THE RURAL CITY OF MURRAY BRIDGE

LOCAL GOVERNMENT CENTRE
2 Seventh Street
Murray Bridge SA 5253
T 08 8539 1100
F 08 8532 2766
council@murraybridge.sa.gov.au

Eastside Onsite Wastewater Systems Study

This document has been released with partial redactions.

Blank sections indicate the removal of images or words due to the presence of proprietary or private information.

Eastside Onsite Wastewater Systems Study

Assessment of existing on-site wastewater systems 2021-2022

Ashbourne Consulting
Environmental Health

MURRAY BRIDGE
THRIVING COMMUNITIES

The Rural City of MURRAY BRIDGE
Bridge to Opportunity

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Executive Summary

The western city-side of Murray Bridge has been serviced with sewerage infrastructure since 1970. However the Eastside of Murray Bridge across the river does not have access to any SA Water sewerage services. All properties on the Eastside of Murray Bridge must accommodate wastewater treatment and disposal within their property boundaries.

Significant population growth over the the last 50 years has put significant pressure on the ageing SA Water sewerage treatment infrastructure servicing the western (city) side of Murray Bridge. Following several major upgrades to manage increased inflows to the treatment plant, a decision was made by the state government in 2010 to identify a new long-term location for a wastewater treatment plant to service Murray Bridge into the future. In 2011, the Minister for Water (the Hon. Paul Caica) provided advice to the Rural City of Murray Bridge regarding services to existing and future development on the east side of Murray Bridge[1].

> *"The provision of wastewater services to existing or future development in the east of Murray Bridge can be assessed on a commercial basis at any stage, but has not been factored into the existing project. This can be done irrespective of the location of the Plant…."*

In 2021, a new wastewater treatment plant was completed to service the city of Murray Bridge with additional reserve capacity to cater for planned future growth of the city. The $52 million development did not include any extension of sewerage services to the Eastside of Murray Bridge.

Over the past 10 to 15 years, the Council has become aware of an increasing number of wastewater systems on Eastside that are failing. In some instances owners have had sufficient area on their allotment to upgrade failing systems to current design standards. However, a significant number of systems that are failing or considered to be at serious risk of failing are on allotments with very limited or insufficient reserve area to upgrade.

Onsite wastewater systems, typically in the form of a septic tank for primary treatment, followed by subsurface disposal of effluent, have provided effective service for South Australians in rural areas for many years, and with significant improvements in design standards introduced in South Australia in 1988 these systems continue to provide a safe and effective means of treating and safely disposing of wastewater on appropriately sized allotments.

New standards introduced in 1988 included significant increases to the minimum capacity for septic tanks and the soakage area required to dispose of effluent[2].

From 1 June 1988, the minimum septic tank capacity was increased by 85% from 1620 litres to 3000 litres and the area required for soakage trenches was increased by 500% from 9m x 1.2m to 45m x 1.2m (or equivalent). Older systems installed on smaller allotments prior to the changes that took effect from 1 June 1988 have been a principal focus of this study on Eastside.

The Eastside Onsite Wastewater Systems Review was initiated by the Council to assess the present condition of onsite wastewater systems on approximately 900 properties on the Eastside to help inform and guide decision making regarding future solutions, including a possible Community Wastewater Management System (CWMS). Mr Phil Eckert from Ashbourne Consulting, a licensed plumber and experienced Environmental Health Officer was engaged to conduct inspections in the defined study area.

System types found in the study area include, 88% (721) Septic tank and soakage systems, 11% (86) Aerobic wastewater treatment systems (AWTS) and 1 % (9) Holding tanks.

Significantly, 49% (357) of the septic and soakage systems were installed before the major improvements to standards were introduced in June 1988. These systems are now at least 33 years old, with the average age of these smaller systems now around 40 years.

Over 150 of the properties with smaller pre-1988 systems were identified as having either very restricted or insufficient reserve area on the allotment to upgrade the system to current standards.

Many of the systems on these allotments are failing and residents have been found to be irrigating untreated effluent onto small garden areas from their failed soakage trenches, in breach of the *South Australian Public Health Act 2011*.

Councils in South Australia are prescribed as enforcement authorities under the *Public Health Act 2011* for the administration of wastewater standards and have authority under the Act to issue Notices requiring the upgrade of onsite wastewater systems. Given the number of allotments with systems that have poor or failing systems and insufficient reserve area to upgrade them to current standards, a regulatory approach is problematic where it simply may not be physically possible to upgrade. The only alternative in some cases may be the installation of a holding tank, which is costly and not considered to be an appropriate long term solution.

The Eastside area comprises a diverse range of allotment sizes and many of the smaller allotments with older septic and soakage systems are dispersed quite widely throughout the area. This stage of the Review is aimed at providing sufficient detail of current onsite systems across approximately 900 properties to assist with decision making for the future management of wastewater on Eastside of Murray Bridge. Comprehensive results of onsite assessments and maps detailing affected allotments are provided in the report.

Project overview

Reasons for undertaking the Eastside Onsite Wastewater Systems Review

The failure of onsite wastewater systems on Eastside is a long standing issue.

System failures have come to the Council's attention through a variety of avenues, including complaints by neighbours regarding odours, owners of failing systems seeking advice, plumbers making contact with the Council on behalf of owners or ad hoc discovery by Council staff undertaking unrelated building or compliance inspection activities.

The Council has responsibilities under the *South Australian Public Health Act 2011* , the *South Australian Public Health (Wastewater) Regulations 2013* , and the *On-site Wastewater Systems Code 2013* . The Public Health Act prescribes Councils in South Australia as enforcement authorities with obligations to administer the Act, Regulations and Standards to protect public health. The Act and Regulations provide for enforcement actions to be taken where considered necessary, including the issue of Notices, and in more serious cases, authority to initiate prosecutorial action to ensure compliance with Standards.

The identification of an increasing number of failing wastewater systems and limitations of allotment size (reserve area) for upgrading systems to current standards, together with the associated risks to public health was the primary motivation for the Eastside Onsite Wastewater Systems Review.

In addition to the more obvious public health risks from direct human contact with untreated effluent are uncertainties regarding the potential for contamination of ground water and the river, particularly given the shallow water table beneath parts of the Eastside area and the close proximity of the SA Water's Pump Station which draws water for Adelaide's water supply, directly opposite the Riverglades wetland.

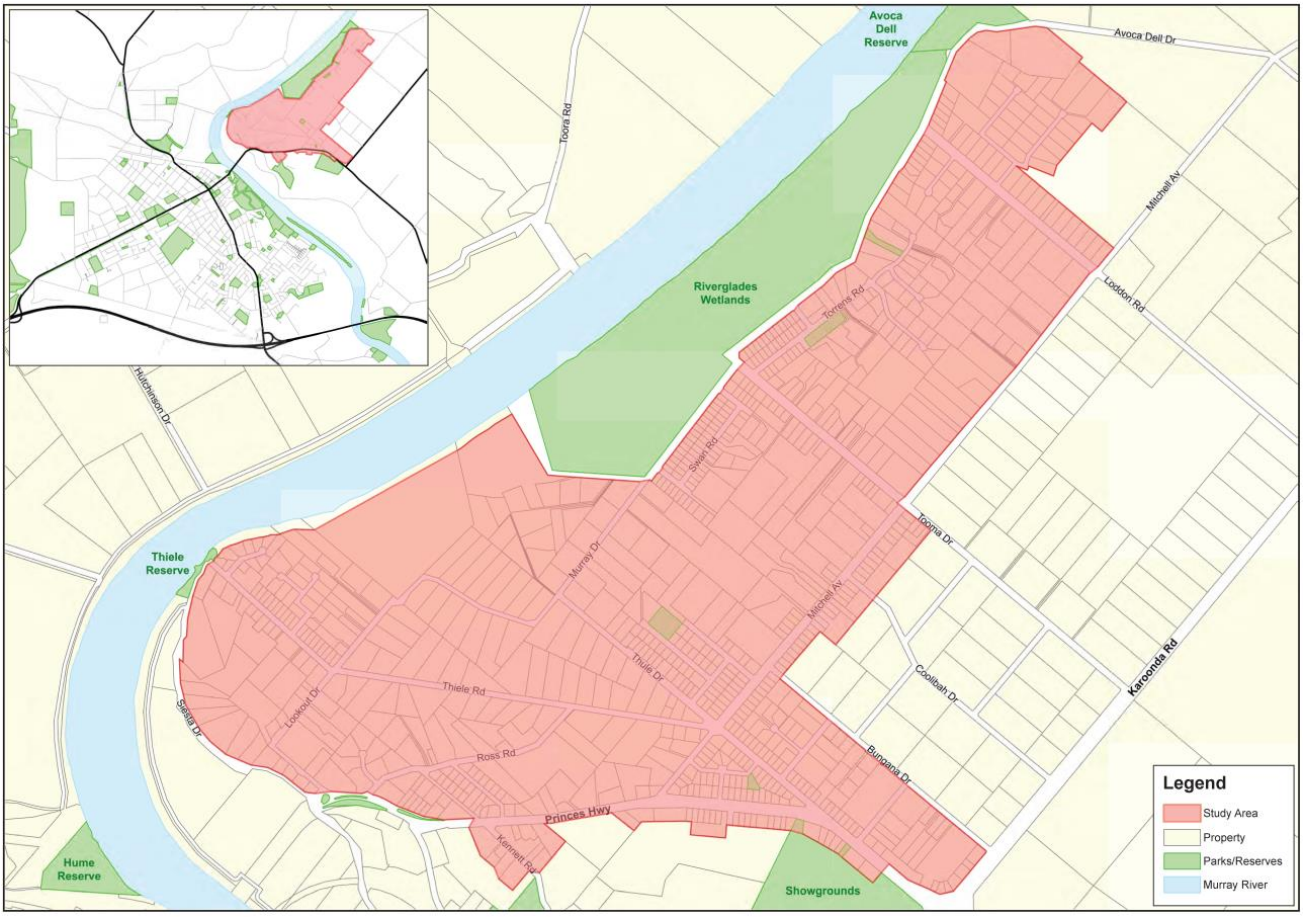
Community Wastewater Management Systems (CWMS) have provided solutions for many towns and small to medium communities across South Australia that have faced challenges with ageing onsite wastewater systems, particularly where allotment size prohibits the upgrading of systems with current design standards. The inspection and assessment of current onsite wastewater systems on approximately 900 properties on Eastside provides valuable baseline data to inform and guide decision making for future management of wastewater in this growing area of Murray Bridge.

Pumps over failed soakage trenches and wells – irrigating untreated effluent to gardens

Examples of restricted space (reserve area) for upgrading existing on-site wastewater systems

Study area and population data

There were 914 allotments in the assessment area, including 812 dwellings. No ABS or local population data was available for the defined study area. However, utilising the LGA SA Community Wastewater Management System Design Criteria "Rate of occupancy" of 2.6 persons per residential dwelling it is estimated that the population of the study area is approximately 2,111.



Property by type	
Dwellings	812
Commercial	14
Sheds	25
Vacant (or adjoing allotments)	63
Total	**914**

Current status of development on Eastside

Allotment sizes vary considerably on Eastside with an average size allotment of 2653 m2. 38% (335) allotments are under 1200 m2.

Development within the study area is guided by the Planning and Design Code, which forms part of the Planning Development and Infrastructure Act legislation. The Planning and Design Code was introduced in March 2021 replacing Development Plans as the key development assessment tool for local government staff. The study area falls within a number of zones including the Rural Neighbourhood Zone, Rural Living Zone and the Rural Zone. All of which seek a development outcome related to larger allotments, providing a spacious rural setting or secluded residential lifestyles within semi-rural or semi-natural environments. The zoning acknowledges that on site wastewater treatments are likely to be necessary.

Whilst the current zoning seeks allotments with a minimum size of 1 hectare, historically a pattern of smaller allotments has been established, a number of which incorporate a long hammerhead or axe handle access

leading to larger sites intended for dwellings, smaller farm holdings and space for trees and vegetation around any dwellings. Many of the smaller more uniform allotments are a consequence of the previous zoning under the Development Act (1993-2016) which allowed for allotments ranging from a minimum size of 2000 square metres.

Whilst there are no immediate plans to review the current zoning, the area known as Eastside has been identified as needing further strategic investigations to determine what development is appropriate in the locality, with a number of larger allotment holders approaching Council with a wish to subdivide their properties.

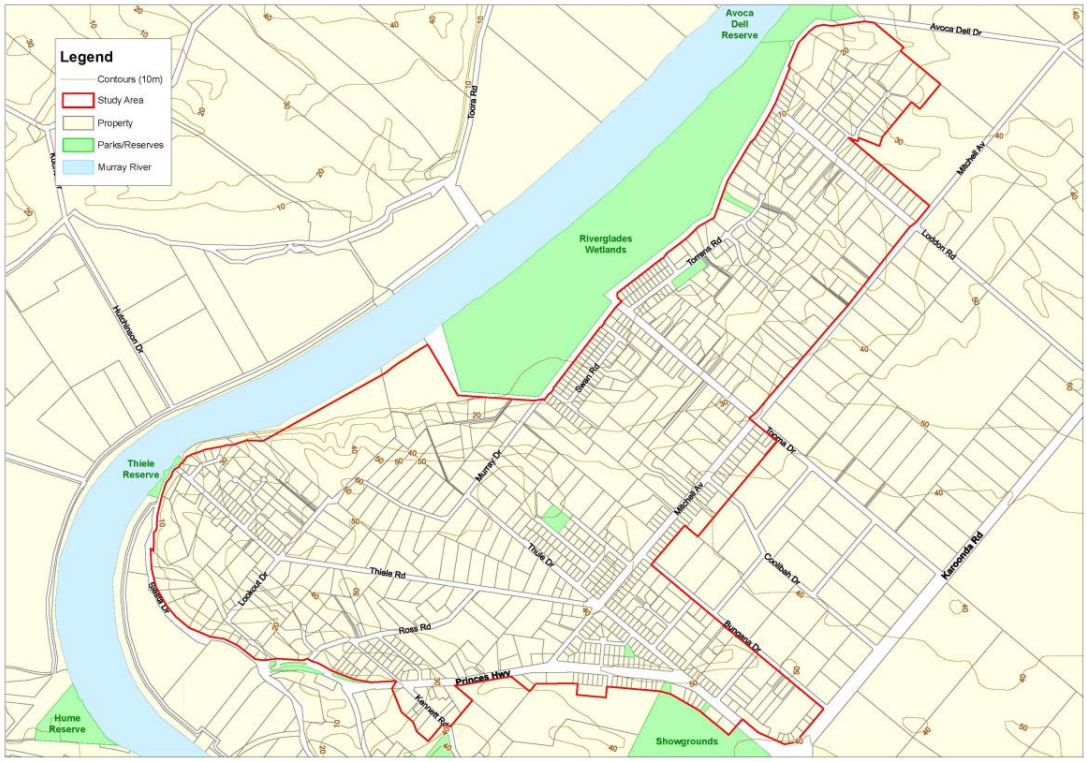
Geographical and Topographical information

The Eastside area is part of the Mannum formation, created during the Lower Miocene Era between 20 and 26 million years ago when high ocean levels periodically inundated the Lower Murray Basin, creating a warm tropical sea in which coral and shellfish proliferated. Mannum Formation limestone is prevalent throughout the study area on Eastside and is typically covered and interspersed with fine to to medium sands of low plasticity and exhibiting a high percolation rate, in some areas exceeding 15 litres/m2/day.

The depth of sandy top soil over limestone varies considerably with limestone typically encountered at shallower depths on elevated areas and deeper sands in low lying areas, including adjacent to the Riverglades Wetland. Elevated areas on Eastside typically have a shallower depth of sandy topsoil over limestone interspersed with horizons of calcerous fragments, fine sandy silts and sandy clay.

Hole 1 Depth (mm)	Hole 2 Depth (mm)	Hole 3 Depth (mm)			Description	U/Symb
0 - 50	0 - 100	0 - 100			FILL - GRAVEL (GP) AND GRAVELLY SANDA (SM) - Brown and grey.	-
50 - 350	100 - 1050	100 - 1000			SAND - Dark brown over brown. Non plastic. Fine and medium.	SP
350 - 1650	1050 - 2000	1000 - 2600			SILTY SAND WITH GRAVEL - Very low plasticity. Highly calcareous.	SM
1650 - 3000	2000 - 3000	2600 - 3000			SAND - Yellow-brown. Non plastic. Fine and medium.	SP

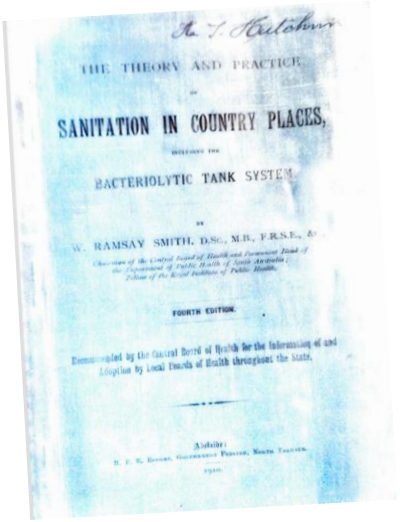
Typical soil profile of low lying area - approx 200m from Riverglades Wetland (high percolation rate)

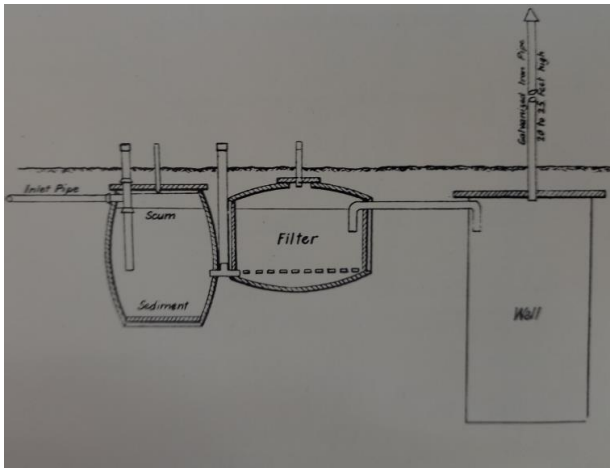


Contours at 10m intervals

Wastewater standards

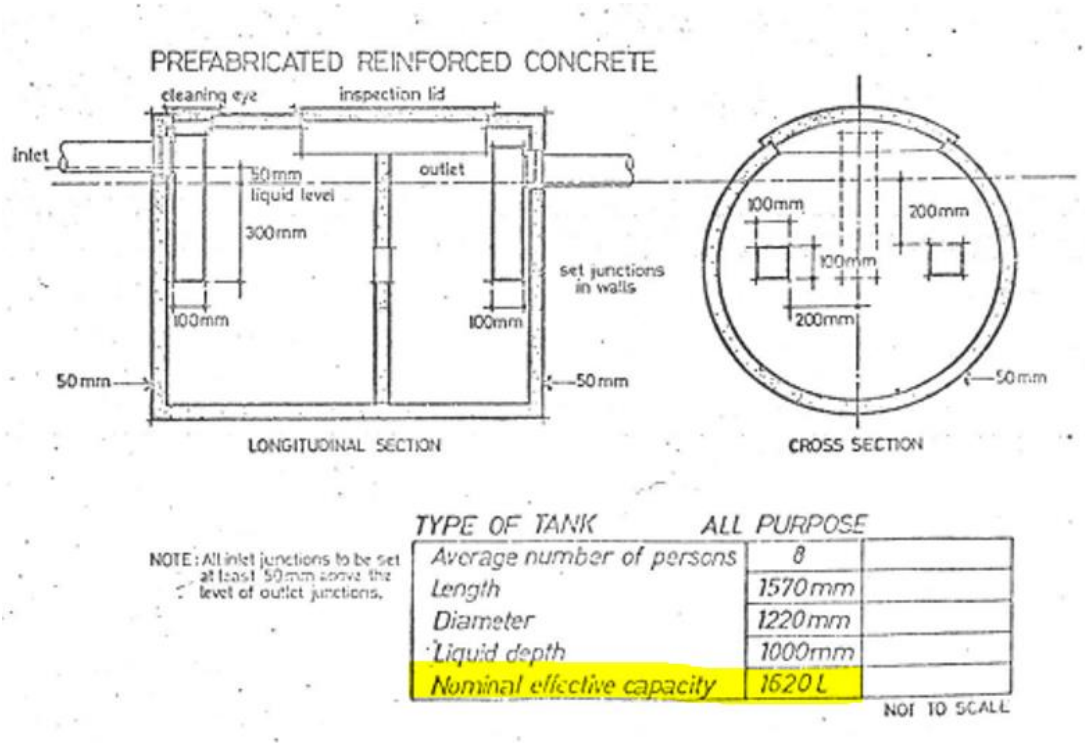
Standards for onsite wastewater systems in South Australia have been managed under public health legislation administered by the State Government and Councils (formerly Local Boards of Health) since the early 1900s. In 1910 standards were first introduced for a "Bacteriolytic Tank System" as an alternative to "pit-privies"[3].


THE THEORY AND PRACTICE
OF
SANITATION IN COUNTRY PLACES,
WITH THE
BACTERIOLYTIC TANK SYSTEM.
BY
W. RAMSAY SMITH, D.Sc., M.B., F.R.S.E., &c.
FOURTH EDITION.



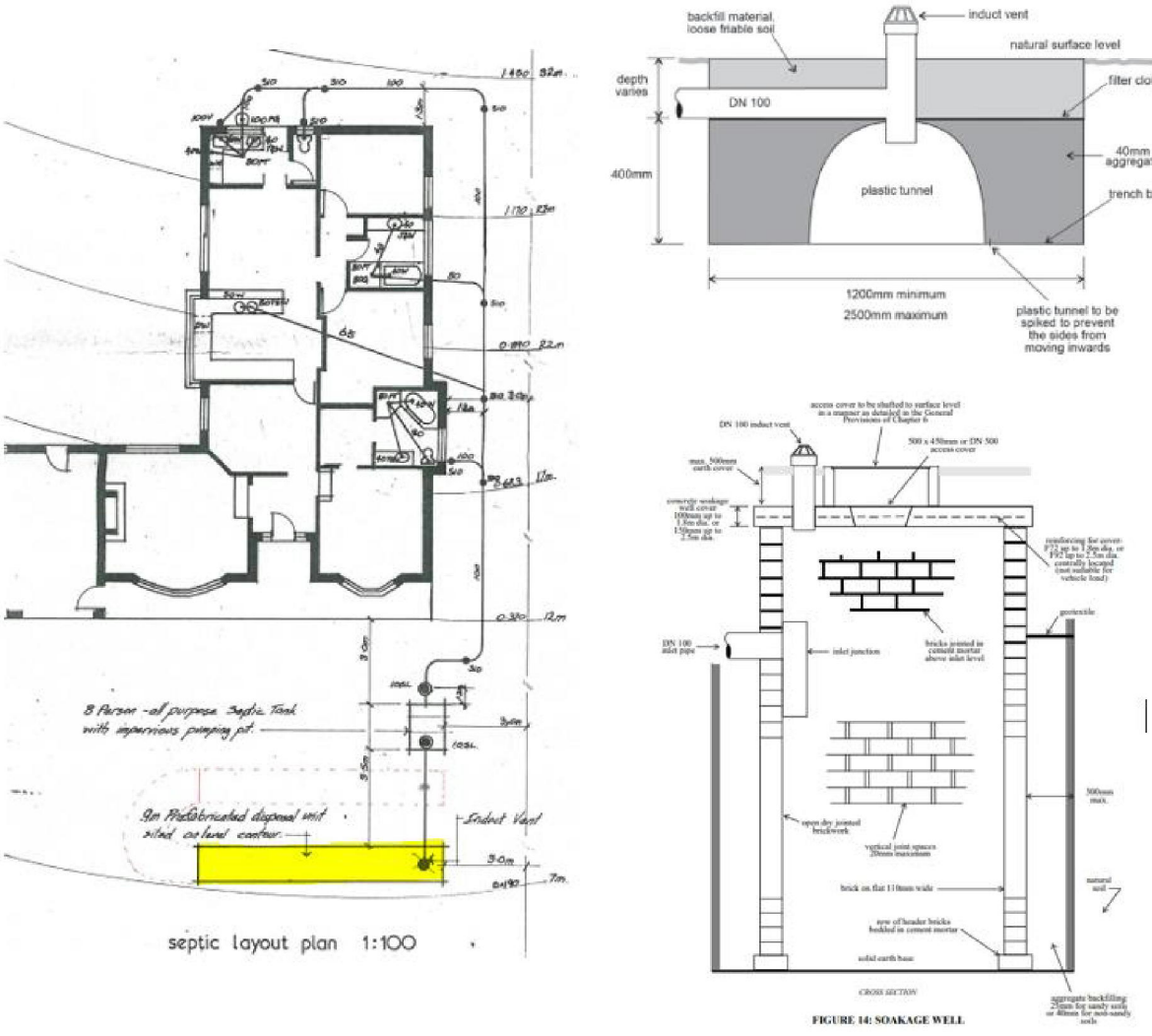
Pre 1988 On-site wastewater standards

By the early 1970s the South Australian Central Board of Health standards included a minimum septic tank capacity of 1,620 litres. This tank was referred to as an "eight person all-purpose septic tank" (8PAP). Tanks were either constructed in-situ with bricks or pre-cast cylindrical concrete tanks. Prior to 1988, the minimum size "soakage trench" specified by the Central Board of Health was 9m x 1.2m x 0.4m deep OR a "soakage well", approximately 1.2m in diameter and to a depth of approximately 2.0m.



Min 1620 L septic tank – 8 Person All-Purpose (8PAP) Tank

Tanks were typically installed without an access shaft on top of the tank, making maintenance difficult.

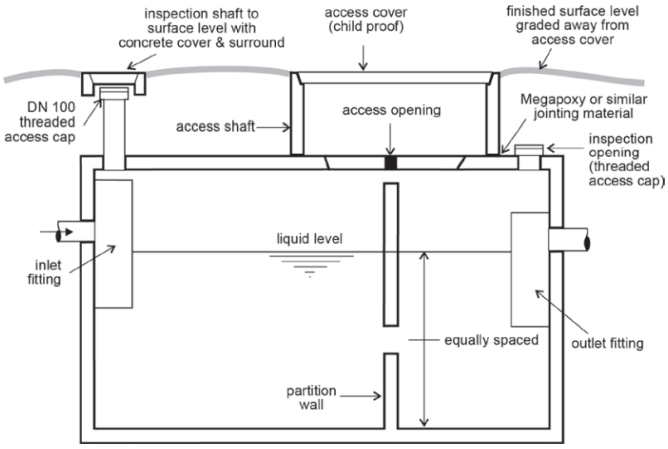


Typical site plan showing 1,620 Litre septic tank (8PAP) & 9m soakage trench or well (typical cross sections)

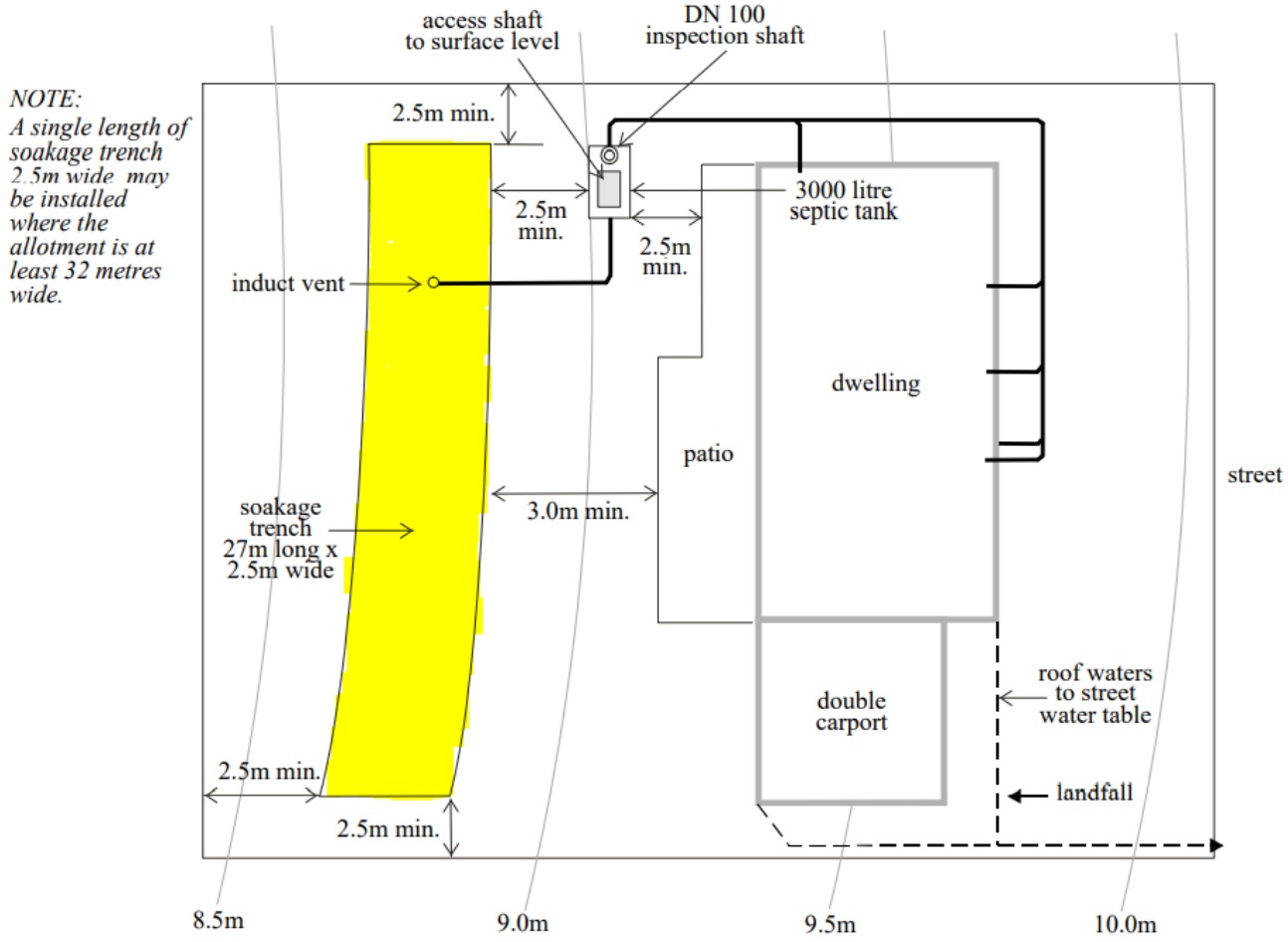
New Standards introduced in 1988 (Largely carried over to the current 2013 standards)

In June 1988 new standards were introduced with significant increases in capacity of the septic tank and soakage areas. The new minimum capacity for a septic tank introduced in 1988 was 3,000 L (85% increase) and the minimum soakage area was increased by 500% from 9m x 1.2m to 45m x 1.2m, or equivalent.

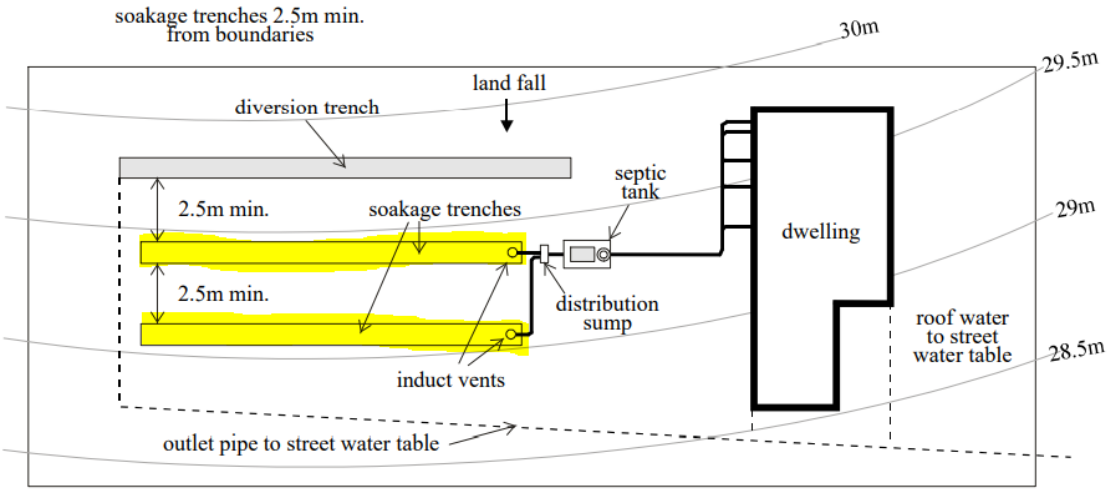
Figure A7: Typical horizontal septic tank design



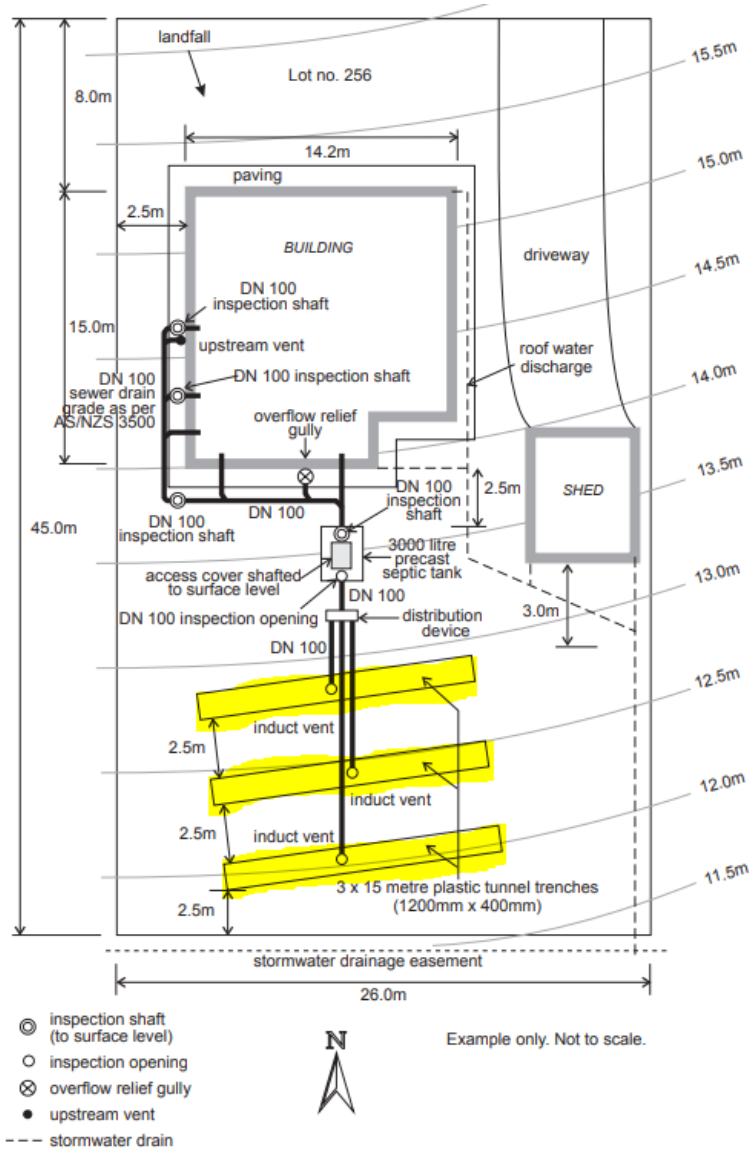
New standard requires an access shaft to be fitted to the tank to the surface to enable easier access.



Typical site plan (1988) showing new 3000 L tank and 27m x 2.5m soakage trench (equivalent to 45m x 1.2m)



Alternative design (1988) showing new 3000 L tank and two soakage trenches (equivalent to 45m x 1.2m)



Another alternative design 2013 On-Site Wastewater Systems Code (current standard)

The wastewater standards introduced in 1988, and largely adopted into the current 2013 On-Site Wastewater Systems Code presented significant challenges for smaller allotments to dispose of effluent within property boundaries, and in many instances meant that there was no "*reserve-area*" available for upgrading poor or failing systems.

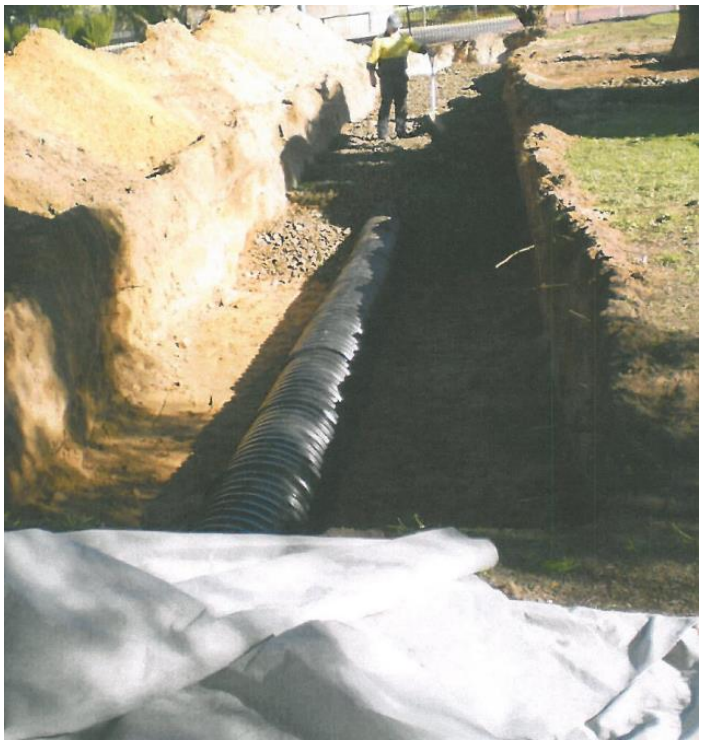
The 1988 Standard included a statement regarding Land Area - *"The size of the area of land available for effluent disposal within the allotment must be adequate and suitable for the intended use."* This statement was also carried over into the current 2013 Standard.

As a consequence, a minimum allotment size of 1200 m^2 was introduced by councils in South Australia for new land divisions where onsite disposal of effluent was required, in an effort to ensure sufficient area was provided to accommodate the new requirements.

Summary of Pre-1988 & Post-1988 Standards

Onsite Wastewater Standards	Pre 1988	Post 1988	% increase
Minimum septic tank capacity	1620 Litres	3000 Litres	85%
Minimum size of soakage trench	9m x 1.2m Or soakage well	45m x 1.2m (or equivalent eg 27m x 2.5m)	500%
Minimum area for irrigation Aerobic wastewater system		200 m2 (since 1990) PLUS a recreation area equal to 50% of the irrigation area	

Pre 1988



Post 1988

Example of increase of soakage trench dimensions with standards introduced in 1988

Introduction of Aerobic Wastewater Treatment Systems (AWTS) - 1990

Aerobic Wastewater Treatment Systems (AWTS), also known at Secondary Treatment Systems (STS), became a popular alternative to the common septic and soakage system in the late 1980s. In 1990 the SA Health Commission introduced two new Supplementary Standards;

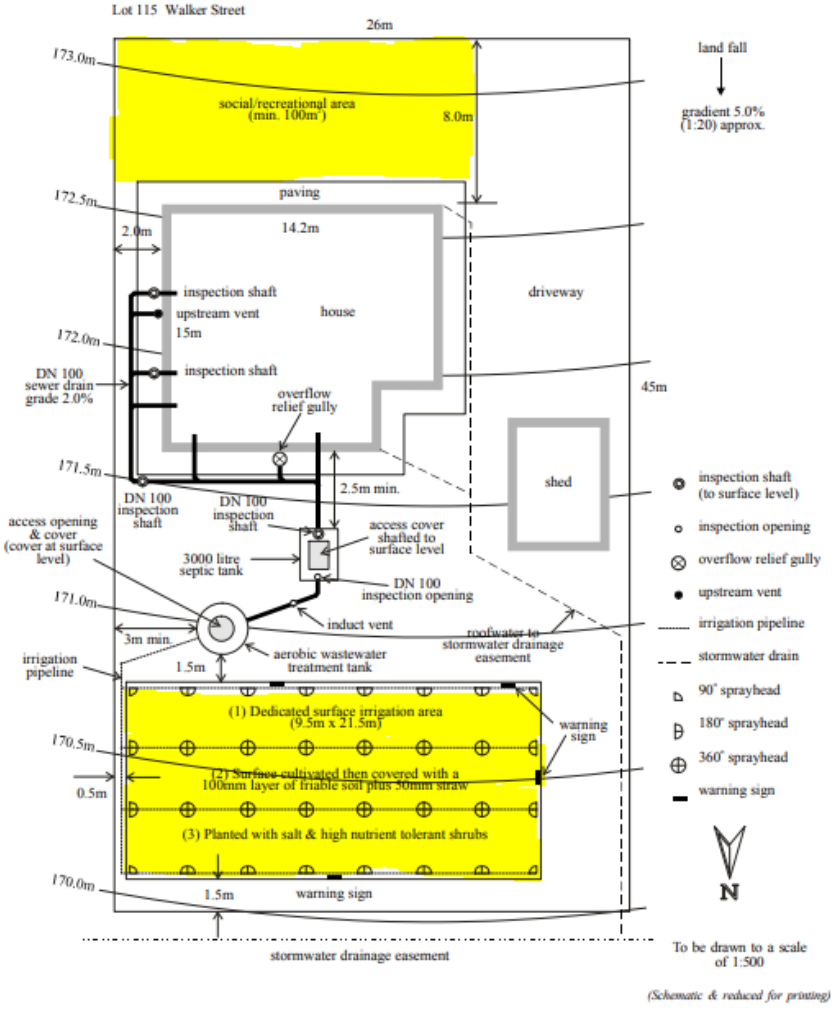
Supplement A – Aerobic Sand Filters, and

Supplement B – Aerobic Wastewater Treatment Systems (AWTS)

No "aerobic sand filters" have been encountered during the inspection of properties in the study area.

A total of 86 Aerobic Wastewater Treatment Systems were found in the study area.

Aerobic Wastewater Treatement Systems have been popular with owners who wish to utilise treated effluent for watering of landscaped garden areas of their property. They provide a quality of effluent suitable for irrigation however they require mandatory quarterly servicing, power to operate mechanical aeration and irrigation pumps, and a high water alarm to indicate pump failure (typically installed in a kitchen or laundry). The standard introduced in 1990 was carried over to the current 2013 standard with minor amendment. The area required under the current standards for safe disposal of treated effluent (via irrigation of a dedicated landscaped area) is typically 200 m^2 and a minimum social/recreation area equal to 50% of the irrigation area (100m^2) is also required.



TWO TANK SYSTEM - SINGLE IRRIGATION AREA

Typical AWTS - showing area required for irrigation and recreation 2013 On-Site Wastewater Systems Code

Project Methodology

Communication Strategy

Communication with property owners has been important to establish an understanding of the reasons and purpose of the Onsite Wastewater Systems Review, and for gaining the community's confidence and cooperation.

Two letters were sent to owners:

The first letter provided an overview of reasons the study was being conducted, the proposed assessment process, and a link to a Q&A web page prepared by the council . Owners were advised that this stage of the Review was principally for research and information gathering purposes.

(The study area includes approximately 900 allotments and these were was divided into 19 "zones").

Two weeks before planned inspections in each zone, a ***second letter*** was sent which included dates for proposed inspections and invited owners to contact the council to book a convenient time for inspection if they wished to be present for the inspection or if they needed to make any special arrangements such as for pets that may need to be contained.

The letter outlined that the purpose of the site visits was:

- To confirm the type of onsite wastewater system on each allotment,
- To confirm the location and condition of each system,
- To assess whether there is adequate area on the allotment that could accommodate a new wastewater system in the event a new or upgraded system is required, and
- To discuss the operation of the system and answer any questions the owner or resident may have.

Engagement of Consultant

Mr Phil Eckert, a licenced plumber and experienced Environmental Health Officer from Ashbourne Consulting was engaged by the Council to:

- Undertake a desktop review of wastewater files held by the Council,
- Carry out property inspections to assess the wastewater systems on each allotment,
- Assess potential reserve area(s) available on each allotment for upgrading wastewater systems,
- Collate inspection data for each allotment, and
- Review final data and assist with preparation of a final report.

Desktop review of wastewater data from Council records

Up until 1994, the South Australian Health Commission (SAHC - Now SA Health) was responsible for approval of all onsite wastewater systems in South Australia. In 1994, this responsibility was transferred to local Councils. Hard copy records of wastewater applications and approvals processed by the SAHC prior to the handover to Councils in 1994 were provided to each respective Council in SA. The Rural City of Murray Bridge has recently scanned and digitised all old records received of systems previously approved by the SAHC, some dating back to the early 1970s.

The desktop review of wastewater system records (where available) prior to inspection of each property has been an important part of the on-site inspection and assessment process. Having copies of approved plans at the time of each visit aided inspection and provided an opportunity to discuss the wastewater system with owners who may not be very familiar with their system, particularly in some older properties.

Records were located for the majority of properties in the study area. Where records were not found, care was taken to establish the age of the dwelling, and the likely design and status of the system.

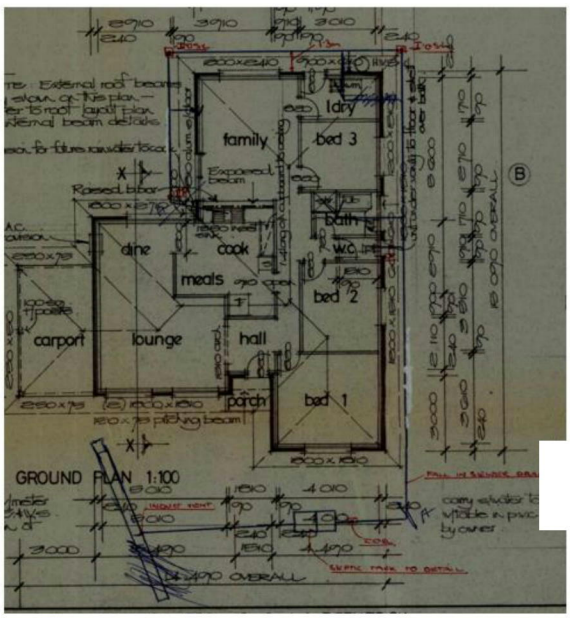
Inspection process and data collection

A data set was developed to record key information of wastewater systems in the area to be reviewed. The list below was used to populate a spreadsheet with property information and data gathered from inspections.

Zone	Zones A to S in the Study Area
Asses_No	Property Assessment number
Name	Owner's name(s)
Street_Address	Physical street address
Area_sq_m	Area of allotment
vacant/ dwelling/ business	Vacant / Dwelling / Commercial / Shed
Previous approval (Y/N)	Wastewater file found (yes/no)
year	Year of installation
DOC ID	Document Identification number
Link to File	Hyperlink to file
System type	Septic soakage / Secondary treatment system (STS) / Holding Tank / Other
Septic Tank Capacity - Litres	(Includes capacity of holding tanks)
Soakage type	Trench / Bed / Well
Soakage area	(Dimensions of trench or bed)
Access for inspection	Access - yard sighted / No access - yard not sighted
Insp date	Date of access (or attempted access)
Soakage condition	Satisfactory / Poor / Failing (Poor = <1988 Septic & soakage systems) (Failing = clear evidence)
Reserve area	Yes/ No (consideration of area available, access, current development on site)
Complies with current Std	Yes / No (Complies with current "design" standard)
Irrigation signs	Sighted / Not sighted / Unknown / NA
Irrigation condition	Satisfactory / Incomplete / Failing / Unknown / NA
Evidence of pump use	Yes / No (Evidence of use of pump with a failing system)
Photos	Yes / No
Comment	Description of property and significant features of site and wastewater system
Aerobic system servicing up to dat	Details on file of servicing frequency
Comments from Cartnotes	Comments by licenced liquid (septic) waste pump-out contractors
Notices on property	Notices on file RE compliance of the system with Standards and or the Public Health Act

RCMB Eastside Onsite Wastewater Systems Review **Approved Wastewater Plan & Site photograph**

Assess No.	Address:	Year of installation:	1985	Allotment size: 706 m2
Link to file	WW File ID 227562			
Comments:		1620 L septic tank & 9m soakage		



Typical file prepared for each property prior to inspection

Zone	F
Assessment Number	
Name	
Street_Address	
Area_sq_m	982.2926
vacant/ dwelling/ business	dwelling
previous approval (Y/N)	yes
year	May-88 (1 month before change to standards)
DOC ID	
Link to File	
System type	Septic - soakage
Septic Tank Capacity - Litres	1620
Soakage type	Trench
Soakage area	9m x 1.2m
Access for inspection	Access - yard sighted
Insp date	27-Apr-21
Soakage condition	Poor
Reserve area	No
Complies with current Standards	No
Irrigation signs	NA
Irrigation condition	NA
Evidence of pump use	No
Photos	Yes
Comments	Owner home. Plan on file indicates that soakage trench may be partly beneath a shed in the backyard. Only 2 people reside in the house. Induct vent has been extended above the shed roof. Photos taken.

Example of details of inspections recorded in a master spreadsheet and also recorded on property files, together with photographs taken at the time of inspection.

Assumptions and management of data

The increase in minimum capacity of onsite wastewater systems introduced in June 1988 is considered the single most important determinant of satisfactory operation of a wastewater system on Eastside. Given the age and generally very poor condition of these systems it was determined by the project team that all systems that were installed prior to June 1988, that had not been upgraded, would be assigned a rating of "poor".

Systems with clear evidence of failure including blockages, overflow of effluent or evidence of the use of a pump over a soakage well or soakage trench were recorded as "Failing".

Assessments to determine the availability of reserve area(s) to upgrade a poor or failing systems included a desktop assessment of approved wastewater plans, recent aerial photography and onsite observations.

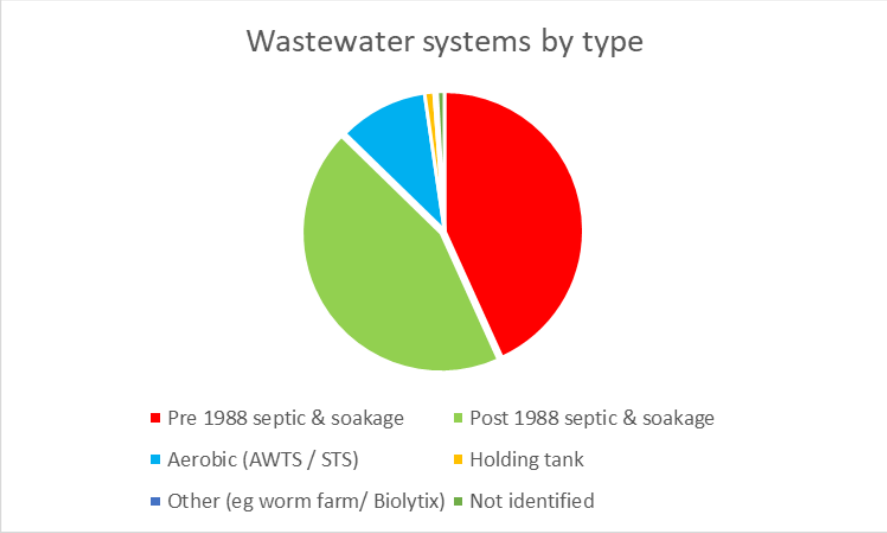
When assessing the potential area on allotments to upgrade, consideration was given to the flexibility of current design standards to utilise any areas of an allotment where a pumped discharge of effluent to sub-surface soakage may be possible, for example on previously unused or elevated areas. Areas of an allotment possibily available for irrigation of effluent from an aerobic wastewater treatment system (AWTS) were also considered. Landscaped irrigation "zones" can provide additional flexibility. These options, together with accessibility for potential upgrade works were also considered.

Where access to a property for inspection was not possible, or denied, a desktop assessment was undertaken, examining wastewater approvals, file notes, development applications and aerial photography.

Results / Discussion

A total of 826 onsite wastewater systems were identified across the 914 allotments in the study area.

Wastewater systems by type		Failing or poor	Upgraded
Pre 1988 septic & soakage	357	318	39
Post 1988 septic & soakage	364	12	
Aerobic (AWTS / STS)	86		
Holding tank	9		
Other (eg worm farm/ Biolytix)	3		
Not confirmed	7		
Total	**826**		



Overview of inspections

Inspections were conducted between February and December 2021. There was a high level of cooperation by owners and access was available for inspection of 91% of properties in the study area. Where access was denied or not possible, a desktop study was undertaken to assess each property.

The single most significant factor determining the satisfactory operation of onsite wastewater systems in the study area was found to be the age of the system and whether it was installed before major changes to standards that took effect from 1 Jun 1988. An 85% increase in the minimum septic tank capacity from 1620 L to 3000 L and a 500% increase in the minimum area required for sub-surface effluent disposal vastly improved the operation and sustainability of onsite septic and soakage systems after the new standards were introduced.

Only 12 (3%) of the 364 septic and soakage systems installed in the study area after June 1988 were considered to be in poor condition.

Conversely, 318 (89%) of the 357 septic and soakage systems installed prior to June 1988 were considered to be poor or failing.

159 (50%) of these poor or failing systems are on allotments which are considered to have insufficient reserve area available to enable an upgrade to current standards. This represents 19% of the total number of onsite systems in the study area.

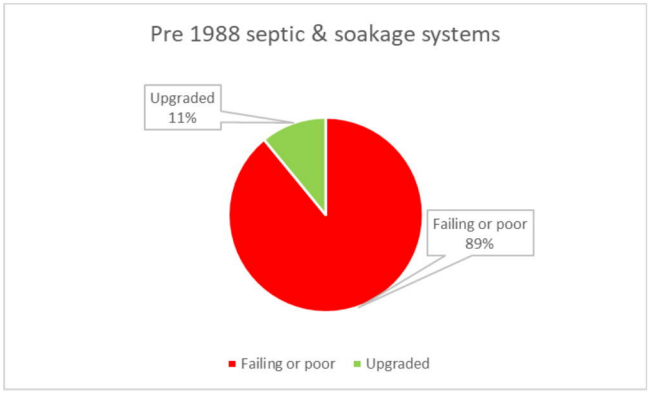
**Numbers of properties with failing or poor systems and without reserve areas are listed by street at appendix 1.*

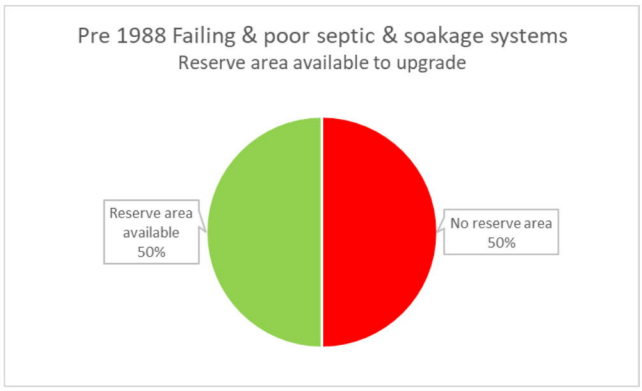
Septic & Soakage systems installed before 1988

Pre 1988 systems	
Failing or poor	318
Upgraded	39
Total	357

Availability of reserve area to upgrade

Failing or poor	No reserve area
318	159 (50%)





Evidence of system failure – pumps over failed soakage trenches

Evidence of system failure – Overflowing old soakage trenches / soakage wells

Efflent overflowing from soakage trenches – Pipe attached to direct overflow along boundary fence (left)

Soakage well failed – no reserve area available

Soakage well overflowing to yard near verandah

Partially buried poly rainwater tank used as a septic tank with overflow to adjacent shallow soakage well (right)

364 Septic and soakage systems installed after 1988

The 364 septic and soakage systems installed after 1988 comply with current design standards and represent 44% of onsite systems in the study area.

Only 12 (3%) of the 364 systems were considered to be in poor condition.

The larger soakage areas, ease of access to the septic tanks for periodic pump-out (de-sludging) via access shafts brought to the ground surface and predominantly sandy soils in the area all help to prolong the effective life of these systems. 8 of the 12 septic and soakage systems that were considered to be in poor condition are on allotments which have either no reserve area or very restricted acess available to upgrade. While the number of more recent systems in poor condition are relatively low, systems on allotments without sufficient reserve area may pose significant challenges in the future should they fail and require replacement.

86 Aerobic Wastewater Treatment Systems (AWTS)

The 86 Aerobic systems represent 10% of the 826 wastewater systems in the study area.

Systems are required to be serviced quarterly by an authorised service provider. Up to date servicing records on council files were located for 27 (31%) of systems. From discussion with owners at time of inspection it is estimated that approximately 75-80% of AWTS systems are being routinely serviced. Delays in forwarding of reports by service agents may account for the low number on file.

The irrigation area is an integral part of an aerobic wastewater system. However the location and layout of irrigation areas was consistently found not to be in accordance with site plans submitted for approval. Until around 2015 plumbers installing AWTS would typically leave irrigation tubing and fittings with each owner to complete the irrigation area once the dedicated landscaped area had been developed. This has resulted in ad hoc installations, many of which fall short of required standards. More recently, plumbers installing AWTS now also complete the irrigation systems and locate them on allotments in accordance with approved site plans.

Irrigation systems on 10 of the 86 AWTS were found to be incomplete or in poor condition.

Six of the AWTS dispose of treated effluent to approved pressure dosed sub-surface soakage trenches or soakage beds instead of surface irrigation.

Maintenance of onsite wastewater systems

The periodic maintenance required to maintain onsite wastewater systems is sometimes poorly understood by owners. While most owners familiarise themselves with the systems they have and the maintenance needed to keep systems operating well, some may have little knowledge or understanding of the principles of operation of their system or the importance of maintenance.

De-sludging (Pump-out) of septic tanks for a standard domestic septic tank is required every 4 years. Sludge and sediment accumulates in the base of the tank and a crust forms on the surface. This reduces the effective capacity of the the tank for retention of incoming waste to undergo anaerobic digestion (breakdown) and reduces the potential for excessive residue/sediment to discharge in the effluent to the subsurface soakage area. Effluent with high levels of sediment and solids can accelerate the growth of a biofilm on the surfaces of the soakage trench (base and sides), creating an impermeable layer leading to failure of the soakage trench.

Septic tanks installed prior to 1988 were typically buried without any access shaft to the surface. This not only makes access difficult for de-sludging tanks but in many cases the location of the tank may be unknown to the owner. Septic tank systems were found that had not been de-sludged (pumped out) for over 15 years. The provision of access shafts from septic tanks to the ground surface readily identifies their location and provides ease of access for maintenance.

Inclusion of maintenance fact sheets to owners with new wastewater system approvals by councils promotes and improves understanding of how their systems work and the maintenance required (Maintenance of septic tank systems [5] & Maintenance of aerobic wastewater systems [6]).

Importance of a reserve area for upgrading onsite systems

159 (50%) of poor or failing systems installed prior to 1988 are on allotments which are considered to have insufficient reserve area available to enable an upgrade to current standards. Numbers of affected properties, listed by street can be found at Appendix A.

This represents 19% of the total number of onsite systems in the study area.

Examples of allotments with no reserve area available for upgrading of onsite wastewater systems.

Addressing non-compliance with Public Health Regulations

Councils in South Australia are prescribed as the "Relevant authority" for administration of the *South Australian Public Health (Wastewater) Regulations 2013* under the *South Australian Public Health Act 2011*.

Councils have authority and responsibility for assessing applications and issuing approvals for wastewater works. Council's authorised officers have significant powers under the Public Health Act and Wastewater Regulations for enforcement, including power to enter property and inspect, require an owner to obtain an expert report (typically from a wastewater engineer), and issue Notices to owners under the "General Duty" provisions set out in Part 6 of the SA Public Health Act 2011. Notices may direct owners to take specified

action(s) considered necessary to address an alleged breach of prescribed standards or to prevent any potential risk to public health.

In short, councils have significant power under the legislation to require an owner to make any necessary improvements or to cease acts such as pumping untreated effluent to a garden. Notices may also require an owner to upgrade an onsite wastewater system in accordance with current prescribed standards if a system is failing and presenting a risk to public health.

Given the number of onsite wastewater systems identified in the study as being in a poor or failing condition and the physical limitations on many allotments for upgrading systems to current standards, a regulatory approach in these situations is considered problematic.

On small allotments where there may be potential for an environmental or public health risk, a holding tank may be the only suitable solution. Shack sites along the Murray River are a typical example where dwellings on small allotments have no option other than a holding tank if no CWMS is available. Holding tanks are not considered to be a suitable long term solution for poor or failing systems.

Public health & environmental considerations

As described earlier in the report, the identification of an increasing number of failing wastewater systems and limitations of allotment size (reserve area) for upgrading systems to current standards, together with the associated risks to public health was the primary motivation for the Eastside Onsite Wastewater Systems Review.

In addition to the more obvious public health risks from direct human contact with untreated effluent are uncertainties regarding the potential for contamination of ground water and the river, particularly given the shallow water table beneath parts of the Eastside area and the close proximity of the SA Water's Pump Station which draws water for Adelaide's water supply, directly opposite the Riverglades wetland.

Examination of groundwater data from the SA government's "Water Connect" website indicates that bores on residential allotments adjacent to the Riverglades Wetland have a "standing water level" (swl) as shallow as 3.18 metres. The shallow depth to water is not unexpected given the proximity to the wetland and limited elevation of residential allotments above the typical water level of the wetland.

The SA On-site Wastewater Systems Code prescribed under the *SA Public Health Act 2011* sets out in 8.2.2 (c) that; "*In the case of a sub-surface disposal system, the base of the trench shall be at least 500mm above the highest level of the water table*." This Standard does not further qualify this short distance between the base of a soakage trench and the water table, or take account of the soil profile. Given the sandy soil and very high percolation rate in much of the area, the 500mm buffer between the base of a soakage trench and the water table may, in some instances, be insufficient to prevent migration of untreated effluent into the water table, and potentially into the wetland.

Unit_No	Obs_No	obs_date	dtw	swl
6727-2975	BDT008	1/03/2002	3.8	3.32
6727-2975	BDT008	2/04/2002	3.78	3.3
6727-2975	BDT008	22/12/2002	3.71	3.23
6727-2975	BDT008	23/01/2003	3.77	3.29
6727-2975	BDT008	24/02/2003		
6727-2975	BDT008	24/03/2003	3.8	3.32
6727-2975	BDT008	28/04/2003	3.81	3.33
6727-2975	BDT008	2/06/2003	3.83	3.35
6727-2975	BDT008	30/06/2003	3.78	3.3
6727-2975	BDT008	27/10/2003	3.66	3.18
6727-2975	BDT008	21/11/2003	3.71	3.23
6727-2975	BDT008	15/12/2003	3.77	3.29

Location of groundwater bore adjacent to Riverglades Wetland – Standing Water Level (SWL)

Proximity of SA Water pump station (suppling water to Adelaide) and residential properties on Eastside.

The 50 km Murray Bridge to Onkaparinga pipeline carries water from Murray Bridge to the Mount Bold Reservoir and water treatment plants in Kanmantoo and Balhannah in the Adelaide Hills.

Pumped supplies from the River Murray have historically met an average 40% of Adelaide's water supply; increasing to over 90% in dry and low inflow years. Thus despite being a climate-dependent source itself, the River Murray has provided Adelaide not only cheap base load supply in average years, but water security in dry years. This was exemplified in 2006/07 when 91% of Adelaide's water supply was derived from the River Murray (Government of S.A. 2009, Caica 2010). Securing Unlimited Water Supply in Adelaide over the Next Century Balancing Desalinated and Murray-Darling Basin Water - *Deakin University 2015.*[4]

The potential for migration of effluent from subsurface disposal trenches to ground water and the river environs is of some concern given the hydraulic load of wastewater generated in the study area and the geological profile of areas along the river. The combination of sandy soils with a high percolation rate and varying depths and layers of limestone provide little resistance in some areas for escape of effluent.

During inspection of a property on an elevated area adjacent to the river an owner explained that during installation of his wastewater system a large quantity of water from a newly laid drain was rapidly released to an excavated hole prepared for a new septic tank (following a water test of the drain). A vortex emerged as the water quickly disappeared from the excavated hole. The event witnessed and described by the owner demonstrates the honeycomb nature of the limestone in the area and potential for water to migrate fairly rapidy through the limestone strata in some areas.

The hydraulic load of effluent from the study area is significant. Based on the "design flow per equivalent person (FEP) of 170L/p/d (litres per person per day) in the "LGA South Australian Community Wastewater Management System (CWMS) Design Criteria" approximately 365,000 litres of effluent is discharged daily from wastewater systems in the study area.

Conclusion

On-site wastewater systems in the study area currently generate approximately 365,000 litres (0.365 ML) of effluent per day. This volume equates to around 8% of the 4.5 ML daily capacity of the new wastewater treatment plant commissioned in 2021 to service the western city side of Murray Bridge.

The inspection and assessment of 826 on-site wastewater systems and the associated data collected provides a valuable snapshot of the condition of systems in the area and is an important first step to examining options for the future management of wastewater in this growing area of Murray Bridge.

There are very limited options for properties with poor or failing systems that have no reserve area to upgrade. In many instances, regular pump-out of septic tanks and soakage trenches by licenced contractor(s) may be the only short term solution to prevent overflow of effluent and reduce any potential risk to public health. This may be required weekly or even more frequently depending on inflows to each system. This is a costly undertaking and difficult for many who may be on lower incomes or pensions. The widespread practice of pumping untreated effluent onto gardens is a breach of the Public Heath Act and considered a priority for urgent attention. An interim support program coordinating the pump-out of septic tanks where tanks are known to be frequently overflowing may be one option worthy of consideration to reduce the risk to public health until more sustainable solutions are established.

Given the large number of poor and failing systems and the physical limitation of many allotments to upgrade, a regulatory approach including the issue of Notices requiring compliance is problematic and in many cases unlikely to achieve sustainable solutions. Enforcement actions of this nature may also be viewed as unreasonable and present a considerable reputational risk to Council.

It's clear that the wastewater issues on Eastside are complex and that priority needs to be given to further engineering assessment and planning to address these challenges. Two options include the examination of a business case for extension of SA Water sewerage infrastructure to service existing and future development on Eastside (understood to possibly be within the designed reserve capacity of the new plant) as outlined by the Minister for Water, Paul Caica in 2011 or for the construction of a separate Community Wastewater Management System (CWMS), managed by the Rural City of Murray Bridge.

Technical advice from both SA Water and the LGA's CWMS engineering team are considered key in exploring options for the future management of wastewater on Eastside. The Eastside Onsite Wastewater Systems Review provides comprehensive baseline data for further assessment and consideration of appropriate solutions.

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5. Maintenance of septic tank systems - Department of Health, Government of South Australia 2008
6. Maintenance of aerobic wastewater treatment systems - Department of Health, Government of South Australia 2008

Appendix A. Pre 1988 septic and soakage systems – Reserve areas (numbers of systems)

Pre 1988 septic & soakage by street	Failing or poor	No reserve area
	43	18
	41	13
	28	11
	27	18
	22	18
	20	19
	18	12
	17	5
	11	1
	11	7
	9	4
	9	6
	8	6
	6	5
	5	3
	5	2
	5	5
	4	0
	4	3
	4	0
	3	0
	3	3
	3	0
	2	0
	2	0
	2	0
	1	0
	1	0
	1	0
	1	0
	1	0
	1	0
	318	**159**

Appendix B. All wastewater systems in study area - Pre June 1988 & Post June 1988

Appendix C. - All Wastewater systems by type

Appendix D – Condition of Pre 1988 Septic & Soakage Systems

Appendix E – Reserve areas available for Pre 1988 Septic & Soakage Systems

Appendix F – Reserve areas available for all wastewater systems in study area.