather leaching septic in to the bays.	11/16/2024 6:43 PM
26	Some houses do seem to have systems that are not working well. However, predominately, I think most systems work well.	11/16/2024 1:28 PM
27	Even the new awts systems designed by a so called designer are failing within months of being installed. All because the designers don't listen to the owners of the dwelling. With absolutely no comeback to them.	11/16/2024 10:30 AM
28	waste water leeching on Primrose beach near the boat ramp & Susans Bay etc (when we get rain) When we were at Lewisham also somewhat similar with surface sludge	11/16/2024 9:16 AM
29	There is frequently the smell of sewage around the neighbourhood. Unfortunately tenants or holiday rentals just don't maintain their septic systems.	11/15/2024 9:50 PM
30	Because it's a bit silly that we're the largest community in Australia without sewers.	11/15/2024 7:04 PM
31	I disagree with historical agreements made with the council by the Lewisham Tavern for example whereby they can empty their overflow of toilet waste directly into the bay. Houses within the Southern Beaches area still have grey water pump systems that directly flow onto gardens. I remember having a conversation with a retired politician who described to me the potential health crisis that is looming as a result of the failure of the septic systems within this area. The run off from the bank surrounding Okines beach can be often times be foul smelling after a rain.	11/15/2024 6:44 PM
32	I am a local plumber and we are constantly being engaged to investigate failed septic systems that are releasing effluent at ground level. Owners looking to build are given too much say in what type of system they would prefer and we are seeing more and more unsuitable designs being passed eg traditional soakage trenches in heavy clay soils	11/15/2024 6:13 PM

Onsite wastewater and stormwater in the Southern Beaches

Q4 Do you agree or disagree that onsite stormwater (spilling from water tanks, driveways and buildings) is generally not managed effectively?

Answered: 71 Skipped: 1

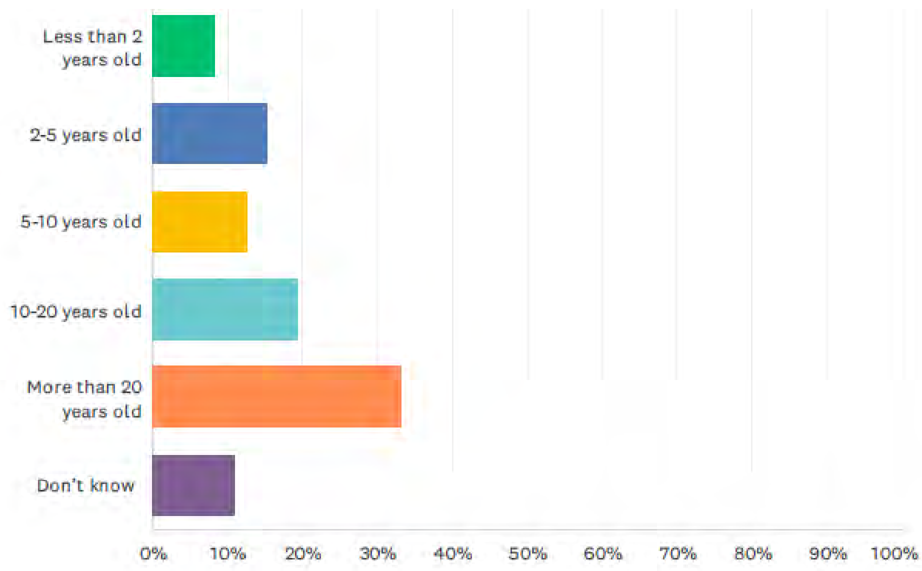


ANSWER CHOICES	RESPONSES	
Strongly Agree	26.76%	19
Somewhat Agree	25.35%	18
Neither Disagree or Agree	25.35%	18
Somewhat Disagree	12.68%	9
Strongly Disagree	5.63%	4
Don't know or no opinion	4.23%	3
TOTAL		71

Onsite wastewater and stormwater in the Southern Beaches

Q5 How old is your on-site wastewater management system is?

Answered: 72 Skipped: 0

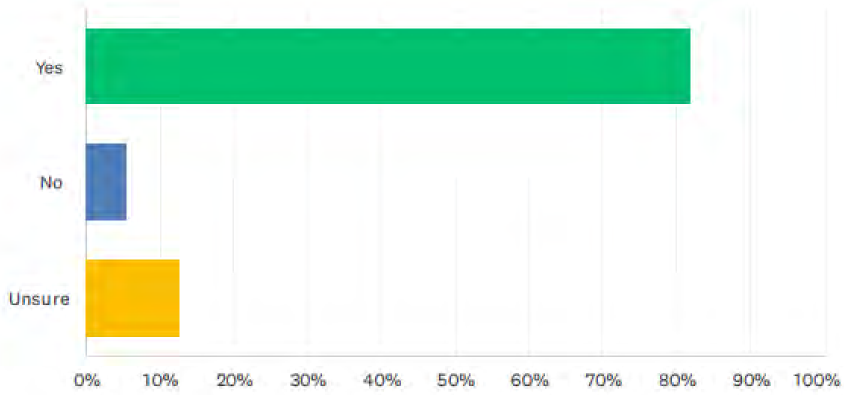


ANSWER CHOICES	RESPONSES	
Less than 2 years old	8.33%	6
2-5 years old	15.28%	11
5-10 years old	12.50%	9
10-20 years old	19.44%	14
More than 20 years old	33.33%	24
Don't know	11.11%	8
TOTAL		72

Onsite wastewater and stormwater in the Southern Beaches

Q6 Do you know how to manage your on-site wastewater management system correctly?

Answered: 72 Skipped: 0

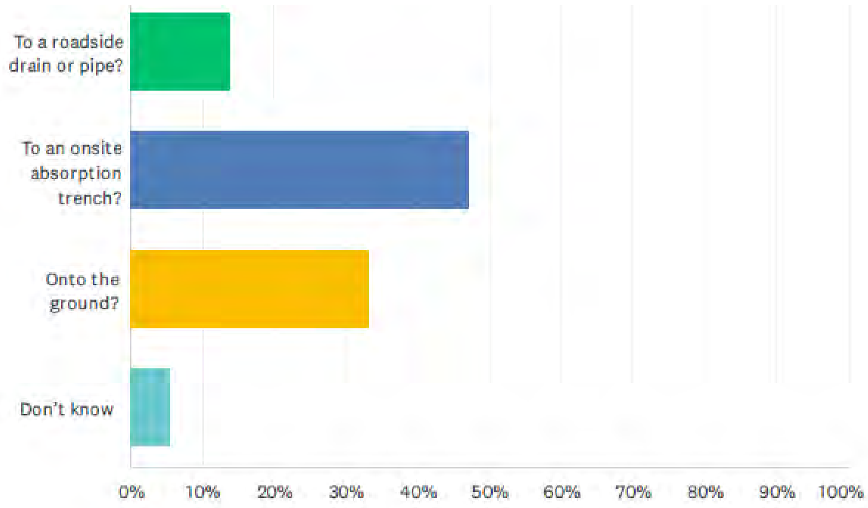


ANSWER CHOICES	RESPONSES	
Yes	81.94%	59
No	5.56%	4
Unsure	12.50%	9
TOTAL		72

Onsite wastewater and stormwater in the Southern Beaches

Q7 Does the overflow from your water tank/s discharge:

Answered: 72 Skipped: 0

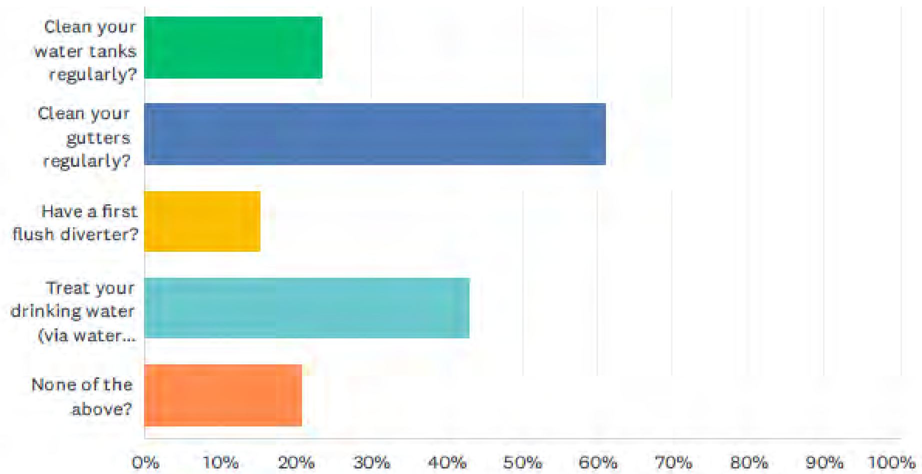


ANSWER CHOICES	RESPONSES	
To a roadside drain or pipe?	13.89%	10
To an onsite absorption trench?	47.22%	34
Onto the ground?	33.33%	24
Don't know	5.56%	4
TOTAL		72

Onsite wastewater and stormwater in the Southern Beaches

Q8 Thinking about your water tanks, do you (select all that apply):

Answered: 72 Skipped: 0



NSWER CHOICES	RESPONSES	
lean your water tanks regularly?	23.61%	17
lean your gutters regularly?	61.11%	44
lave a first flush diverter?	15.28%	11
reat your drinking water (via water filter, chlorination or boil)?	43.06%	31
lone of the above?	20.83%	15
otal Respondents: 72		

Onsite wastewater and stormwater in the Southern Beaches

Q9 Do you have any other comments you wish to make about wastewater or stormwater in the Southern Beaches?

Answered: 41 Skipped: 31

#	RESPONSES	DATE
1	Real estate agents should be obliged to inform prospective buyers that it is unlikely that reticulated water and sewerage systems will be built for half a century, that there are limits on house size and yard sealing and that retaining trees is crucial to not contaminating yards and beaches. Council could produce a brochure and require that buyers acknowledge in writing they have read it before signing purchase contracts. Council should use AI to monitor for new unauthorised hard surfaces. and enforce controls	12/24/2024 9:31 PM
2	There seems to be real inconsistencies with what houses have to do to pass the planning stages with onsite wastewater systems. Large houses on smaller blocks along the waterfront only have very small absorption areas. People on larger blocks are expected to put in much larger absorption areas. Why is this?	12/10/2024 9:52 PM
3	Our lived experience as a community shows that the number of failing systems or illness as a result of tank water etc is very, very low. The Southern Beaches communities mostly live happily with tank water and on-site waste systems. We are self sufficient and that's a good thing. Managing our water and waste on site is generally good for the environment and any faults or failures can be managed on a site by site basis without needing expensive piped systems. The water cartage businesses are important in the community as small businesses and helping households to do the right thing. What is the impact of the extra water trucked in? What would be the impact if grey water could be piped onto gardens? What is the dollar value invested in the thousands of on-site water and waste systems already in use? The huge cost of piped water and sewerage system is not value for money, a false hope, and it's much better and cheaper as a community to invest a fraction of that cost improving onsite water/waste standards (including using grey water), householder education, rental/visitor property owner permit standards and subsidies for lower income households to help upgrade or maintain their on-site systems at a liveable standard. Educate the media so they stop talking about the Southern Beaches as if we're missing out or living in squalor - focus them on living well with onsite water/waste. Plant more trees and gardens, increase permeable surfaces and stop cutting mature trees and land clearing that reduces the capacity of the ground. Update the local planning laws so developments are fit for purpose here, not based on rules for other places.	12/10/2024 12:29 PM
4	We need to take an organic approach! Treasure out wetlands. Encourage more planting of native Bushland and stop so many subdivisions!!	12/10/2024 9:34 AM
5	There has been issues with drainage in Kannah Street, Dodges Ferry with Council drain the nearby lagoon, which I don't recall happening before, so this must be a problem, and I don't think this is a satisfactory solution ! I also see future problems with runoff thru Council owned property between the Dodges Ferry Fire Brigade and School, which may eventually create future flooding of residences at the bottom of Rantons Road, and nearby beaches leading to erosion!	12/9/2024 3:19 PM
6	Council has directed an outflow pipe directly on to my property. In lite of the recent council public meeting on wastewater management I know know that this water is polluted and represents a health hazard. Council has a waste water management plan that directs water around my property however has failed to implement it which results in me incurring expenses.	12/7/2024 9:50 PM
7	The enviro cycle system is an expensive ploy developed by the council to fill the pockets of the selected plumbing companies	12/7/2024 8:06 PM

8	It se me Some areas get drains but others don't. In dire need of drainage along Franklin street lewisham and widening/drainage of scenic drive lewisham	12/7/2024 11:17 AM
9	Waste water systems would be a good thing for the community and its environment	12/5/2024 7:36 PM
10	There are many larger properties where wastewater management is satisfactory. Smaller properties may not be as well managed.	12/5/2024 6:06 PM
11	Gutters/ downpipes and sewerage from older homes, and council provided stormwater drainage trenches are an issue - more needs to be done. These water/septic issues are being absorbed by neighbouring properties.	12/5/2024 3:43 PM
12	More ongoing attention is needed, often the system approved is not suitable, permit clauses are not enforced by Council.	12/5/2024 1:51 PM
13	Wastewater: there's a need for a plan to reduce the amount of chemicals and microplastics that people put into the onsite wastewater systems and that ends up in the soil, ground water, and in natural water systems. This includes the amount of chlorine poured into the envirocycles during maintenance visits. Maybe a partnership with UTAS engineering researchers? Stormwater: There is a need for a plan to prevent suburban rivers and to soak stormwater into the ground. This could include details even as to the types of plants and trees needed in private and public gardens to support this absorption. The Southern Beaches is one of the driest in the state and stormwater shouldn't be treated as a problem to be drained down the pipes, it should be treated as a scarce and limited resource. All our properties are part of an interconnected system and we should all understand how to help continue using these systems in an environmentally and socially responsible way. Many want the Southern Beaches to continue and strengthening the use of onsite wastewater and using stormwater as the main source of water in our properties as this is the most sustainable solution there is. Many places in the world are trying to transition to that and we are already there so we need to become a successful example for the state and the country.	12/5/2024 6:22 AM
14	Council have failed in proliferation of shacks, vans and sheds for habitation without regards to effluent usage. Council has not provided adequate or any drainage when making roads. Council continues to allow runtreated run off from open drains into the Bay without regard to marine environment.	12/4/2024 3:09 PM
15	We purchased our house less than 6 months ago and need to learn more about this issue	12/1/2024 4:20 PM
16	The cost should be for the ratepayers in this area only as midway point ratepayers have already payed for their upgrades in their rates.	11/30/2024 9:23 AM
17	As many of the issues are with older properties, could properties where the council has no record of the wastewater system be required to get a report assessing the efficacy of the system?	11/29/2024 7:49 PM
18	We like having our waste water being used to irrigate our lawn.	11/29/2024 5:04 PM
19	Grey water systems seem to be becoming increasingly used and these also flow onto neighbouring properties	11/29/2024 12:09 PM
20	Reduce air pollution from low flying g jets. Support flight paths not directly over communities reliant on tank water supply.	11/29/2024 10:57 AM
21	Storm water drains are a joke in Primrose Sands. We have gutters that can't be piped and covered as water has nowhere to go. Thanks to councils poor management for years & years !!!	11/28/2024 4:42 PM
22	Connellys Marsh is unique. It does not have the population numbers where drainage, sewerage, wastewater is an issue. Large blocks, few permanent occupants does not require any action or change, especially a mains type wastewater, or water supply system. While it remains unlikely that any suburban subdivision will or can occur here there is no need for change.	11/27/2024 7:28 PM

23	Council has invested in sealed roads, kerb and guttering and concrete pipes to manage stormwater in Southern Beaches. Council has failed to address the impact of removing rain water from the environment and capturing and speeding contaminated stormwater and delivering it unfiltered into wetlands and the marine environment. Council must invest in environmentally sustainable management of water throughout the catchment on private and public land.	11/27/2024 6:03 PM
24	People shouldn't be penalised if their property has not long been constructed and passed on council	11/25/2024 4:31 PM
25	Connect us to town water and sewer	11/25/2024 10:03 AM
26	I'm happy with how things stand, I do not wish to have town water or waste water connected to either of my houses at southern beaches.	11/21/2024 11:35 PM
27	When are we getting town water and sewerage?	11/19/2024 8:27 PM
28	That's it, that is all the survey wanted to know??? How in the turtle stampede world is this going to offer vital info.. 18 years of living down this way and this has to be the most basic, ambiguous survey I have seen thus far	11/19/2024 7:01 PM
29	There is no plumbing plans on most old houses and owners have no idea how to manage the systems. There is nowhere to access this information and the council lacks records of older buildings. People tend not to approach council because the council then expects owners to comply with current standards at unreasonable costs due to the lack of records and old systems.	11/19/2024 6:20 PM
30	It would be great to be able to opt out rather than being forced to pay extra for unwanted services.	11/19/2024 1:45 PM
31	Would be great to find info on water quality monitoring in our area	11/19/2024 8:56 AM
32	Sorell Council should consider introducing a regulation/by-law that compels a property owner to have a compliant waste water system prior to selling a property.	11/18/2024 10:40 AM
33	is this to increase development and therefore council rate base.It is ok as it is at the moment that is why it is popular	11/17/2024 1:34 PM
34	Reticulated mains water and sewers should have been installed years ago. It's like living in a third world country here!	11/16/2024 10:30 AM
35	Have only been at Primrose just over 4 years and hasn't been overly wet but the sandy soil certainly makes a difference compared to Lewisham clay & dolerite. Tanks haven't come near overflowing in that time	11/16/2024 9:16 AM
36	Our neighbours house has been vacant for years and their tank is overflowing and consistently leaking onto our property.	11/15/2024 9:50 PM
37	Town water lines (and sewage lines) should be connected into the soon to be expanded south east irrigations scheme and pipes to dodge's ferry primary school oval to deliver water from Derwent into a dam for town water. With over 5,000 residents and rapidly growing, southern beaches needs a reliable water supply from town water! Frequent droughts and the dry nature of the area means residents fork out hundreds or thousands of dollars a year for water cartage!	11/15/2024 8:12 PM
38	There is need for more regulation on limiting hard surfaces, concrete paving etc, excessive driveways and parking spaces. Individual existing waste water systems should be upgraded by the owners with financing help in the form of loans etc. Individuals need to be made more aware of their responsibilities with water collection, consumption and disposal. Change or reduction of LAA via a sewage system could lead to huge rezoning issues to higher density and or high rise . The estimated cost (60-80,000) per property is way beyond the reach of residence , this will make living here extremely hard for low income earners and further add to the homelessness issue as young families will be forced to leave .	11/15/2024 8:02 PM
39	Yes. Please give us sewers. They are so much more sensible than buying water and storing your waste under your house then have to get a quarterly check from a private company.	11/15/2024 7:04 PM
40	I would love to stop having to buy water and have normal sewage.	11/15/2024 6:55 PM
41	Need to look at the idea of phasing out outdated septic and trench systems in favour of aerated wastewater treatment systems which treat effluent to a much higher standard and work a hell of a lot better	11/15/2024 6:13 PM

Appendix 2

(12 pages including this page)

Stormwater connectivity for properties in the Southern Beaches

Map 2.1	**Lewisham**
Map 2.2	**Lewisham – Dodges Ferry**
Map 2.3	**Dodges Ferry**
Map 2.4	**Dodges Ferry – Carlton**
Map 2.5	**Dodges Ferry – Carlton**
Map 2.6	**Carlton**
Map 2.7	**Carlton**
Map 2.8	**Primrose Sands**
Map 2.9	**Primrose Sands**
Map 2.10	**Primrose Sands**
Map 2.11	**Connellys Marsh**

These maps show which properties in the Southern Beaches:

- (pink) are connected to pipework, or could connect, but network is at capacity
- (blue) are not connected to pipework, but could connect; network is not at capacity
- (yellow) discharge to existing open table drains, or could discharge; no information on drain capacity

Base maps from www.thelist.tas.gov.au, and road data ©Sorell Council 2022.
Maps produced by Sorell Council December 2024

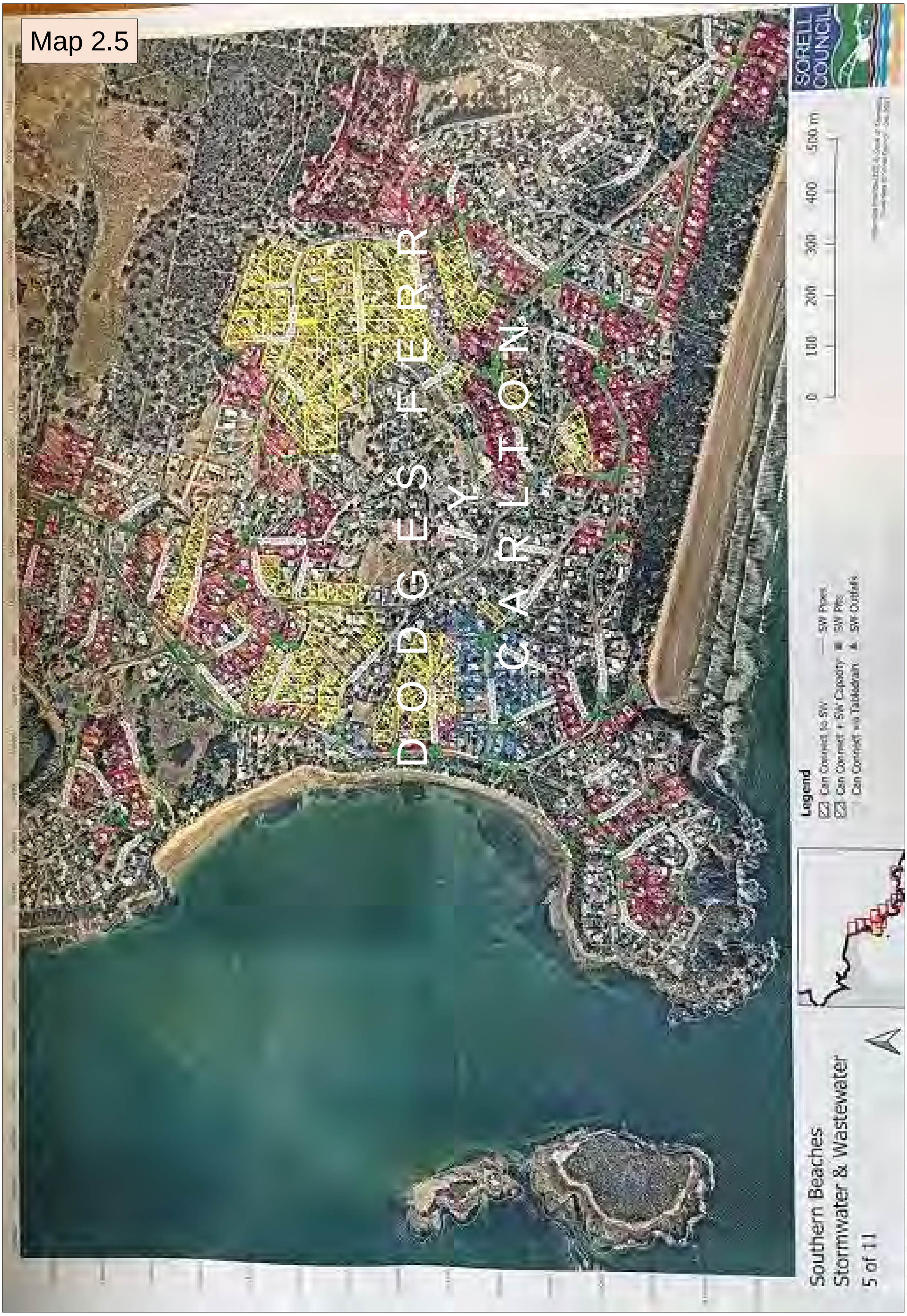

Map 2.1
LEWISHAM
SORELL COUNCIL
Legend
Can Connect to SW
Can Connect + SW Capacity
Can Connect via Tabledrain
SW Pipes
SW Pits
SW Outfalls
0 100 200 300 400 500 m
Southern Beaches
Stormwater & Wastewater
1 of 11


Map 2.2
LEWISHAM DO
DODGES FERRY
SORELL COUNCIL
0 100 200 300 400 500 m
Legend
Can Connect to SW
Can Connect + SW Capacity
Can Connect via Tabledrain
SW Pipes
SW Pits
SW Outfalls
Southern Beaches
Stormwater & Wastewater
2 of 11


Map 2.3
DODGES FERRY
Southern Beaches
Stormwater & Wastewater
3 of 11
SORELL COUNCIL
Legend
SW Pipes
SW Pits
SW Outfalls
0 100 200 300 400 500 m

Map 2.4


DODGES FERRY
CARLTON
SORELL COUNCIL
Legend
Southern Beaches
Stormwater & Wastewater
4 of 11


Map 2.5
DODGES FERRY
CARLTON
SORELL COUNCIL
Legend
Southern Beaches
Stormwater & Wastewater
5 of 11


CARLTON
Legend
Can Connect to SW
Can Connect = SW Capacity
Can Connect Via Tableedrain
SW Pipe
SW Pits
SW Outfalls
0 100 200 300 400 500 m
Southern Beaches
Stormwater & Wastewater
6 of 11
SORELL COUNCIL
Map 2.6

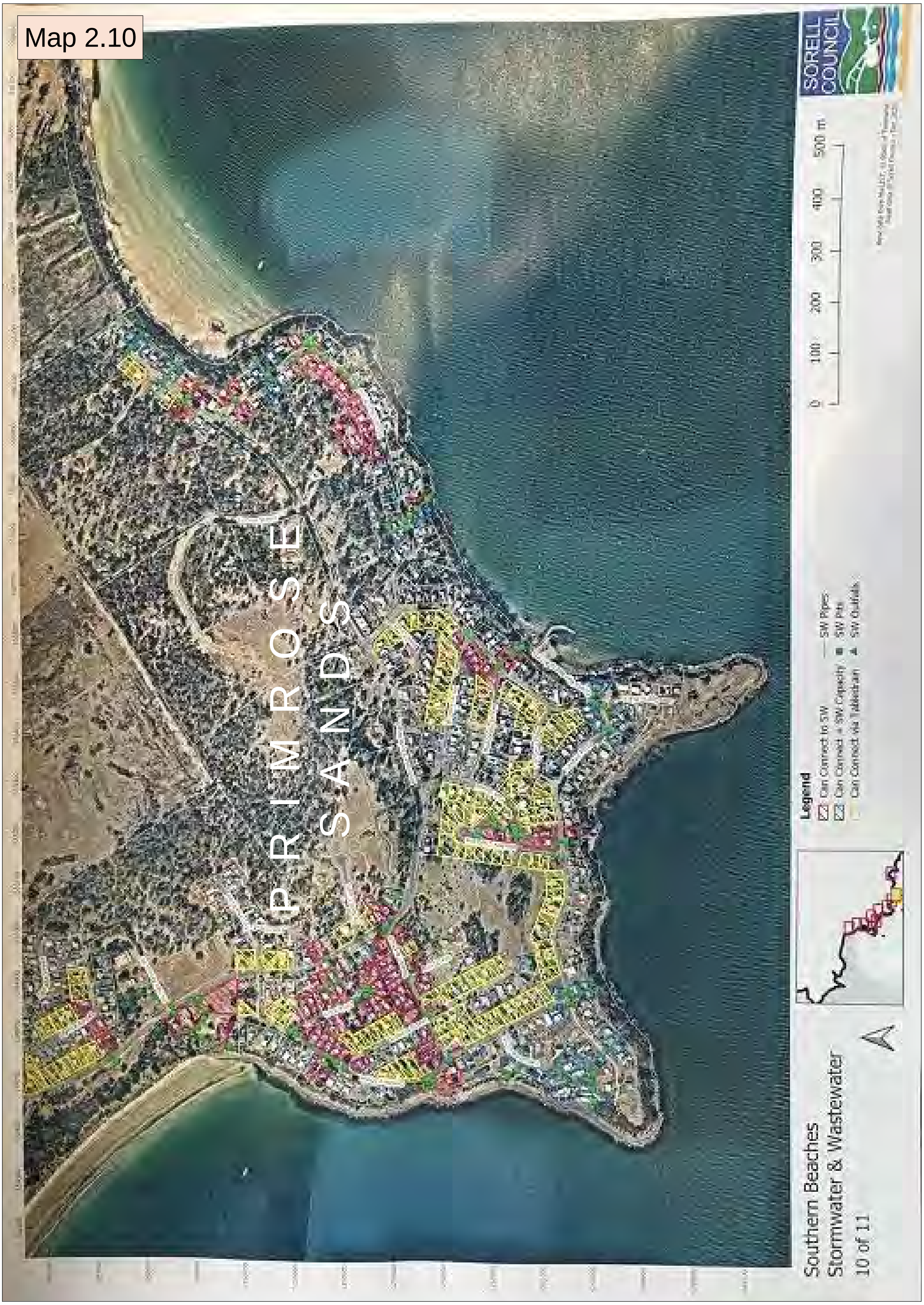

Map 2.7
CARLTON
Legend
SORELL COUNCIL
Southern Beaches
Stormwater & Wastewater
7 of 11

Map 2.8


PRIMROSE SANDS
SORELL COUNCIL
Southern Beaches
Stormwater & Wastewater
8 of 11
0 100 200 300 400 500 m


PRIMROSE SANDS
SORELL COUNCIL
Legend
Can Connect to SW
Can Connect + SW Capacity
Can Connect via Trafalgar
SW Pipes
SW Pits
SW Outfalls
0 100 200 300 400 500 m
Southern Beaches
Stormwater & Wastewater
9 of 11

Map 2.9


Map 2.10
PRIMROSE
SANDS
Legend
SW Pipes
SW Pits
SW Outfalls
0
100
200
300
400
500 m
SORELL COUNCIL
Southern Beaches
Stormwater & Wastewater
10 of 11


Map 2.11
CONNOLLYS
MARSH
Legend
Southern Beaches
Stormwater & Wastewater
11 of 11

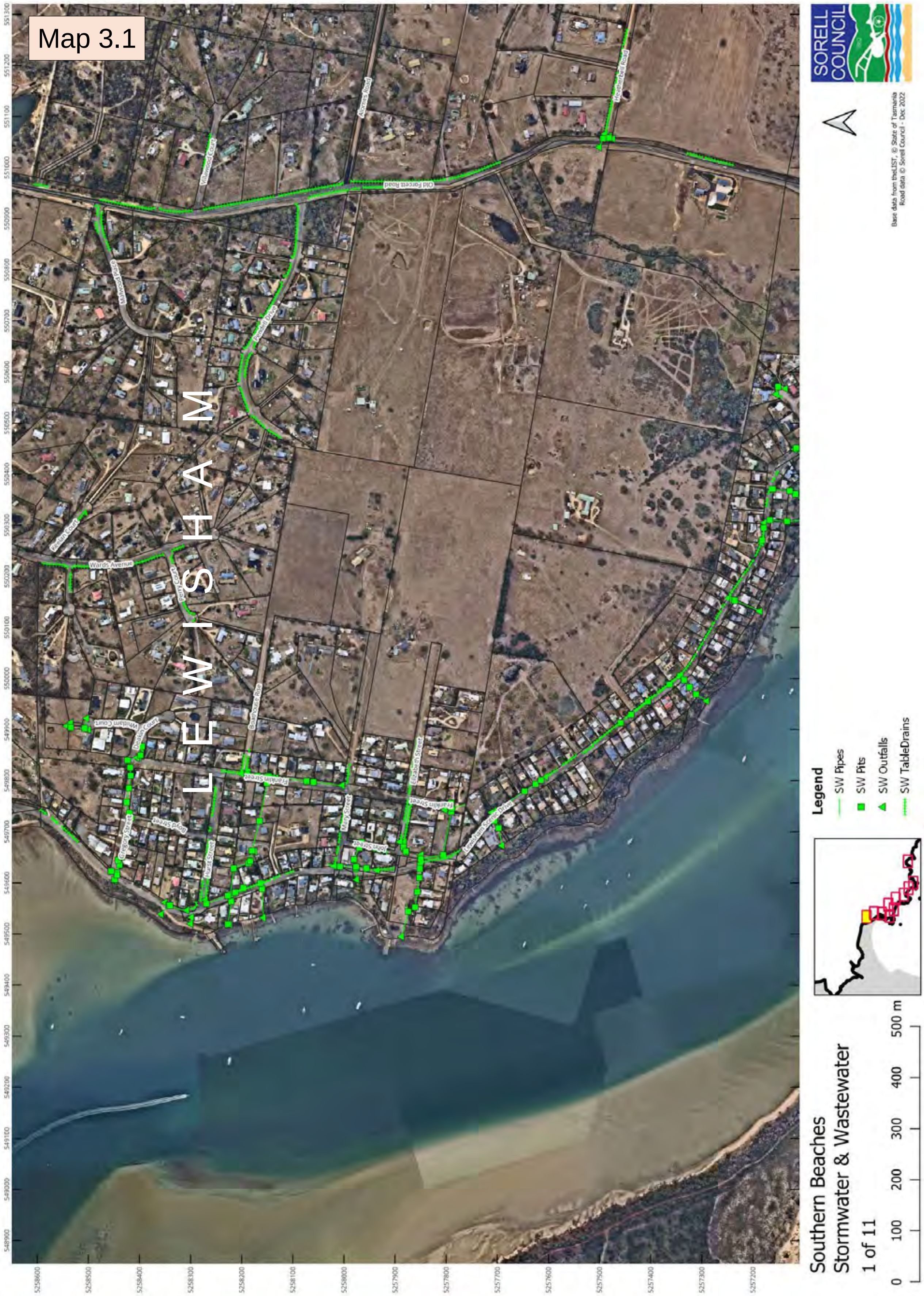
Appendix 3

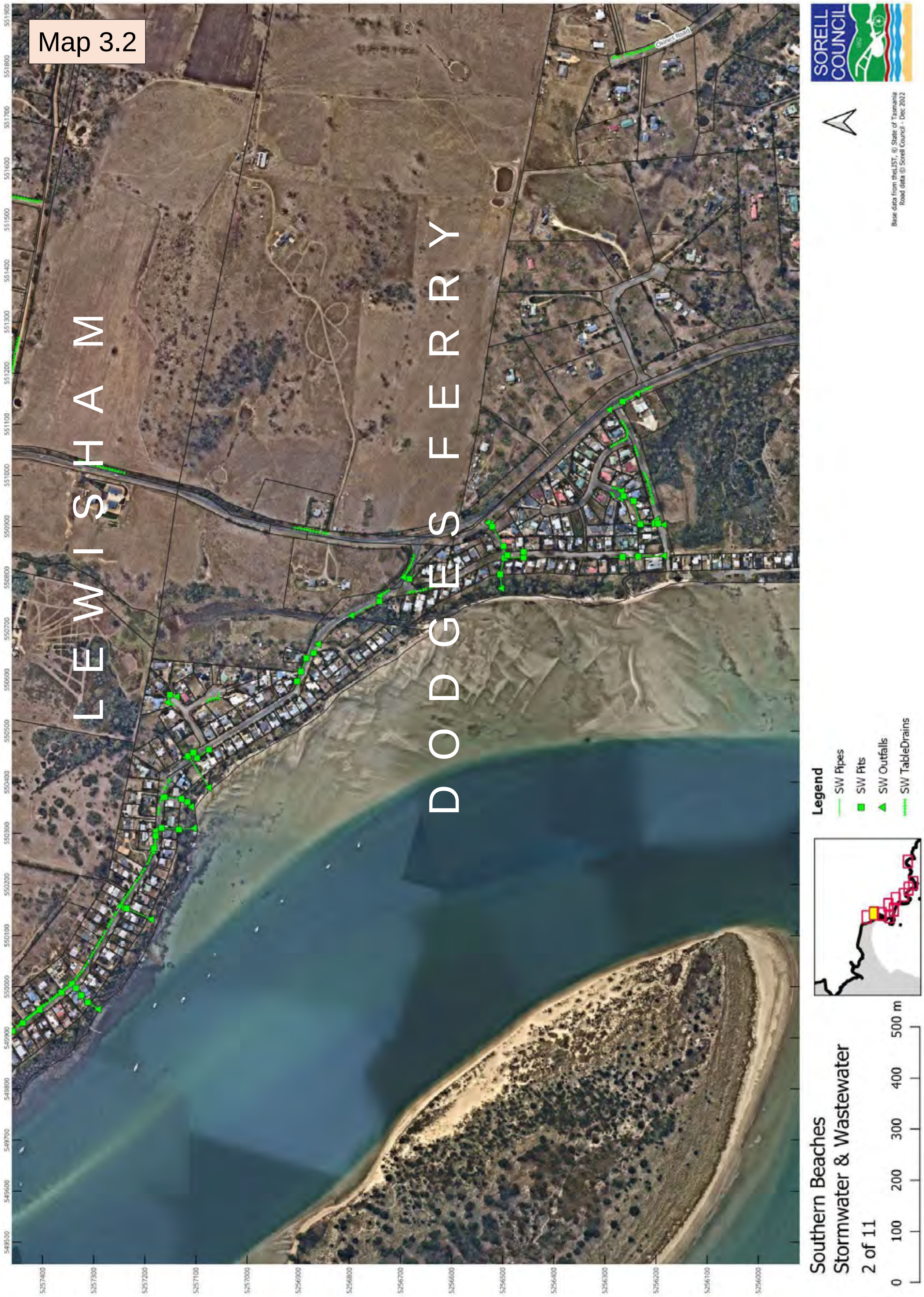
(12 pages including this page)

Stormwater pipes and open drains in the Southern Beaches

Map 3.1	**Lewisham**
Map 3.2	**Lewisham – Dodges Ferry**
Map 3.3	**Dodges Ferry**
Map 3.4	**Dodges Ferry – Carlton**
Map 3.5	**Dodges Ferry – Carlton**
Map 3.6	**Carlton**
Map 3.7	**Carlton**
Map 3.8	**Primrose Sands**
Map 3.9	**Primrose Sands**
Map 3.10	**Primrose Sands**
Map 3.11	**Connellys Marsh**

Base maps from www.thelist.tas.gov.au, and road data © Sorell Council 2022.
Maps produced by Sorell Council December 2024


Map 3.1
LEWISHAM
Old Forcett Road
Wards Avenue
Franklin Street
Legend
SW Pipes
SW Pits
SW Outfalls
SW TableDrains
SORELL COUNCIL
Southern Beaches
Stormwater & Wastewater
1 of 11
0
100
200
300
400
500 m


Map 3.2
LEWISHAM
DODGES FERRY
SORELL COUNCIL
Legend
SW Pipes
SW Pits
SW Outfalls
SW TableDrains
Southern Beaches
Stormwater & Wastewater
2 of 11
0 100 200 300 400 500 m

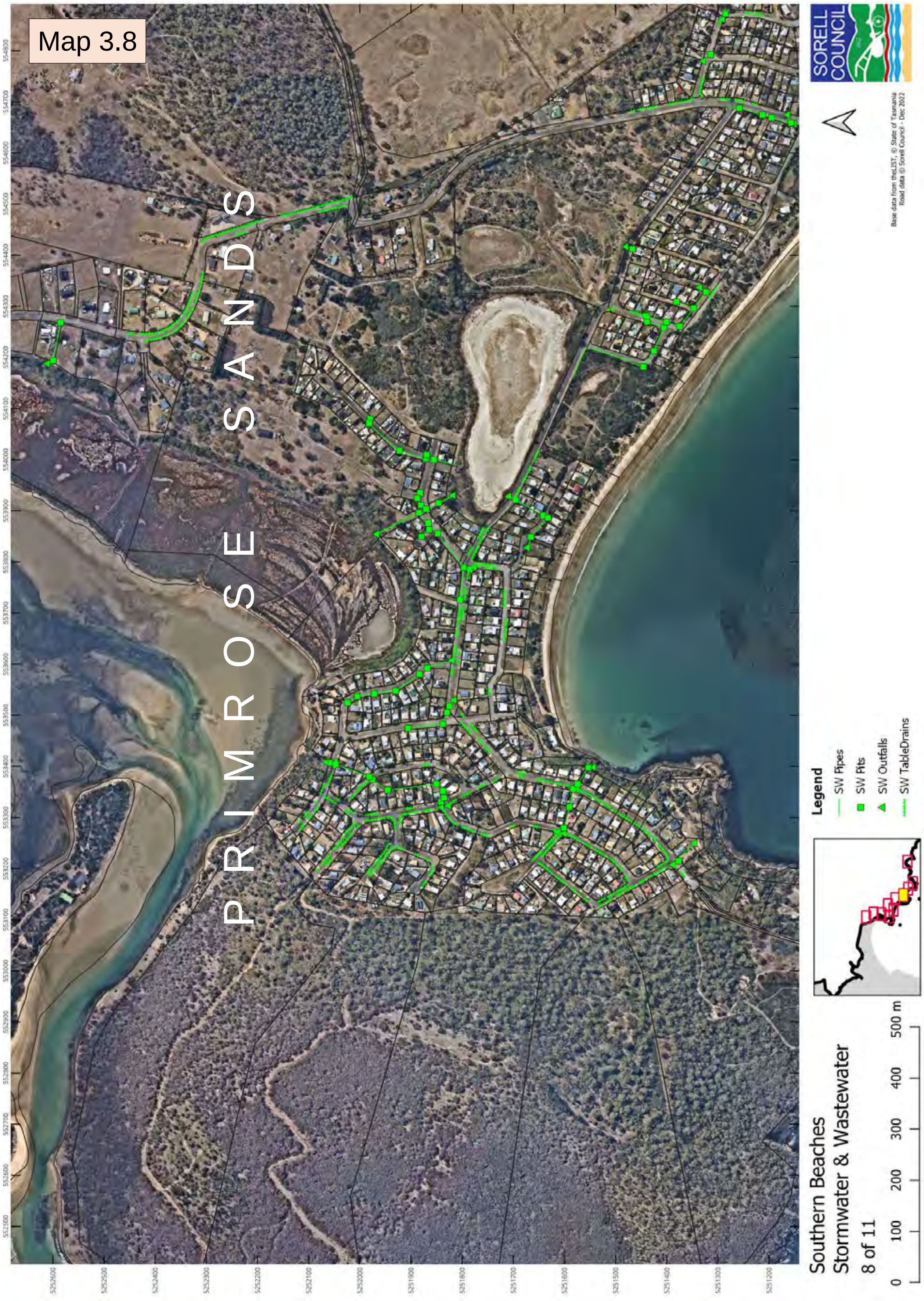

Map 3.3
DODGES FERRY
SORELL COUNCIL
Legend
SW Pipes
SW Pits
SW Outfalls
SW TableDrains
Southern Beaches
Stormwater & Wastewater
3 of 11
0 100 200 300 400 500 m


Map 3.4
DODGES FERRY
CARLTON
SORELL COUNCIL
Legend
SW Pipes
SW Pits
SW Outfalls
SW TableDrains
Southern Beaches
Stormwater & Wastewater
4 of 11
0 100 200 300 400 500 m


Map 3.5
DODGES FERRY
CARLTON
SORELL COUNCIL
Legend
SW Pipes
SW Pits
SW Outfalls
SW TableDrains
Southern Beaches
Stormwater & Wastewater
5 of 11
0
100
200
300
400
500 m


Map 3.6
CARLTON
SORELL COUNCIL
Legend
SW Pipes
SW Pits
SW Outfalls
SW TableDrains
Southern Beaches
Stormwater & Wastewater
6 of 11
0 100 200 300 400 500 m


Map 3.7
CARLTON
SORELL COUNCIL
Legend
SW Pipes
SW Pits
SW Outfalls
SW TableDrains
Southern Beaches
Stormwater & Wastewater
7 of 11
0 100 200 300 400 500 m


Map 3.8
PRIMROSE SANDS
SORELL COUNCIL
Legend
SW Pipes
SW Pits
SW Outfalls
SW TableDrains
Southern Beaches
Stormwater & Wastewater
8 of 11
0
100
200
300
400
500 m


Map 3.9
PRIMROSE SANDS
Legend
SW Pipes
SW Pits
SW Outfalls
SW TableDrains
Southern Beaches
Stormwater & Wastewater
9 of 11
0 100 200 300 400 500 m
SORELL COUNCIL


Map 3.10
PRIMROSE SANDS
SORELL COUNCIL
Legend
SW Pipes
SW Pits
SW Outfalls
SW TableDrains
Southern Beaches
Stormwater & Wastewater
10 of 11
0
100
200
300
400
500 m


Map 3.11
CONNOLLYS MARSH
SORELL COUNCIL
Base data from theLIST, © State of Tasmania
Road data © Sorell Council - Dec 2022
Legend
SW Pipes
SW Pits
SW Outfalls
SW TableDrains
Southern Beaches
Stormwater & Wastewater
11 of 11
0 100 200 300 400 500 m

Appendix 4

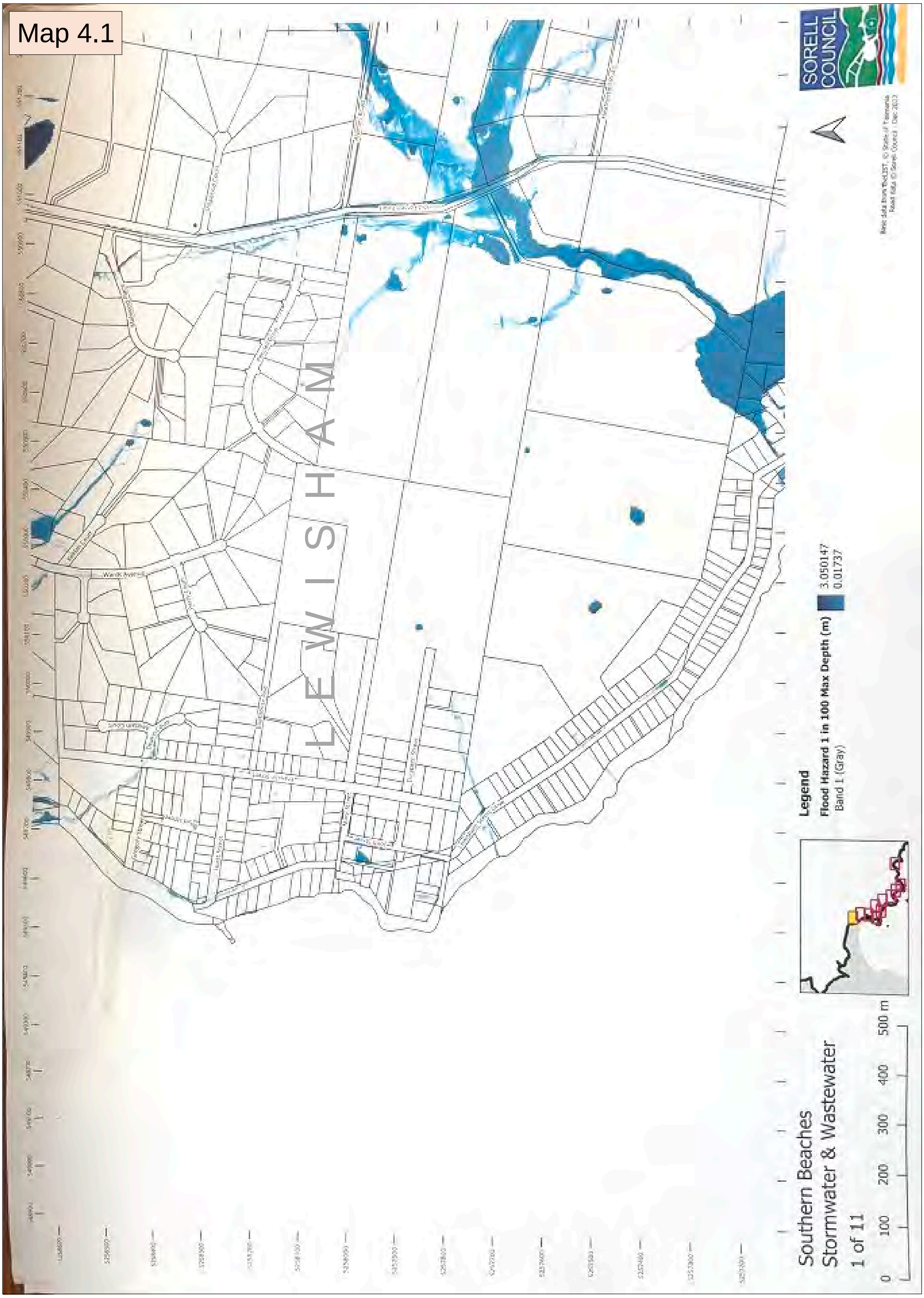
(12 pages including this page)

Flood-prone areas in the Southern Beaches

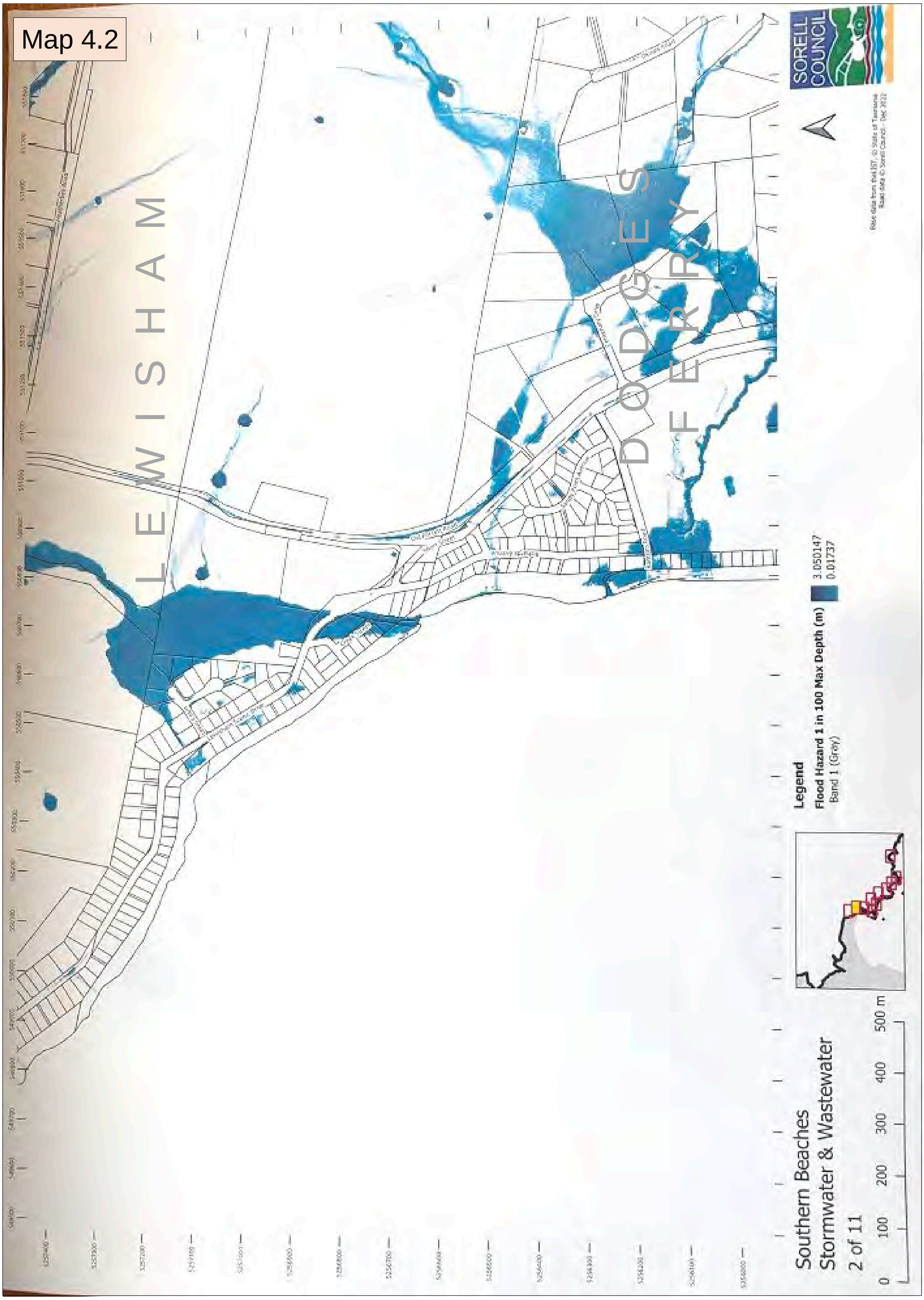
Map 4.1 Lewisham
Map 4.2 Lewisham – Dodges Ferry
Map 4.3 Dodges Ferry
Map 4.4 Dodges Ferry – Carlton
Map 4.5 Dodges Ferry – Carlton
Map 4.6 Carlton
Map 4.7 Carlton
Map 4.8 Primrose Sands
Map 4.9 Primrose Sands
Map 4.10 Primrose Sands
Map 4.11 Connellys Marsh

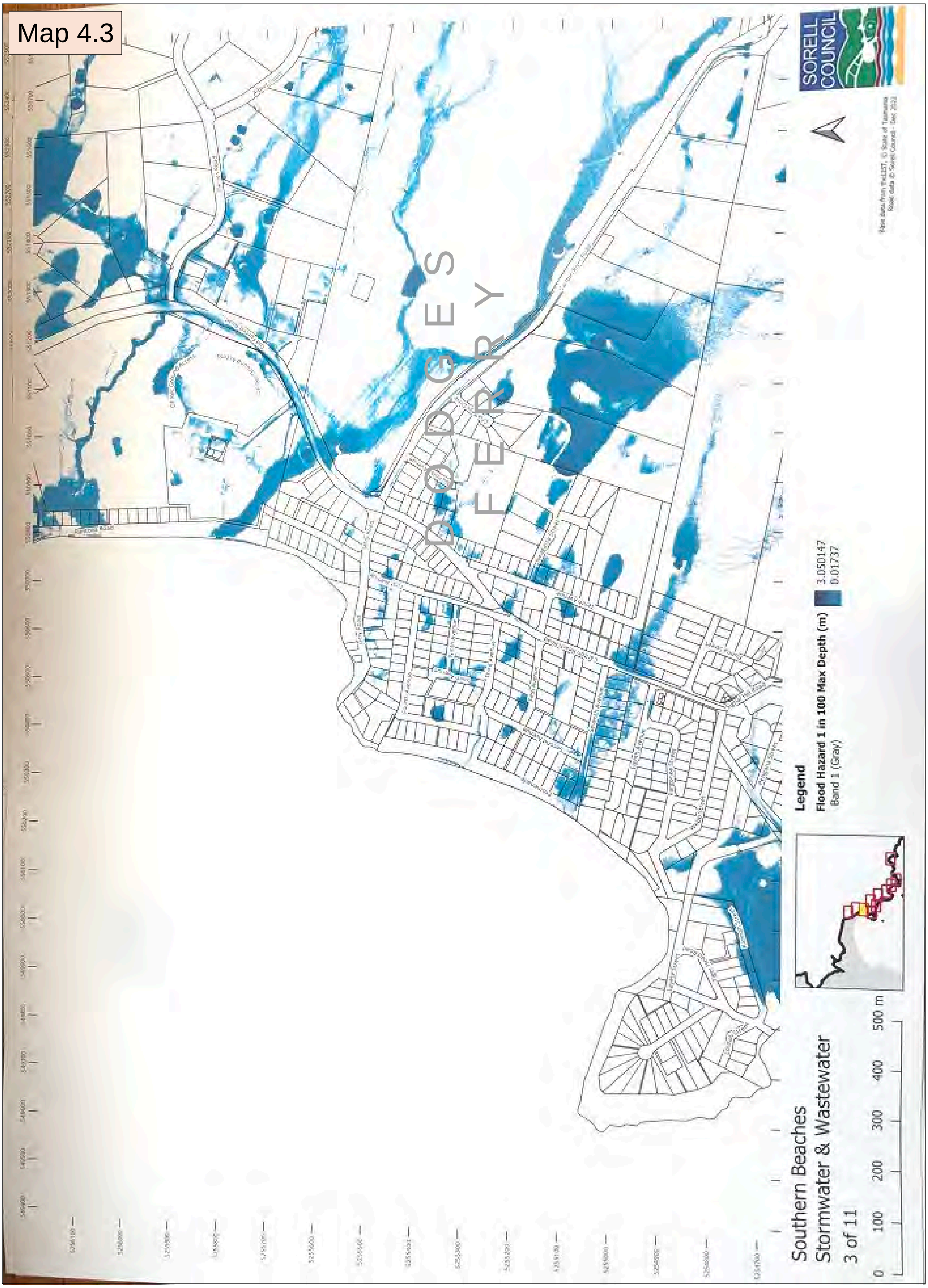
Flood-prone areas are those shown by modelling to be affected by 1 in 100 year flood hazards [approximately equivalent to 1% Annual Exceedance Probability (AEP) rain events]. The Legend on each map shows the modelled flood water depth (m): the darkest blue on the bar scale is 3m flood water depth, and the lightest blue shading is 0.1m depth.

Base maps from www.thelist.tas.gov.au, and road data © Sorell Council 2022.
Maps produced by Sorell Council December 2024

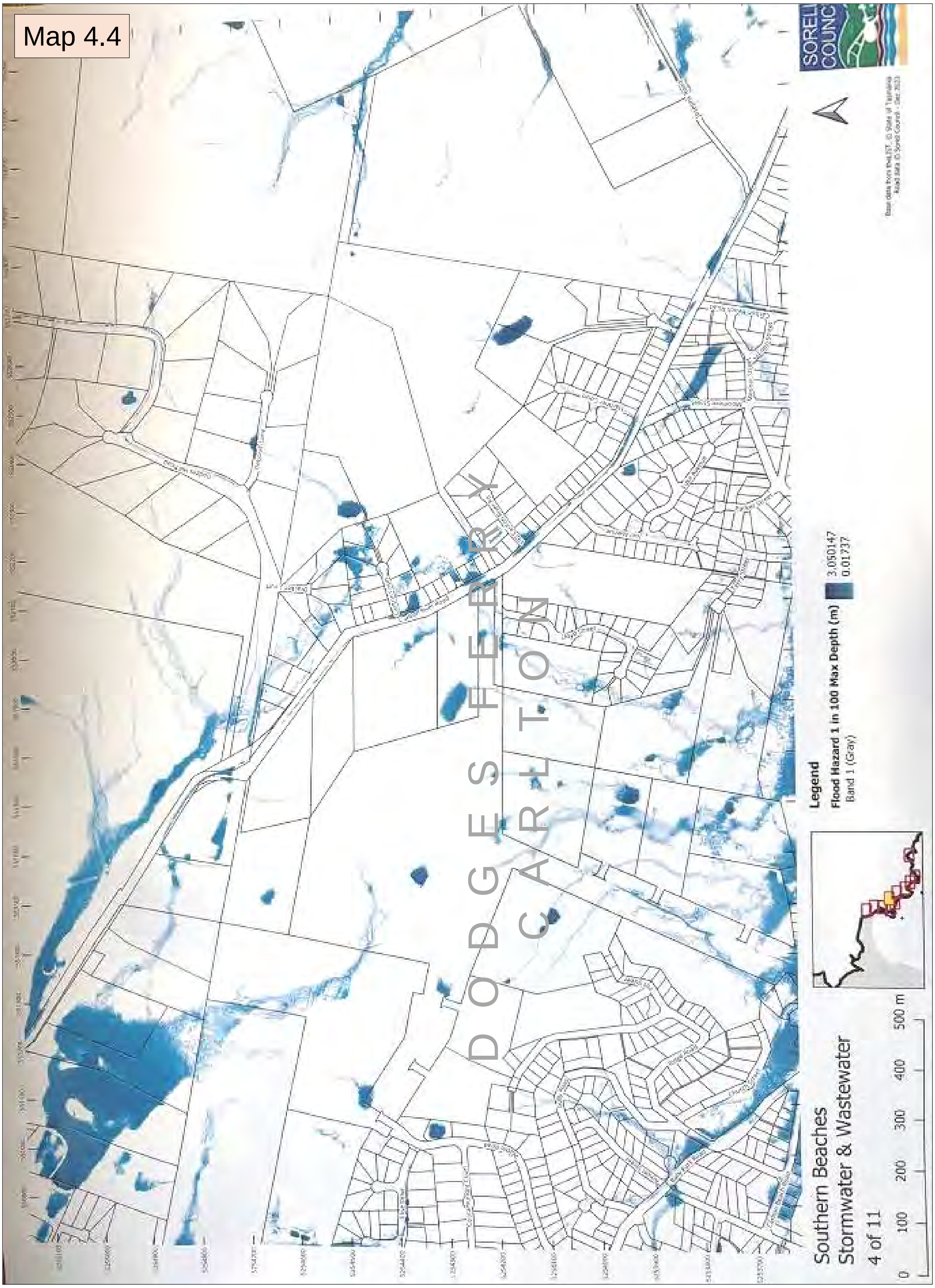

Map 4.1
SORELL COUNCIL
LEWISHAM
Legend
Flood Hazard 1 in 100 Max Depth (m)
Band 1 (Gray)
3.050147
0.01737
Southern Beaches
Stormwater & Wastewater
1 of 11
0 100 200 300 400 500 m

Map 4.2

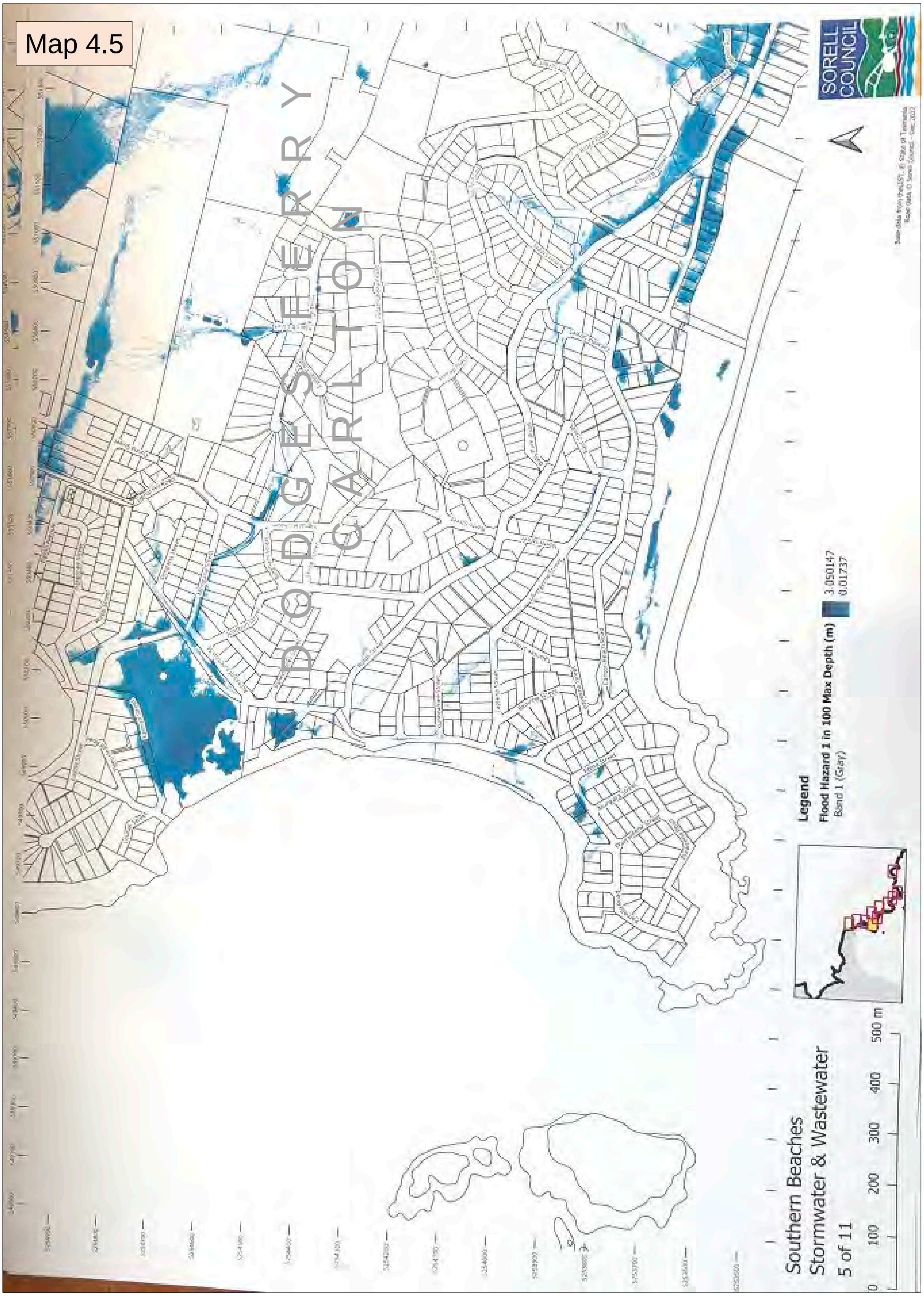

LEWISHAM
DODGES FERRY
SORELL COUNCIL
Legend
Flood Hazard 1 in 100 Max Depth (m)
Band 1 (Gray)
3.050147
0.01737
Southern Beaches
Stormwater & Wastewater
2 of 11
0
100
200
300
400
500 m


Map 4.3
DODGES FERRY
SORELL COUNCIL
Legend
Flood Hazard 1 in 100 Max Depth (m)
Band 1 (Gray)
3.050147
0.01737
Southern Beaches
Stormwater & Wastewater
3 of 11
0 100 200 300 400 500 m

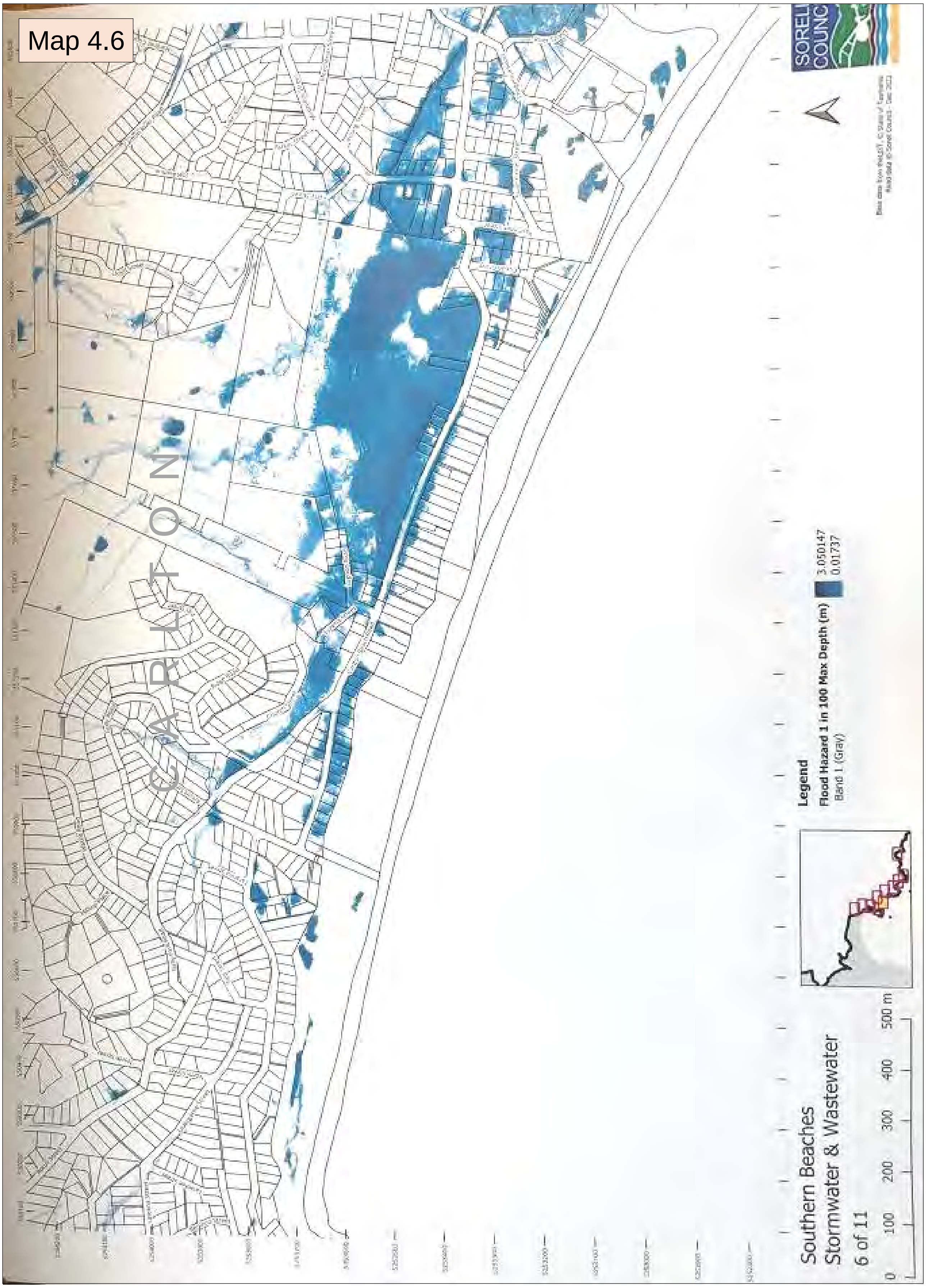
Map 4.4

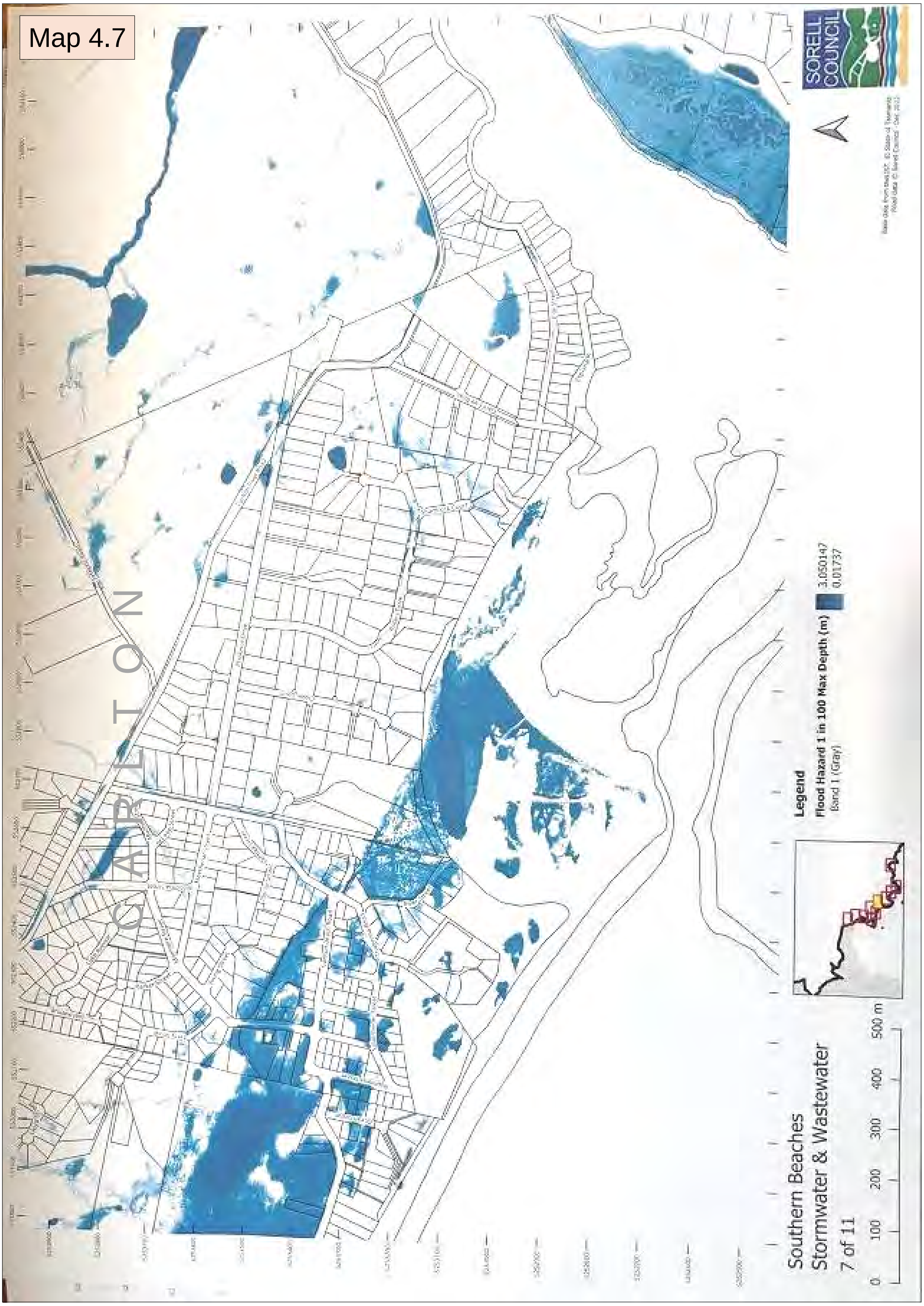

DODGES FERRY
CARLTON
Legend
Flood Hazard 1 in 100 Max Depth (m)
Band 1 (Gray)
3.050147
0.01737
Southern Beaches
Stormwater & Wastewater
4 of 11
0 100 200 300 400 500 m

Map 4.5

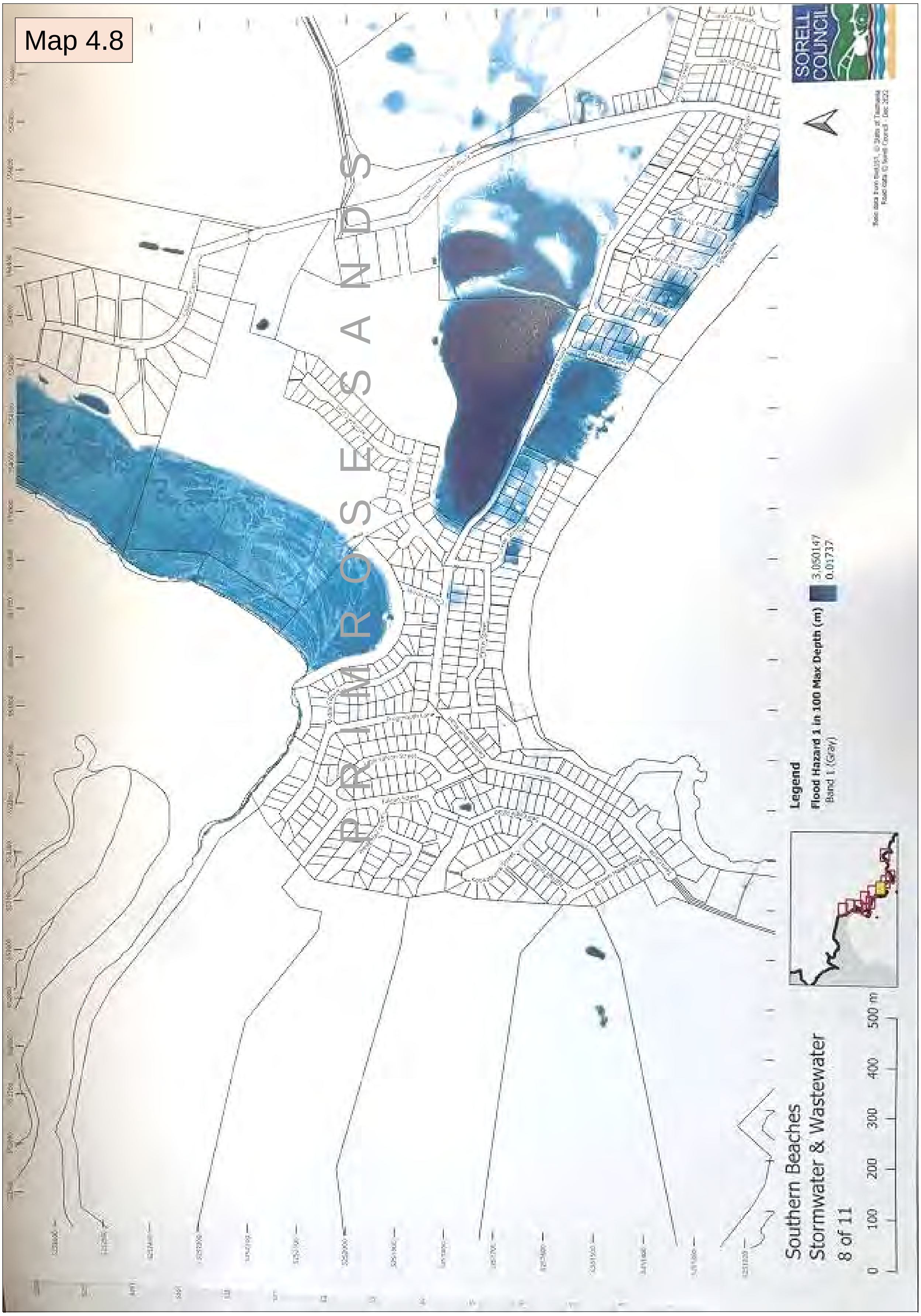


DODGES FERRY
CARLTON
SORELL COUNCIL
Legend
Flood Hazard 1 in 100 Max Depth (m)
Band 1 (Gray)
3.050147
0.01737
Southern Beaches
Stormwater & Wastewater
5 of 11
0
100
200
300
400
500 m


Map 4.6
CARLTON
SORELL COUNCIL
Legend
Flood Hazard 1 in 100 Max Depth (m)
Band 1 (Gray)
3.050147
0.01737
Southern Beaches
Stormwater & Wastewater
6 of 11
0 100 200 300 400 500 m
Base data from theLIST, © State of Tasmania
Road data © Sorell Council - Dec 2022

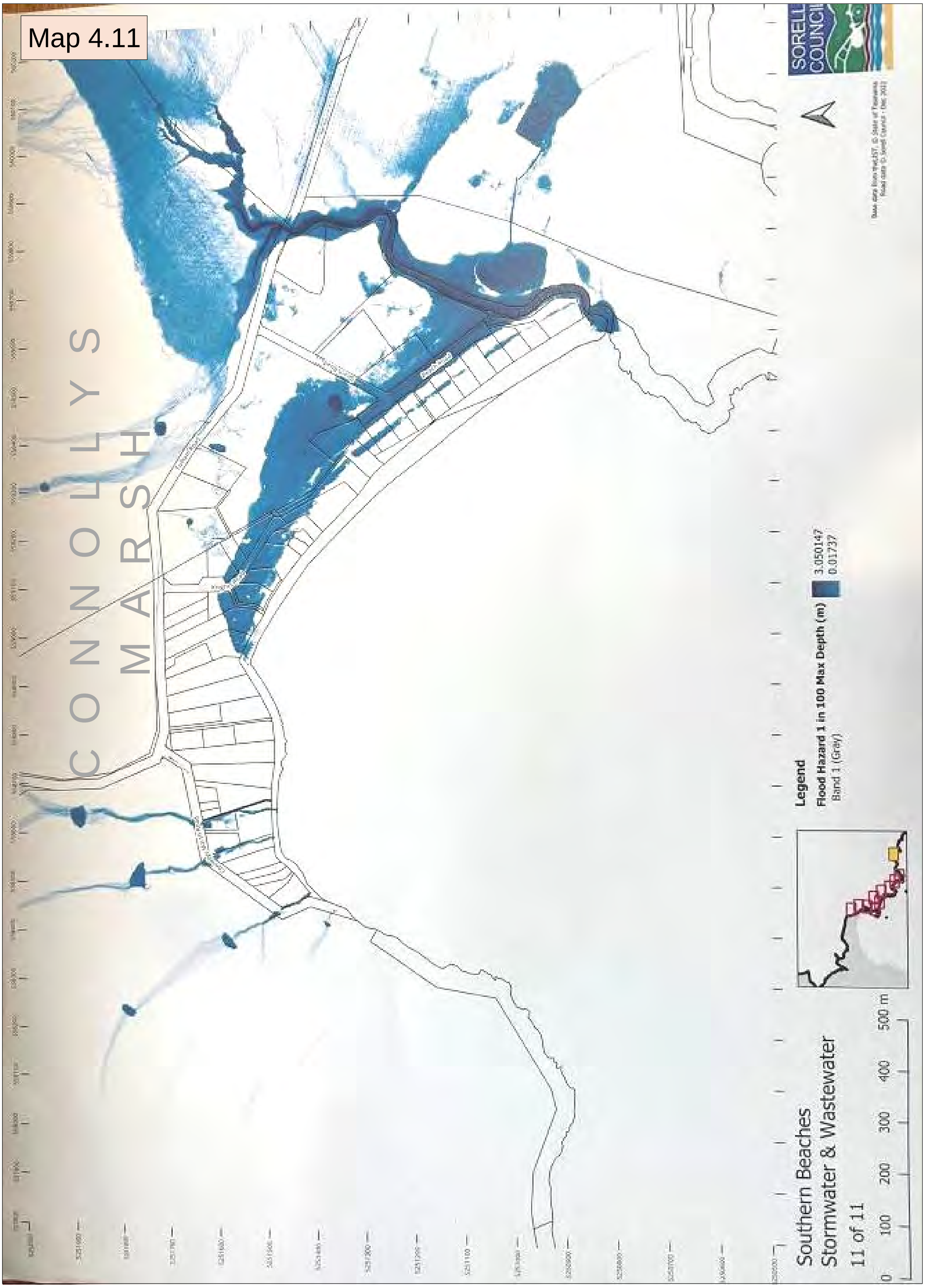

Map 4.7
CARLTON
SORELL COUNCIL
Legend
Flood Hazard 1 in 100 Max Depth (m)
Band 1 (Gray)
3.050147
0.01737
Southern Beaches
Stormwater & Wastewater
7 of 11
0 100 200 300 400 500 m

Map 4.8


PRIMROSE SANDS
SORELL COUNCIL
Legend
Flood Hazard 1 in 100 Max Depth (m)
Band 1 (Gray)
3.050147
0.01737
Southern Beaches
Stormwater & Wastewater
8 of 11
0
100
200
300
400
500 m


Map 4.9
PRIMROSE SANDS
SORELL COUNCIL
Legend
Flood Hazard 1 in 100 Max Depth (m)
Band 1 (Gray)
3.050347
0.01737
Southern Beaches
Stormwater & Wastewater
9 of 11
0 100 200 300 400 500 m


Map 4.10
PRIMROSE SANDS
Legend
Flood Hazard 1 in 100 Max Depth (m)
Band 1 (Gray)
3.050147
0.01737
Southern Beaches
Stormwater & Wastewater
10 of 11
0 100 200 300 400 500 m
SORELL COUNCIL


Map 4.11
CONNOLLYS MARSH
Southern Beaches
Stormwater & Wastewater
11 of 11
0 100 200 300 400 500 m
Legend
Flood Hazard 1 in 100 Max Depth (m)
Band 1 (Gray)
3.050147
0.01737
SORELL COUNCIL

Appendix 5

(5 pages including this page)

On-site wastewater systems potentially at risk of sea level rise in the Southern Beaches

Map Set 5.1 Carlton Beach
Map Set 5.2 Primrose Sands
Map Set 5.3 Connellys Marsh

Base maps from www.thelist.tas.gov.au

Notes

The following three map sets and these Notes are slightly modified from unpublished work done in 2018 by W. C. Cromer, M. J. Hocking, D. J. Windle and A. S. Miner. The authors produced 27 map sets of unsewered low-lying coastal settlements around Tasmania. Each map set focusses on the effects on groundwater levels of projected sea level rise and changes to average annual rainfall for the settlement. The depth to groundwater is or may be a key influence on the design and successful operation of on-site wastewater systems. High groundwater levels may result in increased risk of failure of the wastewater systems.

The accuracy and usefulness of the map sets for depth to seasonal high water table is limited mainly by Step 6 in the following 12-step process. Step 6 necessarily depends on a combination of accurate and current digital water table measurements from a limited number of coastal settlements, less accurate non-digital observations from several other settlements, and interpolation of these data to remaining settlements.

Accordingly, the map sets should be used as a general guide only. They are intended to flag potential issues, but do not obviate the need for site-specific investigations.

The use and upgrade of the map sets will benefit from continuing feedback from users, and in particular from additional depth-to-groundwater data in coastal areas.

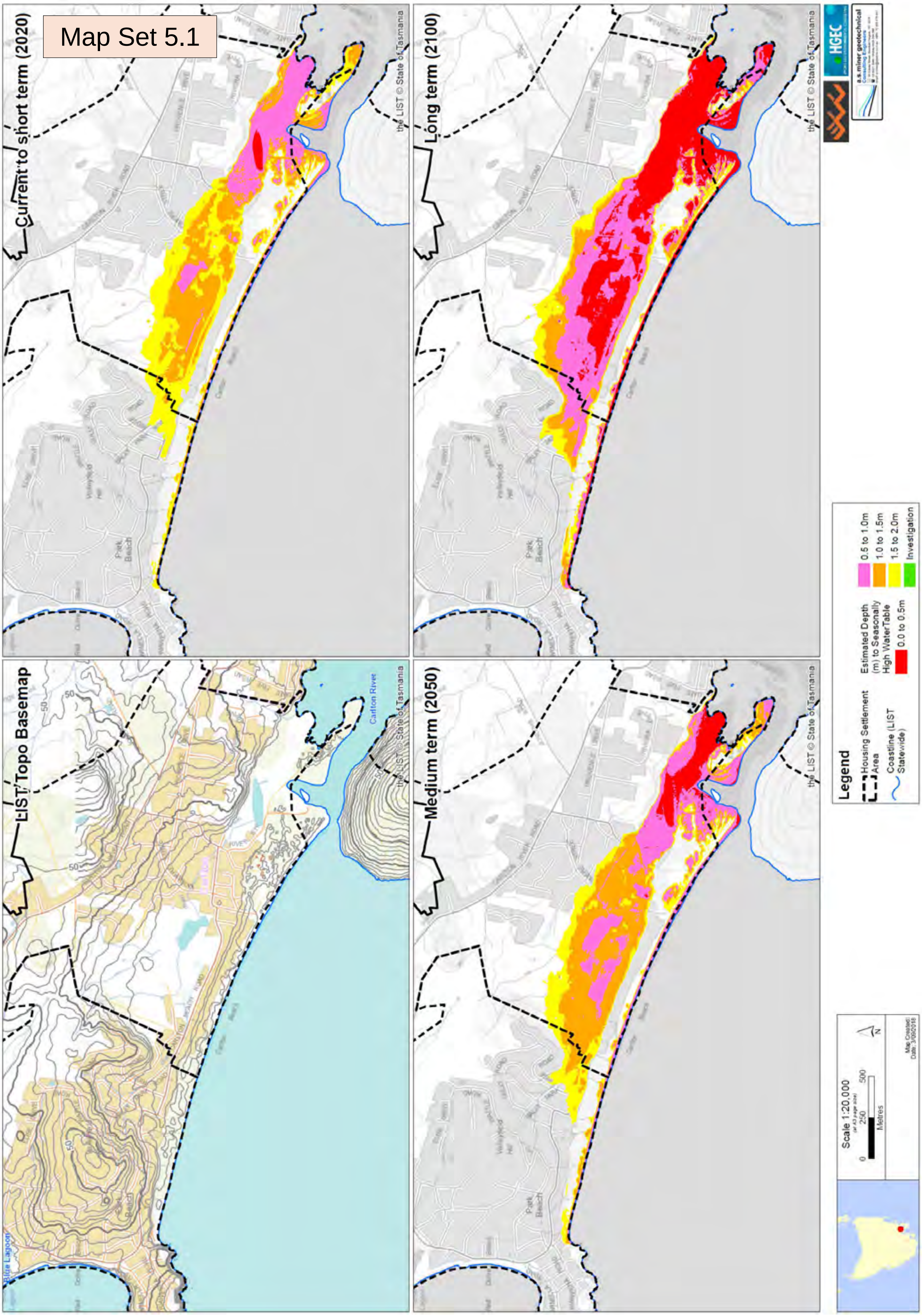
The adopted sea level rise for 2050 and 2100 is based on the Tasmanian Government's Sea Level Rise Planning Allowance (Allowance). The Allowance was developed in 2016 by the Tasmanian Government to help planners, developers and property owners to consider sea level rise in new coastal developments. The Allowances were developed by the CSIRO based on the sea level rise projections provided in the Intergovernmental Panel on Climate Change Fifth Assessment Report (IPCC AR5) and are based on the high emissions scenario RCP8.5. The CSIRO report provided the following Allowances of 0.23m SLR by 2050, and 0.84m SLR by 2100 from 2010 levels. For further reading on sea level rise balance, see:

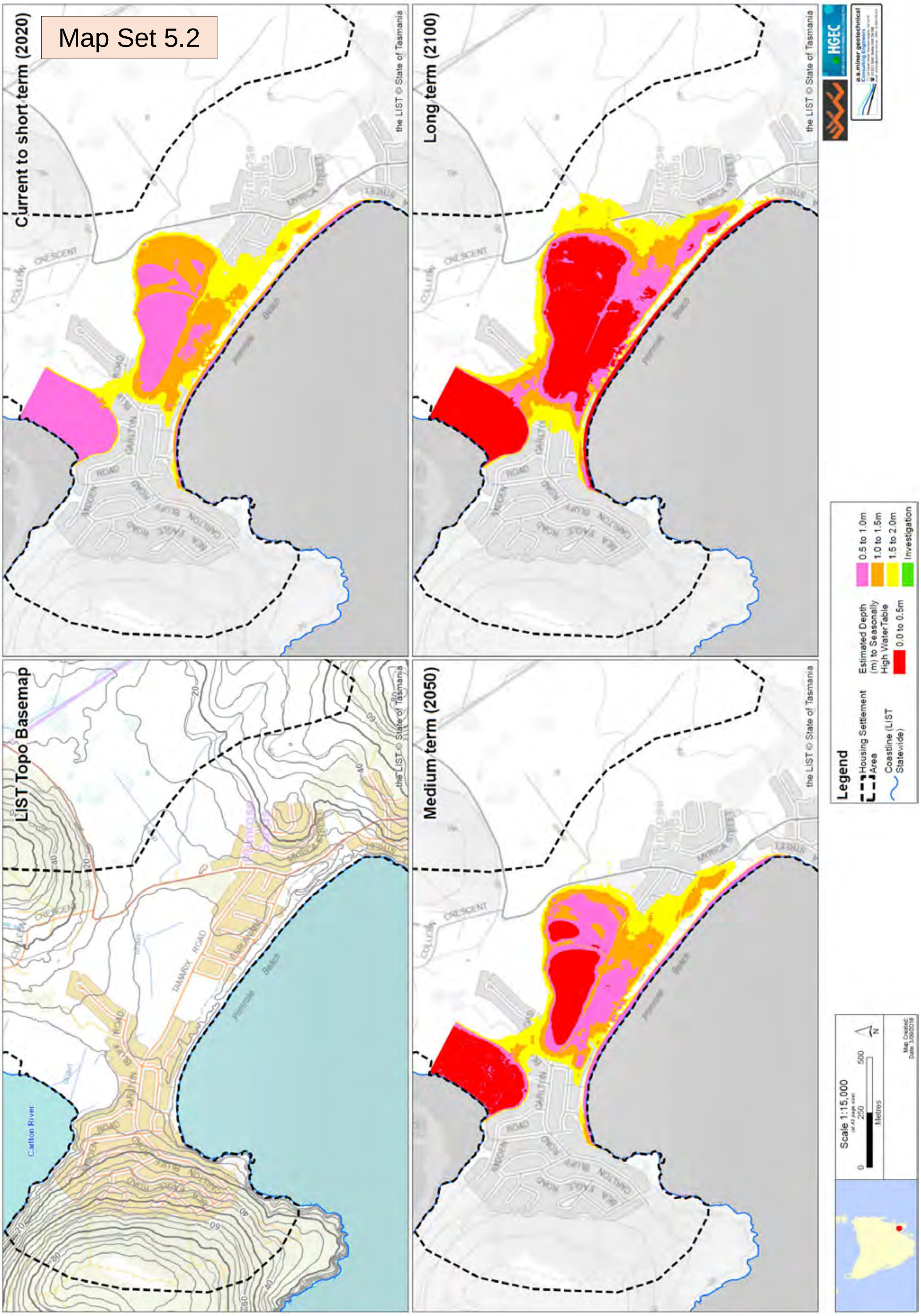
- https://recfit.tas.gov.au/__data/assets/pdf_file/0009/490896/CSIRO_Sea_Level_Rise_Allowance_Report_December_2016.pdf
- https://recfit.tas.gov.au/__data/assets/pdf_file/0011/490898/Local_Council_Sea_Level_Rise_Planning_Allowances_derived_from_RCP_8.5_2.pdf

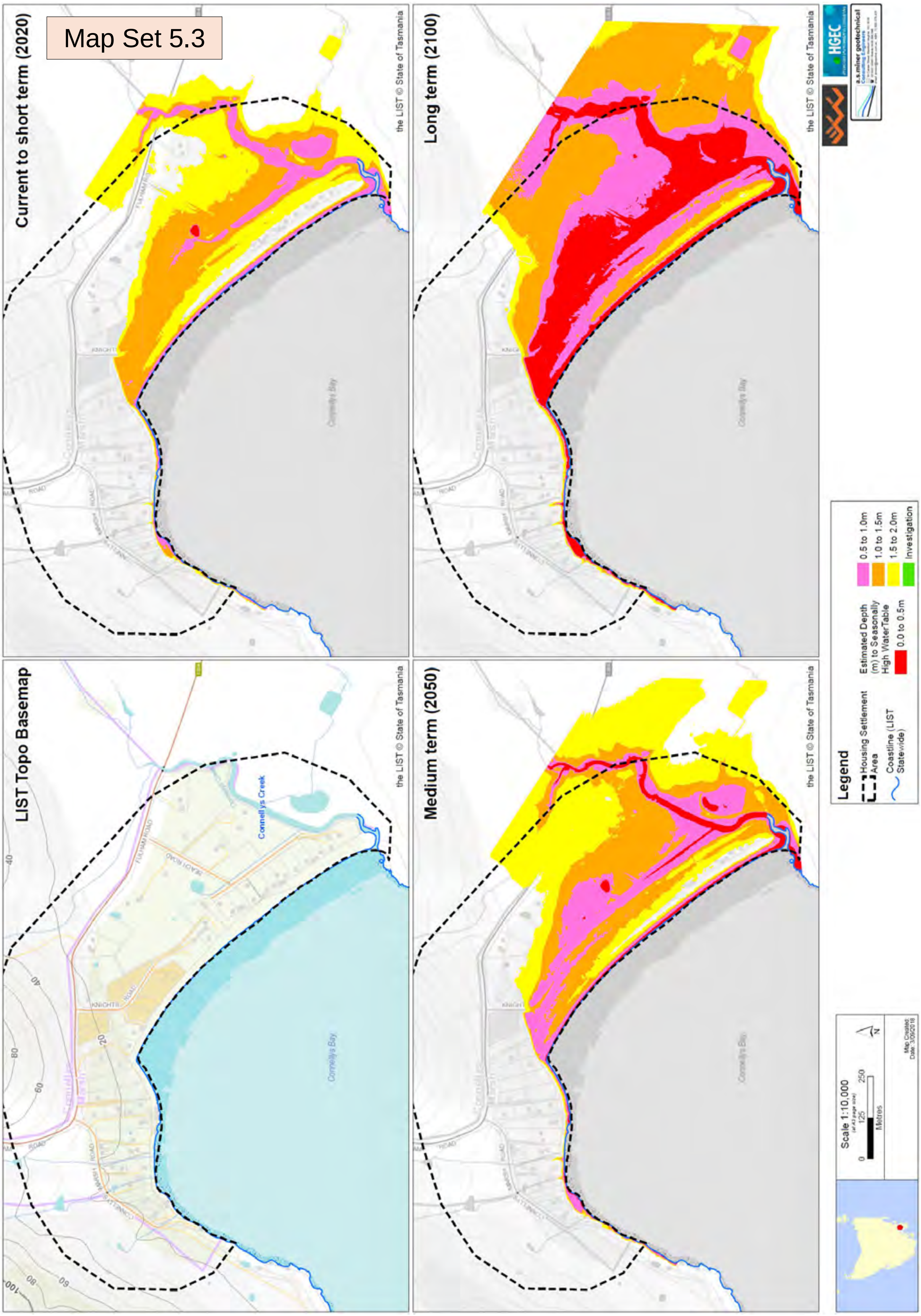
The step-wise process to produce the map sets was:

1. Inspect on a contoured map all low-lying settlements around Tasmania's coastline.
2. Remove from consideration all settlements shown on www.thelist.tas.gov.au as serviced by TasWater reticulated sewerage.
3. Inspect on www.thelist.tas.gov the published geology of the settlements. Retain those wholly or partly underlain by Quaternary/Tertiary sediments. Twenty-seven settlements remained.
4. Consider the Human Settlement Area (HSA; State Fire Management Council, 2014) boundaries, and extend or otherwise adjust them according to topography and geology and the potential for future expansion of the settlement.
5. Review published and unpublished groundwater information relevant to each settlement, and for each, create a digital elevation model (DEM: a three-dimensional representation of a surface, e.g. heights of the land, or groundwater) of the water table at its seasonally high level.
6. Adopt this seasonally high water table (SHWT) DEM as the current to short term (2020) water table DEM for each settlement. It is termed DEM1.
7. Establish how in a general sense the water table in unconfined coastal sand aquifers responds to changes in long-term average annual rainfall.
8. For each settlement, add to DEM1 the adopted 2050 sea level rise (SLR), and the adopted 2050 annual rainfall change (the latter may be positive or negative). The new DEM, called DEM2, is the 2050 water table DEM for each settlement.
9. For each settlement, add to DEM1 the adopted 2100 SLR, and the adopted 2100 annual rainfall change. The new DEM, called DEM3, is the 2100 water table DEM for each settlement.
10. For each settlement, subtract DEM1, DEM2 and DEM3 from the LiDAR. The result is the depth to the water table below ground surface for three scenarios: current to short term (2020), 2050, and 2100. Depth to the water table is also the same as the thickness of dry soil or sediment[17].
11. For the current to short term (2020), 2050, and 2100 scenarios, colour code the depth to the water table: red 0 – 0.5m; pink 0.5 – 1.0m; orange 1.0 – 1.5m, and yellow 1.5 – 2.0m. Use green to colour those areas within a defined settlement but with no LiDAR coverage as requiring further "Investigation".
12. Review each draft colour-coded map, compare with known or estimated groundwater information, and where necessary, revise DEM1 and repeat steps 1 – 12.

[17] The capillary fringe of unsaturated soil or sediment above the water table is neglected in this analysis.


Map Set 5.1
Current to short term (2020)
Long term (2100)
LIST Topo Basemap
Medium term (2050)
the LIST © State of Tasmania
Legend
Housing Settlement Area
Coastline (LIST Statewide)
Estimated Depth (m) to Seasonally High WaterTable
0.0 to 0.5m
0.5 to 1.0m
1.0 to 1.5m
1.5 to 2.0m
Investigation
Scale 1:20,000
Metres


Map Set 5.2
Current to short term (2020)
Long term (2100)
LIST Topo Basemap
Medium term (2050)
the LIST © State of Tasmania
Legend
Housing Settlement Area
Coastline (LIST Statewide)
Estimated Depth (m) to Seasonally High Water Table
0.0 to 0.5m
0.5 to 1.0m
1.0 to 1.5m
1.5 to 2.0m
Investigation
Scale 1:15,000
0
250
500
Metres
CRESCENT
ROAD
CARLTON
MIDDEN
MYRICA STREET
TAMARIX ROAD
Primrose Beach
Carlton River


Map Set 5.3
Current to short term (2020)
LIST Topo Basemap
Medium term (2050)
Long term (2100)
Connellys Creek
Connellys Bay
the LIST © State of Tasmania
Legend
Housing Settlement Area
Coastline (LIST Statewide)
Estimated Depth (m) to Seasonally High WaterTable
0.0 to 0.5m
0.5 to 1.0m
1.0 to 1.5m
1.5 to 2.0m
Investigation
Scale 1:10,000
0 125 250
Metres
HGEC