Item 8.9 - Attachment A

Australian WATER Environments

Branxholme Sewage and Wastewater Feasibility Study

Final Report

May 2013

Report produced for Southern Grampians Shire Council

Report produced by Australian Water Environments Pty Ltd

BRANXHOLME WASTEWATER FEASIBILITY STUDY

May 2013

Project Team

Dave Pennington

Nick Watkins

Rob Burnell

ABN 17 485 960 719

1 / 198 Greenhill Road
Eastwood SA 5063

Telephone: 08 8378 8000
Facsimile: 08 8357 8988

www.austwaterenv.com.au

Australian WATER Environments

TQCSI ISO 9001:2008 Quality Certified AU1088-QC

Document History and Status

Issue	Rev.	Issued to	Qty	Date	Reviewed	Approved
Draft	3.4	K. McIntyre	1	16/01/2013	DP	DP
Draft	3.5	K. McIntyre	1	15/02/2013	DP	RB
Final	3.6	K. McIntyre	1	05/05/2013	DP	RB
Final	3.7	K. McIntyre	1	21/05/2013	DP	RB

Printed:	May 21, 2013
Last Saved:	May 21, 2013
File Name:	Branxholme Domestic Wastewater Feasibility Study_FINAL_130520
Project Manager:	David Pennington
Client:	Southern Grampians Shire Council
Project:	Branxholme Sewage and Wastewater Feasibility Study
Name of Document:	Branxholme Sewage and Wastewater Feasibility Study Final Report
Document Version:	V3.7
Job Number:	12096

Table of Contents

List of Tables

List of Figures

Appendices

Glossary

Absorption System
The uptake of effluent into the surrounding soil by infiltration and capillary action.

Aerated Wastewater Treatment System (AWTS)
An AWTS is purpose built system used for the treatment of sewage and liquid wastes. It consists of a series of treatment chambers where air is bubbled through the wastewater providing oxygen to aerobic micro-organisms that digest organic matter in the wastewater. The resulting effluent is suitable for surface irrigation.

Blackwater
Wastewater from toilets containing faeces and urine.

Domestic wastewater
All wastewater from the toilet, bathroom, laundry, and kitchen.

Effluent
Treated wastewater.

Evapo-transpiration
Transfer of water from the soil to the atmosphere by evaporation and through plant transpiration.

Greywater
Domestic wastewater from sources other than toilets, including washing machines and dishwashers.

Groundwater
Groundwater is water collected in saturated layers of soil, sediment or porous rock below the ground as aquifers. Aquifers in geological formations are permeable enough for water to move within them and be discharged or extracted.

Nutrients
Substances such as Nitrogen and Phosphorus that are essential for life. In excess they may stimulate the growth of plants, algae and cyanobacteria (blue-green algae).

Onsite Wastewater system
A system to treat and dispose of wastewater on site wholly within the property, where no reticulated sewer is available.

Primary treatment
Initial treatment of wastewater such as in a septic tank, where sedimentation and flocculation assists with the removal of organic and inorganic matter from wastewater.

Secondary treatment
Primarily consists of biological treatment and aeration following primary treatment of wastewater, and usually disinfection to the required standard for its disposal or reuse.

Executive Summary

Background

Southern Grampians Shire Council (Council) engaged Australian Water Environments (AWE) to prepare a feasibility study of the options for managing domestic wastewater within the township of Branxholme. There are two main drivers for this study:

- Council and residents recognise that future growth in Branxholme will be dependent on having a better understanding of the infrastructure required to sustain growth; and
- Council and residents have identified that currently some domestic wastewater management systems in Branxholme may be substandard, and that existing septic systems are aging and increasingly prone to failure, presenting a potential future health and environmental risk to the community.

Previous studies had found that ageing septic systems in Branxholme were contributing to a decline in environmental standards within the town; additionally, that the cost of a reticulated sewerage system for the town would be high.

This Feasibility Study assesses the adequacy of the existing wastewater systems within the township to identify (and prioritise) potential approaches that could be implemented. The goal is to provide an appropriate level of environmental protection and public health for the township into the future.

The findings in this study have been informed by: a review of relevant legislation and policy and previous studies; an analysis of cultural, natural and built heritage and physical characteristics (topography, soil and catchment hydrology); stakeholder engagement; mapping and audit of existing wastewater infrastructure in the township and a technical assessment of potential options.

For the purposes of this investigation, there are an estimated 164 residents of Branxholme, residing in 63 dwellings. The nominated study area includes the area of Branxholme that is zoned as township in the current Planning Scheme plus additional properties to the south and east of the zone. This coverage allowed consideration of issues impacting on the Arrandoovong Creek and future growth issues. Of the 63 dwellings within the study area, 53 dwellings are located within the township zone and 10 dwellings located within the farming zone. There has been no significant growth in Branxholme in the last 5 years, and no trend for growth in the foreseeable future. It is understood that any future growth in the area would be driven by land prices, lifestyle and commutability.

Site inspection

Branxholme township currently has no common wastewater collection or treatment system; each household has a septic tank system where effluent from the tank is disposed onsite by land application means. There are two properties that currently that have secondary wastewater systems which are Aerated Wastewater Treatment Systems (AWTS).

The town is not serviced by a reticulated potable water supply; household water supply is generally supplied by roof water collection and storage. It is understood there are a few properties on the northern side of the township that access Council's town bore. This was evidenced during an onsite inspection in Branxholme.

Most of the older and original homes in Branxholme still have original septic tanks that were installed in the early 1960s. The majority of wastewater systems in Branxholme are 'split systems',

where greywater and blackwater are treated separately. The properties inspected discharged greywater via barrel drains into garden areas, usually away from the house, to the rear.

The stormwater system generally consists of a number of table drains or swales located in roads heading north south, more or less along level contours. Approximately 80% of the developed township discharges to the Arandoovong Creek. The site inspection found that:

- The condition and level of septic system failure is evident;
- There is evidence of greywater and effluent discharging off site, and this situation presents a risk to public health and the environment, especially where greywater discharges directly into the stormwater system ;
- There appears to be stormwater management issues especially where stormwater is able to pool in swale drains, and not adequately drain following high rainfall events;
- There are no pollutant traps or water quality devices for treatment of stormwater prior to discharging to the Arrandoovong Creek; and
- It would appear that many properties have bores that are located within the prescribed setback distance from the wastewater disposal area (refer to EPA CoP requirement for minimum 20 metre setback). This could present a potential risk to human health and contamination of groundwater sources.

Policy and legislation

There is some uncertainty about Council's legal power to require owners of septic tank systems to modify their septic tank systems, unless the systems are deemed to be causing a nuisance e.g. an effluent discharge that is causing an offensive odour.

The Local Government Act gives Councils the power to create local by-laws to regulate wastewater management as long as these laws are consistent with state policy and legislation; councils may introduce a special charge on homeowners to fund any 'genuine function if the function benefits the persons being charged'. Therefore, Council may be able to raise a charge to fund a domestic wastewater management program if it can demonstrate the 'genuineness' and benefits of the program.

Water Authorities have the power to inspect septic tank systems and order owners to repair and/or properly maintain their systems within their sewer districts. They also have the power to carry out works on septic systems and impose charges for these works (if a by-law is created). These provisions appear to give Wannon Water, in its sewer district, equivalent powers to Council to facilitate the repair of septic systems.

Stakeholder engagement

Engagement with stakeholders was undertaken to gather feedback on a set of preliminary options and general information on current wastewater management systems and practices in Branxholme.

A community feedback questionnaire and information sheet was prepared and distributed to 65 property owners or occupants and a community information session was held on 8th March 2012. In summary, the responses:

- Reinforce previous findings that the community values the protection of the environment and public health;
- Indicates that the community generally feels that their current systems are adequate and do not require change;

- Indicates that there is a notable lack of understanding regarding the maintenance of systems but a desire to learn more about making systems work better; and
- Highlights the community's concerns regarding incurring the costs of any required upgrade or imposed system change.

The results of the questionnaire and feedback gathered in the community information session demonstrate that a large proportion of the community potentially does not want a change to the current systems. However, some of the resistance to change by the community may be tied to articulated concerns regarding 'who pays' and what the financial costs of this change would be.

Relevant government agencies were also consulted. The Department of Sustainability and Environment (DSE) identified there are no sources of funding available in the short term.

Wannon Water understands the difficulty that small communities have, and is therefore willing to consider a range of options for wastewater management including alternative systems.

A meeting was held on 8 March 2012 with Wannon Water representatives and Council staff. At the meeting the representatives stated that any proposed option would be assessed on a range of economic, environmental and social criteria. Typically the cost of installation and operation of any system would be met by the Branxholme community. A communal style system has not been implemented elsewhere by Wannon Water and would require detailed assessment before Wannon Water would commit to such a solution. In response to this the Council staff present at the meeting noted that the same options would be difficult for Council to manage and operate.

The Glenelg Hopkins CMA was consulted in relation to their role in monitoring the health of inland waterways, particularly Arrandoovong Creek. Their stated position is that, with respect to water resource management, they provide a supportive and advisory role to council and stakeholders, but are not in a position to provide financial support for a water quality monitoring program. However, they do wish to partner in future water management initiatives.

Water Quality Testing

During the course of the stakeholder engagement, it was clear that there was a level of community concern regarding the need to protect the environment and public health. Consequently, it was determined that water quality testing needed to be undertaken to ascertain whether current wastewater management systems are in any way contaminating local water courses, notably the Arrandoovong Creek.

Three samples were commissioned as part of this project and undertaken by Council staff.

The testing indicated that effluent from Branxholme may be entering the stormwater system. It is also possible that contamination entered the creek from the adjacent recreation ground's septic system.

Options for Wastewater Management in Branxholme

As a result of the above investigations the following options were identified for further investigation:

- Option 1: Centralised sewage waste water system;
- Option 2A: Decentralised greywater system;
- Option 2B: Decentralised effluent collection and treatment;
- Option 3: Low pressure sewer system; and

- Option 4: Upgrade existing on site wastewater systems.

Issues taken into consideration in determining preferred options included: financial, legislative, health, environmental and social issues along with the outcomes of the stakeholder engagement. Key considerations in identifying the preferred option were the likelihood of external funds being available to carry out capital works and the likelihood of any population growth.

Option 1, a centralised gravity sewer system, is the most expensive option in terms of initial capital constructions costs.

Option 2A and 2B provide a lower cost solution than Option 3 and in the absence of external funding may be a viable alternative, given the current population growth of the township. Consideration would need to be given as to who maintains and manages the system and it is recommended that Council consults further with Wannon Water.

If external funding becomes available for the required capital works, Option 3 would be preferred as it would provide an acceptable environmental outcome at a reasonable capital and ongoing maintenance cost over the longer term. It would provide for population growth and could be extended as required, should there be an increase in demand for building sites in Branxholme.

Key aspects of the preferred option (Option 3) are:

- The low pressure sewer system is compliant with relevant legislation and standards and is a proven technology. A similar system was recommended for Merricks Beach in Mornington Peninsula Shire;
- The system is flexible and would enable a design that would immediately address the issue of failed and failing septic systems, which are especially evident on allotments under 2200m^2;
- Properties of 4000m^2 or less would also be required to install a pressure sewer system;
- Once constructed the system can expand to meet demand. The system will facilitate allotments of minimum size within the township zone;
- It is estimated that the on-property costs for 33 properties would be in the order of $12,000 (refer to the costings under Option 3);
- This type of system is preferred in environmentally sensitive and flat terrain settings where a mains sewer system is expensive and difficult to implement; and
- It would be expected that implementation could be achieved within a 2 year time frame, subject to funding being secured from relevant sources, and approvals being sought, including by Wannon Water.

Option 4 is the least expensive option, and may be more likely to receive support from the community. However it does not address the problem of small allotments which have insufficient area to manage the waste water generated on the site and would not provide for subdivision and further housing development in Branxholme.

Option 4 would be considered as a preferred short term option where funding of a more centralised solution such as Option 3, is problematic.

Recommendations

It is recommended that Council approve the preferred option 3 identified in this study for further stakeholder engagement. If approved this engagement would need to occur in the context of the

broader education. For the preferred option to be successful it is recommended that Council give consideration to the following:

- Establishing a financial incentive or subsidy mechanism for the 33 affected properties to install the necessary infrastructure;
- Engaging Wannon Water and potentially a private sector partner in scoping the preferred option and developing a functional design that complies with Wannon Water's identified business case model. Similar Private Public Partnership arrangements have been established in other states for the management of small scale centralised wastewater systems;
- Identifying potential external funding sources; and
- Using some Council funding as leverage to secure the necessary external funds to cover the capital costs to design and construct the preferred option.

It is clearly evident that a collective approach by stakeholders is required for this option to succeed. It is recommended that Council take an advocacy, leadership, facilitative and part funder role in progressing this option.

The following table summarises a number of supporting actions that are recommended for implementation by Council in partnership with relevant stakeholders. These supporting actions apply to all options and are seen as a fundamental part of any transition to a more effective approach to wastewater management in the township.

	Action	Priority
Policy review	It is recommended that (a) Council reviews and amends the current Planning Scheme to incorporate minimum allotment sizes for unsewered residential land development; and b)When new development is proposed, Council specifies the necessary system upgrades.	High
Corrective actions	Work with relevant property owners to address off site discharge of wastewater. Report water quality test results to relevant regulatory bodies.	High High
Education program	Given the findings of the stakeholder consultation, in particular the identified community resistance to change being tied to their concerns regarding who bears the cost, it is recommended that an education program is developed and implemented as a priority. This recommendation confirms the findings from the 2006 DWMP regarding the need for such a program. The program would focus on educating the residents on contemporary practice regarding domestic wastewater management and maintenance of existing systems.	Medium
Auditing	It is recommended that Council undertake a full audit of all properties including effluent outfall from septic tanks, disposal fields and sludge and scum measurements.	High
Assessment	It is recommended that a consistent approach is taken in undertaking Land Capability Assessments (LCAs) in all relevant planning and development decision making concerning wastewater management in Branxholme. Whole of township soil mapping.	Medium
Centralised desludging program	It is recommended that Council consider establishing a centralised desludging program, where the Council manages the pump out and passes the cost as part of the annual rates.	Medium
Monitoring	It is recommended that Council secure the support of the Glenelg Hopkins Catchment Management Board to undertake a comprehensive water quality monitoring program in the relevant watercourses.	High

1 Introduction

1.1 Purpose of Study

Southern Grampians Shire Council (Council) engaged Australian Water Environments (AWE) to prepare a feasibility study of the options for managing domestic wastewater within the township of Branxholme. There are two main drivers for this study:

- Council and residents recognise that future growth in Branxholme will be dependent on having a better understanding of the infrastructure required to sustain growth; and
- It has been identified that currently some domestic wastewater management systems in Branxholme may be substandard, and that existing septic systems are aging and increasingly prone to failure, presenting a potential future health and environmental risk to the community.

One of the key findings of the 2006 Southern Grampians Domestic Wastewater Management Plan (1)(DWMP) was that aging septic systems in Branxholme were contributing to a decline in environmental standards within the town; additionally, that the cost of a reticulated sewerage system for the town would be high.

Accordingly Council and the community, through the Branxholme Progress Association, are keen to explore the options to deal with this issue for existing properties, and develop a strategy that allows for future development and expansion of the town.

This Feasibility Study assesses the adequacy of the existing wastewater systems within the township to identify (and prioritise) potential approaches that could be implemented. The goal is to provide an appropriate level of environmental protection and public health for the township into the future.

1.2 Study Objectives

Council has identified the following key study objectives:

- To specify the environmental standards which need to be met for domestic waste water management;
- To assess the quality of domestic waste water management in the township of Branxholme;
- To identify a range of options for managing domestic waste water within the town;
- To provide costings for each option;
- To assess the feasibility of options, according to the expectations of the community and each option's ability to deliver given environmental and financial constraints;
- To provide recommendations for management and budgeting of the favoured system;
- To conduct an effective community engagement process to determine governance arrangements and to ensure that the community is fully informed and involved in the decision making process; and
- To provide a methodology for small town waste water management that can be rolled out in other small towns within the Shire.

1.3 Project Methodology

The following methodology was used in the preparation of this report:

1. Comprehensive literature review including Federal and State legislation and policy context and State, Regional and Local plans and strategies;
2. Stakeholder and community consultation to facilitate the identification of relevant opportunities and partnerships (including members of the Project Steering Committee):
    - Branxholme Progress Association;
    - Wannon Water;
    - Environmental Protection Authority;
    - Glenelg Hopkins Catchment Management Authority; and
    - Southern Grampians Shire Council.
3. Identification and detailing of existing wastewater infrastructure in Branxholme, in order to:
    - Provide updated details of individual systems in tablature format in conjunction with existing information provided by Council;
    - Identify the capacity of the soil and the receiving environment to accept wastewater (by utilising existing geotechnical reports to determine infiltration rates);
    - Identify opportunities for alternative systems, such as passive public domain, cluster systems and engineered wastewater solutions (in accordance with Australian Standard AS1547:2000) that incorporate natural processes and low carbon footprints; and
    - Identify opportunities for beneficial wastewater reuse, and associated infrastructure requirements.
4. Provide recommendations on future directions and priority projects to pursue in the short term (next 5 years), and longer term, where appropriate; and
5. Preparation of the Final Report, including mapping of the study area as necessary, to effectively represent the findings and recommendations.

2 Branxholme Township

2.1 Study Area

Branxholme is located 25 km south west of Hamilton, near the southern border of the Southern Grampians Shire. The Southern Grampians Shire has a population of over 17,000 and covers an area of 6,650 square kilometres. Hamilton is the main retail and service centre, supported by the smaller towns Balmoral, Branxholme, Byaduk, Cavendish, Coleraine, Dunkeld, Glenthompson, Penshurst, and Tarrington. Hamilton, Coleraine and Dunkeld are partly serviced by a reticulated sewer system and the other towns use onsite wastewater management systems.

Branxholme's current population is estimated to be 164 people.

Branxholme is located on elevated land between the Crawford River catchment to the west, and the Arrandoovong Creek, which runs through the town on the eastern side. The Arrandoovong Creek flows into the Condah Swamp, and then into Darlot's Creek and the Crawford River, which joins the Glenelg River at Dartmoor (see Figure 2-1).

From the information provided by council, there are approximately 132 properties in Branxholme, of which approximately 63 have been developed. Of the 63 dwellings within the study area, there are 53 dwellings located within the township zone and 10 dwellings located within the farming zone. Two blocks are smaller than 1,000 square metres. The remaining properties are generally 1,500 square metres or larger. Density rates do not exceed 10 dwellings per hectare in any part of the township.

In addition to residences, Branxholme has a small primary school, a hotel, CFA station, local store, police station, community hall and recreation reserve.

The core of the township is located on the side of a small incline (below 20 degrees), which drains in an easterly direction to the Arrandoovong Creek. The predominant soil type is black expansive clay with stony outcrops, which is poorly drained (see section 2.3.2).

The nominated study area was identified by Council as the region within Branxholme which is zoned as township in the current Planning Scheme. The township zone is the region of land bound by Lynch St, Railway Parade, Cox Street, and Henty Highway, and incorporates the majority of dwellings. Following a discussion with the Project Control team at the inception stage of the Project, it was decided to widen the study area to include additional properties, especially to the south and east. This would enable consideration regarding:

- The influence that wastewater management in Branxholme may have on nearby Arrandoovong Creek, including water quality, and an appreciation of cultural and environmental significance;
- Inclusion of the Arrandoovong Creek and floodplain in the mapping of physical limitations to future land division, including prescribed setback distances from wastewater infrastructure;
- Identification of likely growth areas in Branxholme, and constraints related to wastewater management; and
- The extent that local geology and groundwater flows, and hydrological issues outside of the township zone, may generally influence decisions around wastewater management in Branxholme.

From the information provided by council, of the 63 dwellings within the study area, there are 53 dwellings located within the township zone and 10 dwellings located within the farming zone.

Figure 2-1 indicates the extent of the Branxholme study area.

Job No. 12096 - 004
120306

Figure 2.1

2.2 Historical Relevance

Whilst not specifically requested in the project brief, it became apparent at the initial stakeholder and community consultation stage that cultural heritage implications needed to be considered. Accordingly, the following provides a brief outline of the Indigenous and European heritage importance of the area. This information is primarily sourced through the Department of Planning and Community Development.

2.2.1 Cultural Heritage

2.2.1.1 Indigenous Heritage

The Gunditjmara people are the traditional custodians of the region that Branxholme lies within.

Lake Condah is traditionally known as Tae Rak and is the heart of Gunditjmara country. The Arrandoovong Creek that runs through Branxholme flows into Lake Condah.
The Kerrup Jmara (People of the Lake) developed an extensive system of ponds, channels and traps at the southern end of the lake for fishing and trading eels. Lake Condah and the Condah Swamp were subject to drainage works since the arrival of European people to the area. Following devastating floods in 1946, a larger drain was constructed along the Condah Swamp from Branxholme to and through Lake Condah. The works were completed in 1954 and connected the drain to the spring at the Lake Condah Aboriginal Mission that flowed into Darlots Creek. In March 2008, Lake Condah was returned to Gunditjmara people by the State of Victoria. The Lake Condah Restoration Conservation Management Plan was also completed to ensure that the extensive Aboriginal cultural heritage values were maintained and enhanced during and after the installation of a new weir in 2010 that restored flows to the Lake.

The current Gunditj Mirring Partnership Project is a 4 year project supported by funding from the Australian Government's Caring for Our Country, involves a collaboration between the Glenelg Hopkins CMA and the Gunditj Mirring Traditional Owners in the form of the. One of the proposed activities has been to investigate the opportunity to re-establish eel farming in Lake Condah.

This highlights the importance of good upstream environmental management and protection of waterways, such as in the Arrandoovong Creek, to ensure future downstream assets are not placed at risk.

A cultural heritage management plan will be required if any excavation works are carried out in the identified areas of cultural significance.

2.2.1.2 European Settlement and Heritage

There are 28 places of heritage significance in the Branxholme area documented in the Southern Grampians Heritage Study 2008. A heritage overlay (HO) has been applied to twenty five of these places in the Southern Grampians Planning Scheme (HO 36 to 61). Heritage controls over these places can be found in Section 43 of the Planning Scheme: the Heritage and Built Forms Overlay schedule (planningschemes.dpcd.vic.gov.au). The Victorian Heritage Register does not contain any listings in Branxholme. Examples of sites of historical significance to the Southern Grampians Shire within the study area include:

- The remnant garden on the Corner of Henty Highway (Creek Street) and Brown Street is a typical nineteenth century allotment, which was originally a suburban cottage and garden.

Its historical significance is as a rare surviving example of an early nineteenth century town-based orchard and garden associated with a small residence;

- The Junction Hotel, located at the north-east corner of Brown and McNicol Streets, is of architectural significance as a typical example of a small country pub constructed in a vernacular style in the late 19th century;
- The Branxholme Recreation Reserve, which was gazetted in 1870, and the Swimming Pool Reserve, which was gazetted in 1929. The reserves, which total over 6.5 hectares, straddle the Arrandoovong Creek immediately to the east of the Henty Highway;
- The Branxholme Primary School, which is a collection of buildings situated on a large site with frontages to both Monroe and Cox Streets; and
- The Railway Water Tower at the Branxholme Railway Reserve, which is located on the west of Railway Parade, north of the former station site in the disused railway yards.

In consideration of any future new or upgraded infrastructure, preservation of heritage sites should be considered for their value to the community.

2.3 Physical Characteristics

The topography, general stormwater flow path, contours, and groundwater flows are indicated in Figure 2-2.

2.3.1 Topography

Branxholme is at approximately 125 metres Australian Height Datum (AHD), located on the western slope of the Arrandoovong River embankment. The land gradient varies from approximately level at 125m AHD (around Best Street and McNicol Street area) to slopes of up to 20% along the northern end of Wyndham Street, and around 10% south of Lynch Street. The western slope gradient generally reduces towards Henty Highway and the Arrandoovong Creek floodplain, to around 106m AHD.

The level ground extends from Cox Street through Brown Street and has sufficient depression to detain stormwater, which has caused flooding issues in the past. This occurs from Cox Street to Brown Street, and McNicol through Best Street.

Both steep grades and areas subject to flooding are a concern for wastewater system design; in each case, the surface disposal of wastewater should be avoided.

2.3.2 Surface Soils

The structure of surface soils is critical in determining the capacity to treat and dispose of wastewater within the surface soil horizons. A number of soil assessments have been reviewed in this study, including a geotechnical report for road construction, Land Capability Assessments (LCA) for wastewater disposal applications, and soil mapping sourced from the Australian Soil Resource Information System (ASRIS).

In accordance with Standard *AS/NZ1547:2012 On-site Domestic Wastewater Management* (3)*,* soil types are categorised according to their capacity to permeate wastewater and to determine the most appropriate land application disposal system for domestic wastewater. Treated domestic wastewater is further classified as either primary treated sewage (septic tank effluent), or secondary treated sewerage (advanced treatment, such as an Aerated Wastewater Treatment System).

A table of suitable land application systems that is considered appropriate for various soil types is provided in Table 2-1. Specifically, these systems relate to subsurface treatment of wastewater, which is predominant in Branxholme. Aerated Wastewater Treatment Systems (AWTS) treat wastewater to the extent that it is suitable for surface irrigation, and is also suitable for subsurface disposal (especially where heavy soils are encountered). Note that whilst surface irrigation is permitted under the Environmental Protection Authority – Code of Practice for Domestic Wastewater Management it is not considered best practice due to the public health and environmental hazards presented by non-disinfected waste water.

For the purposes of this study, a conservative Category 5/6 has been used to describe the soil infiltration capacity, with a permeability of around 60mm per day for primary treated (septic tank) effluent. An inspection of drilling logs has provided an indication of local soil types and indicative depths to geological strata such as clays, limestone and underlying volcanic basalt. The surface soils are predominantly heavy clays of varying depth, but there is evidence that this is typically variable.

Subsurface land application systems which dispose into Category 5/6 soils are generally limited to systems that dispose in the upper soils, and incorporate Evapo-transpiration in their design. A range of appropriate systems for various soil types are further explained in the Environmental Protection Authority – Code of Practice for Domestic Wastewater Management, and examples of suitable disposal systems for Branxholme soils are illustrated in section 3.1.1.

TABLE 2-1 SOIL CATEGORIES AND SUITABLE SUBSURFACE LAND APPLICATION SYSTEMS

Soil Category	Soil texture	Soil structure	Permeability (mm/day)	Recommended Land Application Systems	Notes
1	Gravels and Sands	Structureless (massive)	>3000	Shallow subsurface drip irrigation (SSI), Mounds, Wick Trenches	Secondary treatment is required where there is a risk of groundwater contamination. EPA do not permit Absorption Trenches in Cat1-3a soils
2	Sandy loams	Weakly structured	> 3000	Mounds, ETA, Wick, SSI	
		Massive	1400 – 3000	Mounds, SSI Low Pressure Effluent Distribution (LPED),	
3	Loams	High/moderate structured	1500 – 3000	Evapo-transpiration Absorption (ETA) Mounds, LPED, SSI	
		Weakly structured or massive	500 – 1500	ETA, Absorption trenches, LPED, Mounds, SSI	
4	Clay loams	High/moderate structured	500 – 1500	ETA, Absorption trenches, LPED Mounds, SSI	
		Weakly structured	120 – 500	ETA, Absorption trenches, LPED, SSI	
		Massive	60-120	ETA, Absorption trenches, LPED, SSI	

5	Light clays	Strongly structured	120-500	Absorption trenches, SSI, LPED (with modified topsoil) Evapo-transpiration Absorption (ETA)	
		Moderately structured	60-120	LPED (with modified topsoil) , SSI, Surface drip/spray irrigation	
		Weakly structured or massive	<60	SSI, Surface drip/spray irrigation	Secondary treatment is recommended in Cat5/6 soils where a primary treatment system cannot be designed to fit land conditions
6	Medium to heavy clays	Strongly structured	60-500	Surface drip/spray irrigation, SSI	
		Moderately structured	<60	Surface drip/spray irrigation, SSI	
		Weakly structured or massive	<60	Surface drip/spray irrigation, SSI	

Due to the generally limited soil capacity in Branxholme, it is recommended the following approach be adopted when considering land application systems:

- Undertake Land Capability Assessments (LCAs) thoroughly and design disposal systems conservatively. For example, ensure that there is sufficient designed reserve area, and always employ the appropriate Long Term Acceptance Rate (LTAR) based on robust water balance calculations;
- Using secondary treatment systems generally reduces the risk of health and nuisance issues (when correctly maintained), but does not necessarily reduce the build up of nitrites in the soil and subsequent downstream contamination;
- Council should require a LCA to accompany any planning permit application for subdivisions where the lots created are less than 10,000 m^2.

2.3.3 Hydrogeology and Bores

Southern Rural Water (SRW) is primarily responsible for helping to protect and manage water resources across Southern Victoria, in accordance with the Water Act 1989. This includes administering water supply in the irrigation districts, including groundwater and surface water licensing, and bulk water supply to the urban water authorities.

The SRW Groundwater and Rivers Business manage licences to take and use groundwater and have a number of responsibilities in accordance with the Water Act 1989. These include:

- Licence Management; ensuring that existing water users are complying with licence conditions to protect the resource, the environment, other users and stakeholders;
- Works Approvals; ensuring that proposed bores are properly constructed and sited; and
- Water Allocations; assessing applications according to policies, environmental sustainability, and impacts on Victoria's water resources.

There is a number of Stock and Domestic bores in Branxholme, as indicated in Figure 2-3. They are registered with SRW, and bore logs and available details of each bore are provided through the Victorian Resources Database.

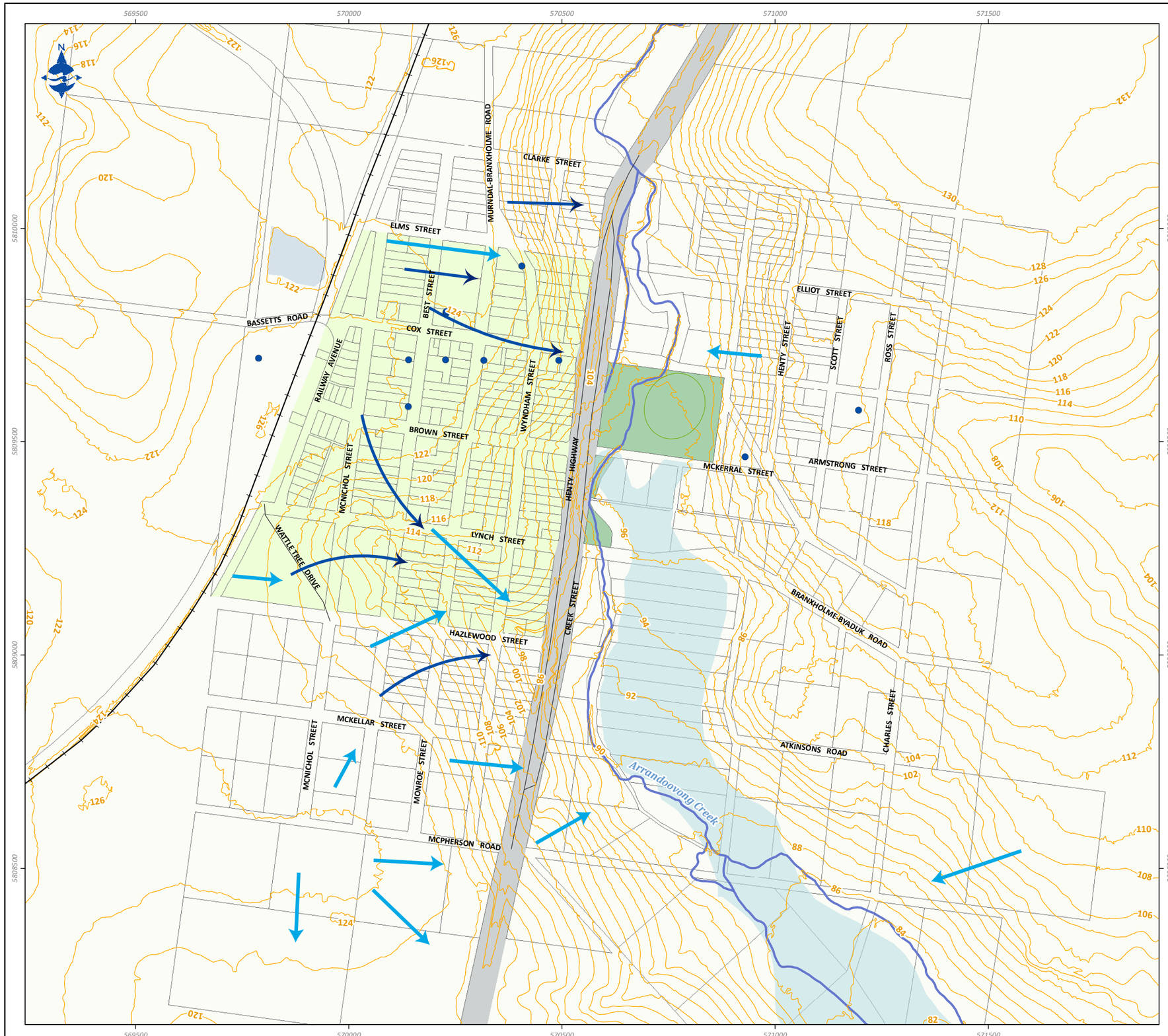
As is often the case, there are numerous active bores that do not appear on the Register. This was evidenced during the site inspection of Branxholme (refer to example in Figure 3-7).

The key consideration with respect to bore location is the provision for sufficient setback distance to a wastewater disposal site. Regardless of the type of bore, the minimum setback distance is 20 metres, as prescribed in the EPA CoP.

In each case during the site inspection, where a bore was located on the property, the distance between the bore and wastewater disposal area was less than 20 metres.

The major issue is the potential for migrating wastewater to contaminate groundwater systems.

It would be recommended that any proposed audit of wastewater systems in Branxholme should also include an audit of bores. This should incorporate noting the number and location, and regular monitoring of bore water quality should be considered.



LEGEND

- Bores
- Generalised Groundwater Flow
- Surface Water Flow
- Railway
- Oval
- Contours (2m interval)
- Roads
- Watercourse
- 100 Year ARI Flood
- Cadastre

Planning Zone

- Farming Zone
- Public Park and Recreation Zone
- Road Zone Category 1
- Town Zone
- Branxholme Reservoir

Data Source:
Bores supplied by Southern Rural Water; Septic Tanks, Oval, Railway, Roads (note that only a minimum number of selected roads are displayed), Contours (Null contours were edited by Australian Water Environments (AWE)); Cadastre, Planning Zones and Watercourse supplied by Southern Grampians Shire Council; 100 Year ARI Flood supplied by Dept of Sustainability and Environment; Generalised Groundwater Flow and Surface Water Flow created by AWE.

0 0.25 0.5

Kilometres (Scale 1:9,500 Sheet A3)

Australian WATER Environments

Branxholme Wastewater Feasibility Study

Physical Characteristics

12096 D003 A3 Branxholme Wasterwater Feasibilty Study Physical Characteristics v2_3 121108
Last Updated: 2012/11/26

Figure 2.2

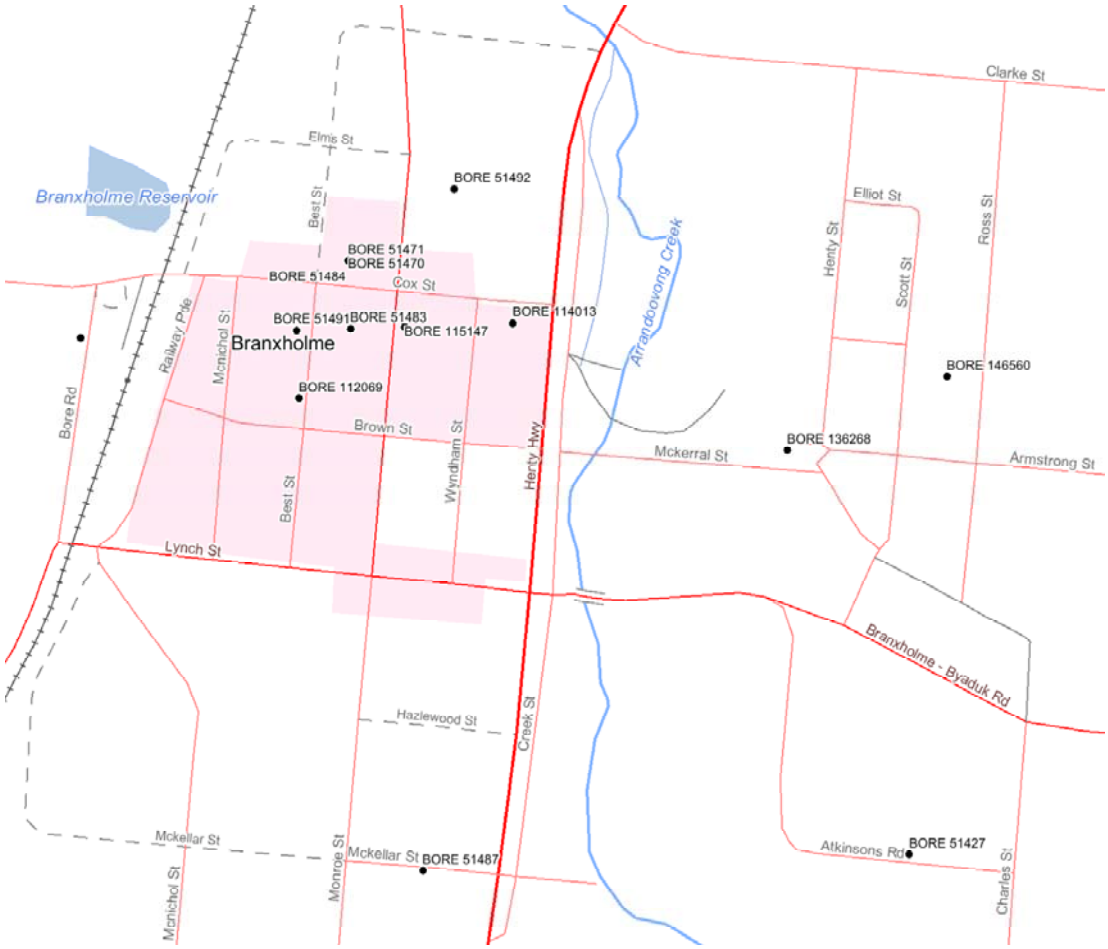


FIGURE 2-3 REGISTERED STOCK AND DOMESTIC BORE LOCATION PLAN (SOURCE: DEPT OF SUSTAINABILITY AND THE ENVIRONMENT MAPPING SERVICE)

2.3.4 Anticipated Growth

For the purposes of this investigation, there are an estimated 164 residents of Branxholme, residing in 63 dwellings.

Actual population information for the township itself is difficult to establish due to the large area over which the Australian Bureau of Statistics (ABS) conducts its census. The 2011 Census provides statistics for the large Branxholme district (SSC 0172), which covers an approximate 280km2 area. ABS statistic indicates that 370 people were residing in 139 private dwellings in the district on the night of the Census. The average occupation density for the region is given as 2.6 persons per household.

Whilst the ABS figures indicate that there has been a number of people move into the district between 2006 and 2011, they also indicate there has been no significant growth in Branxholme in the last 5 years, and no trend for growth in the foreseeable future.

It is understood that any future growth in the area would be driven by:

- Land prices and properties being more affordable in Branxholme than in Hamilton;
- The attraction of larger land holdings and rural lifestyle;
- Commuting distance to Hamilton for work is relatively short; and
- Proximity to Portland also allows commuting.

3 Existing Conditions in Branxholme

3.1 Current wastewater management in Branxholme

Branxholme Township has no common wastewater collection or treatment system; each household has a septic tank system where effluent from the tank is disposed onsite by land application means. There are two properties that currently that have secondary wastewater systems which are Aerated Wastewater Treatment Systems (AWTS).

The town is not serviced by a reticulated potable water supply; household water supply is generally supplied by roof water collection and storage. It is understood there are a few properties on the northern side of the township that access Council's town bore. This was evidenced during an onsite inspection in Branxholme.

The Southern Grampians Domestic Wastewater Management Plan (DWMP, 2006) was undertaken in November 2006 and included an audit of the town. The audit described the physical characteristics and condition of their septic tank systems, as well as identifying any environmental and health problems associated with the systems. The summary of findings, with regard to Branxholme, included:

- The township has potential for some growth because of inexpensive land and proximity to Hamilton;
- The topography is suitable for septic systems, although soil type is not ideal;
- Predominant method of disposal is split systems;
- Most septic tank systems are old and some are failing;
- Properties with fall to the rear appear to contain grey water onsite;
- Properties which fall to the front are mainly discharging off-site, mostly to the street and into barrel drains that discharge to the Arrandoovong Creek;
- In most cases, houses are set to front and grey water could only be contained on-site if pumped to the rear;
- Systems on larger blocks appear to be working well;
- Grey water discharges causing nuisance conditions and possible contamination of the creek; and
- The addition of new houses in the township would add to the hydraulic load on the soil and the potential for contamination of nearby water bodies.

The Plan concluded that:

- The sewering of the township cannot be justified on the basis of population or current or potential development activity;
- Existing and future problems with wastewater disposal should be addressed through a complement of the following actions:
    - Regular sampling of Arrandoovong Creek – upstream and downstream of town (priority 1);

- Consideration of common effluent drainage system, including treating effluent at the culvert (priority 1);
- Regular clearing of barrel and table drains (priority 1);
- Education kit to all householders on proper maintenance of all systems (priority 2);
- Advice to owners on what actions to take when systems fail (priority 2);
- Investigation of grey water discharge and advice to owners on appropriate action – reuse, improved treatment, absorption on site (priority 2); and
- Regular desludging of tanks (priority 3).

These findings have been taken into consideration in the preparation of this report.

3.1.1 Septic System Assessment

As indicated in Table 2-1, the selection and design of land application systems is primarily based on the capacity of the soil to treat effluent. Other considerations for selection of appropriate systems include the gradient of the subject land, proximity of groundwater, available area for disposal, and a water balance assessment.

The evaluation of sites to determine the appropriate system for onsite application of wastewater should comprise a detailed appraisal of site and soil conditions, and take in to consideration the long term environmental performance of the proposed system and receiving soils.

A Land Capability Assessment (LCA), undertaken by an accredited and experienced wastewater professional, is a legislative requirement for all new developments (and alterations to existing developments).

The following Figure 3-1 Wastewater Dispersal Process (source: AS 1547:2012)Figure 3-1 illustrates the process of wastewater dispersal in the surface and subsurface soils, and associated risks to surface and groundwater systems.

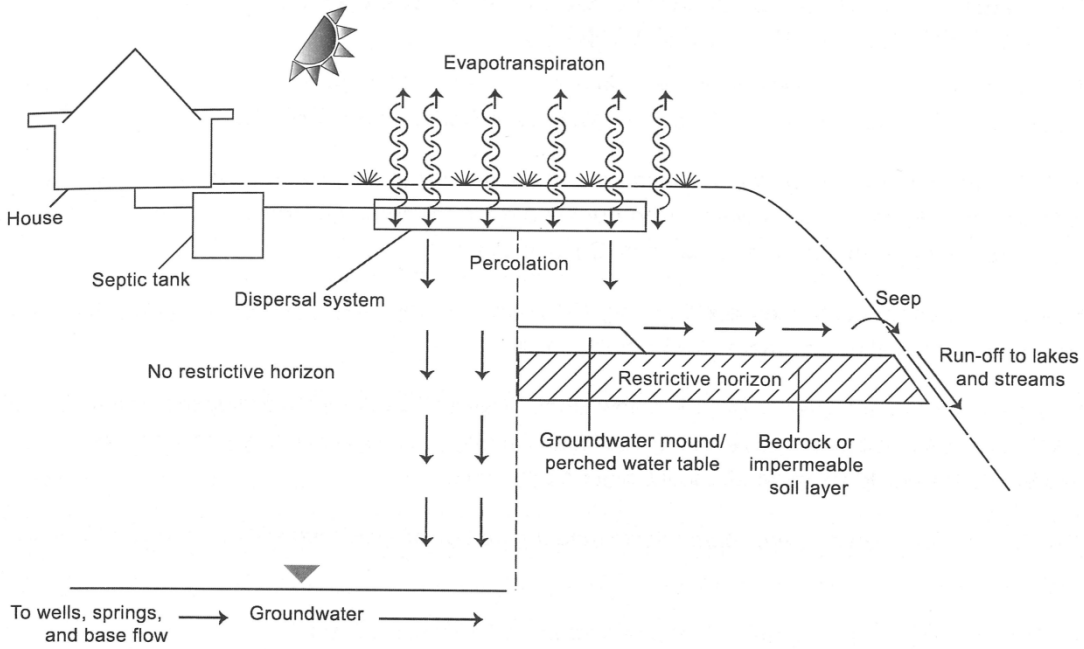


FIGURE 3-1 WASTEWATER DISPERSAL PROCESS (SOURCE: AS 1547:2012)

3.2 Site Visit and Inspection

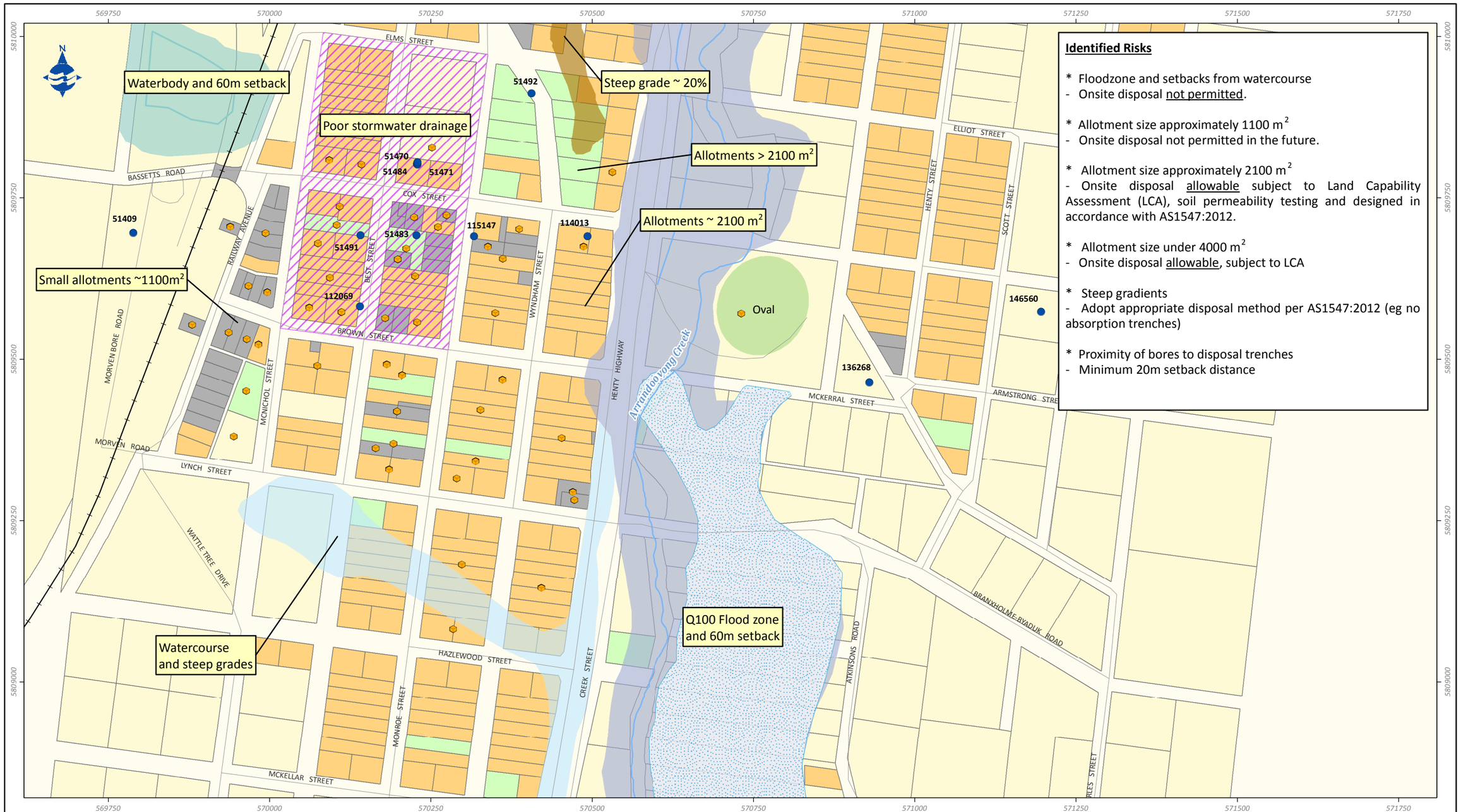
A site inspection was undertaken to investigate current wastewater management in Branxholme and identify key physical constraints for the development of future wastewater options.

The site visit to inspect a number of residential properties in Branxholme was organised with members of the Branxholme Progress Association and Council staff.

In addition, the stormwater network of table drains and pipe infrastructure was inspected, and discussion ensued around wastewater and stormwater issues.

The Recreation grounds, swimming pool, and Arrandoovong Creek were also visited, including the wastewater disposal area for the clubrooms, adjacent to Memorial Drive.

Following the initial site visit, a town-wide plan identifying key constraints has been prepared; see Figure 3-2. The plan outlines potential issues, especially regarding onsite wastewater management.



LEGEND

	Constraint Areas	Allotment Area
Bores	Flood Zone and Setback 50 m	less than 1150 m^2
Septic Tanks	Poor Stormwater Drainage	less than 2100 and greater than 1150 m^2
Railway	Steep Grade approx 20%	less than 4000 and greater than 2100 m^2
Roads	Waterbody and setback	greater than 4000 m^2
Oval	Watercourse	
Watercourse		
100 Year ARI Flood		

Data Source:
Cadastre, Roads and Septic Tanks supplied by Southern Grampians Shire Council (SGSC); Constraint Areas created by Australian Water Environments (AWE); Watercourse, Oval and 100 Year ARI Flood created by AWE from aerial photography and contours supplied by SGSC; Railway supplied by Geoscience Australia; Bores supplied by Dept of Sustainability and Environment (DSE).

0 150 300
Meters, Scale: 1:6,000 on A3 Page

Australian WATER Environments

Branxholme Wastewater Feasibility Study

Onsite Domestic Wastewater Disposal Constraints

Job No. 12096 - 008
120307

Figure 3.1

3.2.1 Issues Arising from Site Inspection

The following selection of photos was taken on site during the initial visit and investigation to highlight findings and key issues.

FIGURE 3-3 TYPICAL DOMESTIC BLACKWATER SEPTIC TANK

FIGURE 3-4 TYPICAL ABSORPTION TRENCH AND VENT

FIGURE 3-5 EXAMPLE OF EVAPO -TRANSPIRATION TRENCHES

FIGURE 3-6 ONE OF TWO AERATED WASTEWATER TREATMENT SYSTEMS (AWTS) IN THE STUDY AREA

FIGURE 3-7 STOCK AND DOMESTIC BORE CENTRALLY LOCATED IN AN ALLOTMENT

FIGURE 3-8 MCNICHOL ST. SMALL ALLOTMENTS, AND POOR SURFACE WATER DRAINAGE ISSUES

FIGURE 3-9 TYPICAL STORMWATER SWALE/TABLE DRAIN

3.2.1.1 Septic Systems

An inspection of wastewater systems consisted of:

- Visual inspection of septic tank and disposal area condition, including lifting tank lids, but no scum of sludge depth measurment;
- Location and setback distances to buildings, property boundaries and bores;
- Discussion with residents on maintenance and septic tank pump out frequencies; and
- Grey water discharge locations, and conditions.

Most of the older and original homes in Branxholme still have original septic tanks that were installed in the early 1960s. Most lids sit well above of the surrounding ground level which assists to

prevent surface water ingress. Tank construction appeared to be mortar rendered redbrick, with concrete multi-part lids. The condition of the tanks below water level is not known, nor whether there is any leakage into the surrounding soil. However, it would be expected that typically this would be occuring due to the deterioration of the bricks over this length of time. The original multi part lids were mostly cracked or broken, which would present issues of debris entry and safety concerns.

In each case of two septic tank lids lifted for inspection, the surface scum level was sufficiently deep to cover the tank outlet, which wasnt visible. This is undesirable, and indicates that either the outlet is blocked, or sludge and scum buildup has not been removed by routine regular pump outs.

This was generally confirmed through discussion on site, where it appears there is a misconception that septic tanks need only be pumped when there is a blockage, and they would by default function correctly at all other times. The primary retention time (required to adequately reduce the Biochemical Oxygen Demand (BOD_5) level and nutrients) would be considerably reduced in these circumstances. This could have a follow on impact on human health and environmental health.

Generally, effluent is disposed in Absorption trenches and dry wells. The trench shown in Figure 3-4 is an example of an Absorption trench, usually comprising a perforated earthenware pipe in a gravel filled trench. The trench construction was not confirmed on site, or whether in fact it was functioning correctly. However, the obvious depression in the ground surface above it would indicate some degree of collapse or subsidence.

3.2.1.2 Greywater

The majority of wastewater systems in Branxholme are ‘split systems’, where greywater and blackwater are treated seperately. Prior to 1988, greywater discharge was permitted, untreated, into the stormwater system. In Branxholme this meant discharge into the street table drains, or generally as surface discharge into garden areas. The properties inspected discharged greywater via barrel drains into garden areas, usually away from the house, to the rear. In one instance, greywater appears to discharge into a neighbouring vacant block where it ponds, as indicated in Figure 3-10. Instances of discharge to the stormwater system were not always evident (access to properties was limited and mostly from the street frontage), though properties abutting road drains on the uphill (western) side would be expected to discharge downhill towards the road. Greywater was evident at a few locations, and a slight smell was present.

FIGURE 3-10 OFF SITE DISCHARGE OF GREYWATER

3.2.1.3 Stormwater

The stormwater system generally consists of a number of table drains or swales located in roads heading north south, more or less along level contours. They appear to allow for some infiltration and larger flows are directed into swales running eastwards towards Arrandoovong Creek. Approximately 80% of the developed township discharges to the Arandoovong Creek, through an existing stormwater drainage network and via informal culverts crossing under Henty Highway adjacent Brown Street and Lynch Street.

In the past, stormwater drainage has been an issue in a low lying area at the top end of Branxholme, with local flooding around McNicol Street and adjoining streets. The Shire has installed some stormwater drainage in this area to relieve the drainage issue. However, there appears to be further work to do to mitigate flooding where larger rainfall events occur.

3.2.1.4 Summary of Site Inspection

The following summarises the findings from the site inspection:

- The condition and level of septic system failure, outlined in the DWMP 2006, is confirmed as an ongoing and present issue;
- There is evidence of greywater and effluent discharging off site, and this situation presents a risk to public health and the environment, especially where greywater discharges directly into the stormwater system ;
- There appears to be stormwater management issues especially where stormwater is able to pool in swale drains, and not adequately drain following high rainfall events;
- There are no pollutant traps or water quality devices for treatment of stormwater prior to discharging to the Arrandoovong Creek ; and
- It would appear that many properties have bores that are that are located within the prescribed setback distance from the wastewater disposal area (refer to EPA CoP requirement for minimum 20 metre setback). This could could present a potential risk to human health and contamination of groundwater sources.

3.2.1.5 Disposal System Failure

The following are indications of failing septic tanks and soil absorption systems:

- Evidence of seepage or ponding along trenches;
- Lush green growth around septic tank or disposal trench;
- Septic tanks that are not pumped out every 3 years;
- General water-logging around the disposal trench, or becomes waterlogged after rain events; and
- General odour from the disposal trench area or from greywater disposal areas.

Evidence of some or all of these factors was found during the site inspection.

3.3 Current Allotment Sizes

Table 3-1 has been compiled from spreadsheet data provided by Council, which categorises the properties within the study area that are served by septic disposal systems. The GIS data was further filtered to provide overall allotment sizes determined by property ownership, rather than on a per title basis, due to the number of multiple titles that constitute each land holding.

Figure 3-11 also graphically indicates allotment sizes based on property ownership.

TABLE 3-1 SIZE OF ALLOTMENTS IN THE BRANXHOLME TOWNSHIP ZONE

Branxholme	Number of properties in each street	Properties which are < 1100m^2	Properties which are < 2200m^2	Properties which are < 4000m^2	Properties which are > 4000m^2
Best Street	7	3	3	1	0
Brown Street	8	2	2	3	1
Cox Street	5	1	2	0	2
Creek Street	3	0	0	0	3
Henty Highway	1	1	0	0	0
Lynch Street	4	1	1	0	2
Mckellar Street	1	0	0	0	1
McNichol Street	11	0	3	5	3
Monroe Street	17	2	4	4	7
Railway Avenue	3	3	0	0	0
Wyndham Street	3	0	1	0	2
Total	63	13	16	13	21

Table 3-1 indicates that approximately half of the properties (29) in the study area are allotments less than 2200m^2 in size. The figure 2200m^2 was chosen to capture property sizes that vary around the original half acre size block (2024m^2), and for the same reason the 1100m^2 filter captures the variance around the quarter acre allotment.

Allotments less than 4000m^2 are considered small allotments (EPA Code of Practice). It is recommended by the EPA (EPA CoP) that efficient wastewater disposal design and the adoption of water saving devices and water conservation methods be used to ensure onsite wastewater is managed appropriately on sites that are less than 4000m^2. Based on Table 3-1, there are 42 properties in Branxholme that would need to satisfy these criteria.

Allotments sized under approximately 2200m^2 could be expected at some stage in the system's lifetime, to discharge excess wastewater off site. Discharges off site are not permitted under the EPA Act. To prevent this occurring, careful planning and management of the wastewater discharge needs to be incorporated in the system design. A LCA is critical, and the disposal design should consist of an engineered solution as detailed in AS1547:2012 that is appropriate for the local conditions, and takes into consideration water and nutrient balances. Secondary effluent treatment systems may also be recommended on sites under 2200m^2, to provide additional buffering. Based on Table 3-1, there are 29 properties that fall into this category.

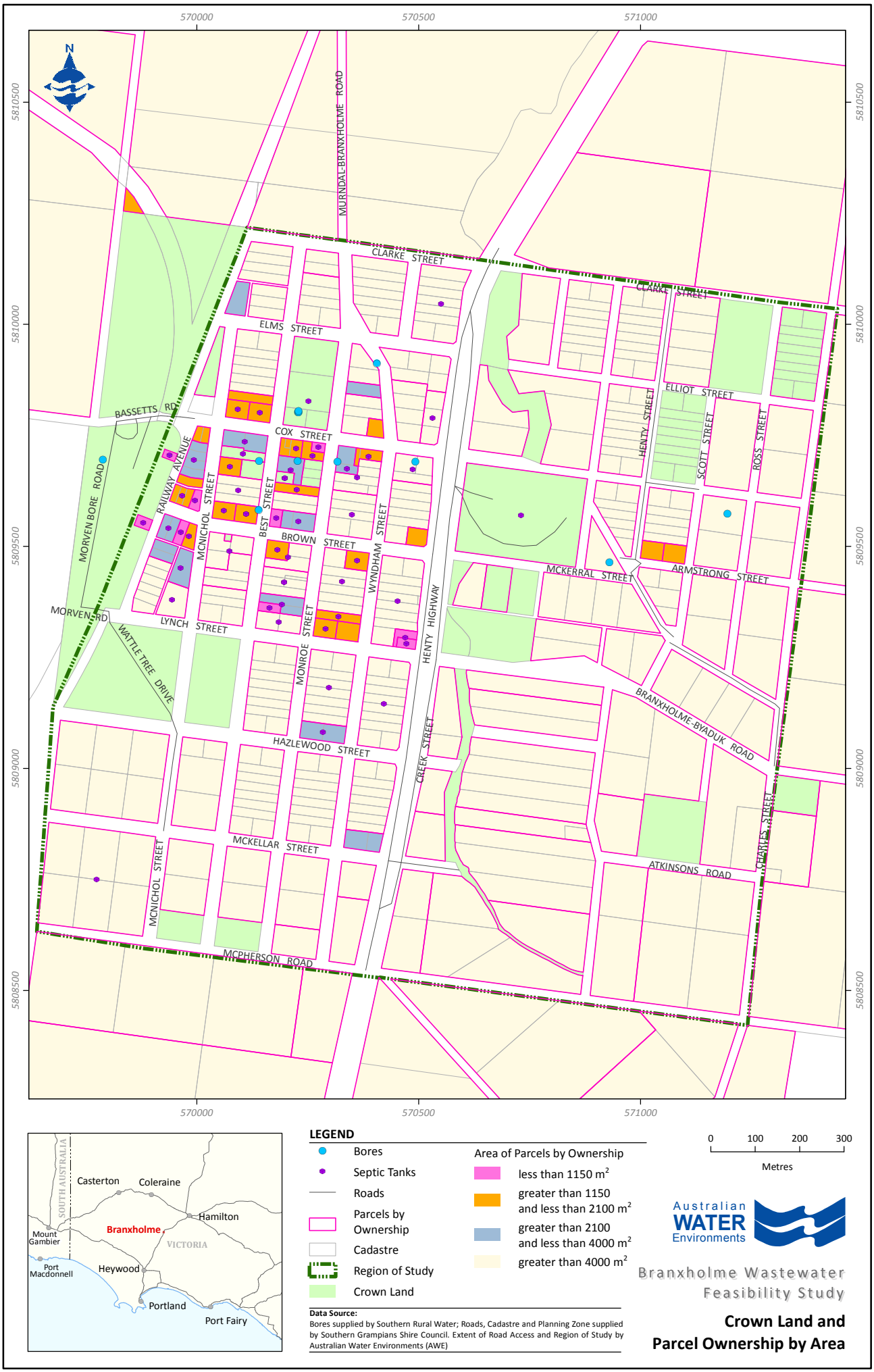
Allotment sizes which are less than 1100m^2 would not generally be permitted in current day planning policy unless reticulated sewer is available. Considering there are approximately 13

properties in Branxholme that are in this category, it is critical that residents and the community carefully assess all options that will manage and minimise future health and environmental impacts.

Of the total 42 properties that have areas of 4000m^2 or less, there are 33 properties with primary septic disposal systems that have been identified by this study as requiring some form of upgrade. The remaining 9 properties comprise of:

- 2 properties that have aerated wastewater treatment systems;
- 3 properties that appear to have recently installed systems (Monroe St/ Wyndham St)
- 3 properties (Shire properties) that have been recently installed (CFA, Recreation Ground, Community Hall); and
- 1 property (registered as having a septic system) that has an inhabitable building on it (Cox St).

It should be noted that the information provided by Council has incomplete and missing data. Much of the missing information relates to details of septic systems that were installed prior to 1988, or unconsolidated data following the transition from the former Shire of Heywood (previously the Shire of Portland) to the Southern Grampians Shire. In these cases, the data description of the septic systems has been coded as a 'Migration System Type', with a default septic tank size of 1000L. In general, this would indicate a 'split system' (black water septic tank disposal and separate greywater discharge), which was consistent with some cases inspected on site. An audit of each property is recommended to determine the type and condition of every septic system in Branxholme.



Data Source:
Bores supplied by Southern Rural Water; Roads, Cadastre and Planning Zone supplied by Southern Grampians Shire Council. Extent of Road Access and Region of Study by Australian Water Environments (AWE)

Australian WATER Environments

Branxholme Wastewater Feasibility Study

Crown Land and Parcel Ownership by Area

12096 D011 Crown Land and Parcel Ownership by Area v1_1 121107
Last Updated: 2012/11/26

Figure 3.11

4 Policy and Legislative Context

The DWMP 2006 presented an overview of policy and legislation relevant to domestic wastewater management, much of which is still current. This report summarises the key elements of that overview and provides additional information relevant to broader environmental protection and public health matters that apply to the range of wastewater management options considered.

4.1 Legislation

Environment Protection Act 1970

This legislation confers responsibility to Council for approving the installation and alteration of wastewater disposal systems that generate 5000 litres of wastewater or less a day (via permits). Wastewater systems that are capable of treating over 5000 litres of wastewater per day are required under this legislation to be licensed by the Environment Protection Authority.

Provisions relevant to the role of local government include:

- Council may refuse the application if the site is unsuitable; the area available for the treatment or disposal of effluent is insufficient; the system is not of a type approved by the EPA or does not comply with the relevant State Environment Protection Policies (SEPP); or, does not treat all sewage;
- Property owners are required to operate and maintain the systems in accordance with the permits and EPA licence requirements; and
- Council is required to lodge an annual return with the EPA outlining the number of permits issued and the number of systems disconnected, inspected and operating.

The legislation (and other nuisance provisions under the Public Health and Wellbeing Act 2008) confers powers to Council's Environmental Health Officers to enter any property to investigate failing septic systems and the duty to serve notices requiring the repair of failing or defective systems. The property owner is responsible for undertaking corrective action.

In terms of broader environmental protection and public health issues that may relate to the management of wastewater systems, relevant provisions of the legislation are:

- ***Section 38*** requires that any 'discharge or deposit of waste into waters' must be in accordance with the declared state environment protection policy (SEPP) or waste management policy, which includes the *SEPP Waters of Victoria 2003* (see below);
- ***Section 39*** sets down the requirements that no person shall pollute any waters so that the condition of the waters are made:
    - noxious or poisonous;
    - harmful or potentially harmful to the health, welfare, safety or property of human beings;
    - poisonous, harmful or potentially harmful to animals, birds, wildlife, fish or other aquatic life;
    - poisonous, harmful or potentially harmful to plants or other vegetation; or
    - detrimental to any beneficial use made of those waters.

Section 39 also states that any person shall not cause or permit waste to be placed or left in any position whereby it could reasonably be expected to gain access to any waters and result in those waters being polluted.

Public Health and Wellbeing Act 2008

The Public Health and Wellbeing Act 2008 and Public Health and Wellbeing Regulations 2009 came into effect on 1 January 2010. Section 60 of this legislation requires Council to remedy, as far as reasonable, all nuisances (i.e. activities that are dangerous or are liable to be dangerous to health or that are offensive), which exist in the municipality. Section 38 and 39 provisions of the Health and Wellbeing Act are provided in Appendix D.

Local Government Act 1989

This legislation enables Councils to enact local laws and set special charges for Council activities. Council may use these powers to raise revenue for its wastewater management programs and to develop local regulations for wastewater management, as long as these regulations are consistent with state policy and legislation.

Water Act 1987

The legislation regulates the water industry and describes the powers and responsibilities of water and sewage authorities. The legislation contains the following provisions relating to the options considered in this report:

- Within their sewer districts, sewer authorities may inspect and require property owners to repair or maintain their septic tank systems. If owners fail to undertake these works, authorities can undertake the work and recover costs from the property owners;
- Within their sewer districts and following the adoption of a by-law, authorities are able to: require regular maintenance of septic tanks; the payment of fees by property owners for works carried out by the authorities on their septic tank systems; prohibit septic tank discharge and impose penalties for breaches of the legislation; and
- The legislation also confers power to the authority to force connections to the sewer (where available) and to recover the costs of repair of failing septic tank systems in their municipality.

Southern Grampians Planning Scheme

The Southern Grampians Planning Scheme sets out objectives, policies and provisions relating to the use, development, protection and conservation of land within the Southern Grampians Shire. The Planning Scheme regulates the use and development of land through planning provisions to achieve those objectives and policies, and is subordinate to the *Planning & Environment Act 1987*.

There are numerous references made with respect to domestic waste water disposal under changes proposed to the Local Planning Policy Framework through Amendment C25, which was adopted by Council on 12 September 2012. The following are clauses taken from the adopted Municipal Strategic Statement (Clause 21) and should be considered with respect to onsite waste disposal in Branxholme:

- Under ‘Strategies’ for ‘Urban Growth’ (Clause 21.02-2):
    - Ensure that residential development not serviced by reticulated sewerage is able to dispose of all effluent within the boundaries of the site;

- Under 'Policy guidelines' for 'Urban Growth' (Clause 21.02-2):
    - Council will have regard to the EPA Code of Practice for Onsite Wastewater Management;
    - Permit applications must conclusively demonstrate that all waste water and effluent can be disposed of entirely within the lot which the development takes place where reticulated sewerage is not provided. Particular attention will be given to this requirement where land adjoins significant features such as the Wannon River reserve, the Grange Burn and other waterways;
- Under 'Strategies' for 'Environment' (Clause 21.03-1):
    - Ensure that land use and development take into account land capability;
    - Require that new land use and develo9pment do not increase net run-off, soil degradation, or effluent release to rivers and streams;
- Under 'Strategies' for 'Water' (Clause 21.04-3):
    - Require that new land use and development do not increase net run-off, soil degradation, or effluent release to rivers and streams;
- Under 'Policy Guidelines' for 'Water' (Clause 21.04-3):
    - Council will have regard to the EPA Code of Practice – Onsite Wastewater Management;
- Under 'Local area implementation' for 'Branxholme' (Clause 21.10-7):
    - The applicant must conclusively demonstrate that all wastewater and effluent be disposed of entirely within the lot upon which the development takes place where reticulated sewerage is not provided; and
    - Particular attention is to be given to this requirement where land adjoins significant features such as waterways.

The predominant zone found in the study area for this report is the Township Zone. With respect to the Township Zone, the Planning Scheme provides the following direction:

- A lot may be used for a dwelling provided that each dwelling is connected to reticulated sewerage, if available.
- If reticulated sewerage is not available, all wastewater from each dwelling must be treated and retained within the lot in accordance with the State Environment Protection Policy (Waters of Victoria) under the Environment Protection Act. This requirement also applies to a dependent person's unit;
- A permit is required to construct or extend one dwelling on a lot of less than 300 square metres;
- A planning permit is required to subdivide land. Each lot created through the subdivision of land must be provided with reticulated sewerage, if available. If reticulated sewerage is not available, the application for a planning permit for the subdivision of land must be accompanied by:
    - A land assessment which demonstrates that each lot is capable of treating and retaining all wastewater in accordance with the State Environment Protection Policy (Waters of Victoria) under the Environment Protection Act 1970;
    - A plan which shows a building envelope and effluent disposal area for each lot;

The Township Zone also specifies that, before deciding on an application to use or subdivide land, construct or extend a dwelling or residential building, construct a building or carry out works, the responsible authority (Council) must consider as appropriate:

- In the absence of reticulated sewerage, the capability of the lot to treat and retain all wastewater in accordance with the State Environment Protection Policy (Waters of Victoria) under the Environment Protection Act 1970.

The study area for this report also contains some small lots in the Farming Zone. With respect to domestic wastewater disposal on land in the Farming Zone, the Planning Scheme provides the following direction:

- The dwelling must be connected to a reticulated sewerage system or if not available, the waste water must be treated and retained on-site in accordance with the State Environment Protection Policy (Waters of Victoria) under the Environment Protection Act 1970. This requirement also applies to a dependent person's unit.
- The Planning Scheme also specifies that, before deciding on an application to use or subdivide land, construct a building or construct or carry out works, the responsible authority must consider, as appropriate, the capability of the land to accommodate the proposed use or development, including the disposal of effluent.

Building Regulations 2006

Regulation 801 requires the issue of a 'report and consent' by Council before a permit is issued for any development that will involve the installation or alteration of a septic tank system. The report from Council indicates whether the block is suitable for development from a wastewater management perspective.

Regulation 1003 requires the issue of 'a report and consent' by Council prior to a certificate of occupancy being provided for any building development in an unsewered area where a septic tank system has been installed. The report from Council indicates that the septic tank system has been approved and is suitable for use.

State Environment Protection Policies (SEPP) Waters of Victoria Policy 2003

This policy deals with the protection of waterways. Clause 32 details the requirements for managing domestic wastewater, including the requirements that Councils':

- Assess the suitability of land that is proposed for development for its capacity to absorb wastewater on-site. This will include the conduct of a land capability assessment;
- Ensure that wastewater systems installed in unsewered areas are consistent with EPA guidelines and Onsite Wastewater Management Code of Practice 2008;
- Identify properties in unsewered areas that are discharging off-site or contaminating groundwater;
- Develop wastewater management plans to address problems relating to wastewater disposal and ensure the proper design and management of future systems; and
- Ensure that land that cannot absorb wastewater on-site is either not developed or, if developed, is connected to a sewerage system.

Code of Practice - Onsite Wastewater Management 2013

This code describes the measures that should be taken to ensure that domestic wastewater is treated and disposed of in a manner that minimises health and environmental risks, including for:

- The consideration of on-site wastewater management with the land development process; and
- Designing, installing, operating and maintaining on-site wastewater treatment systems.
- A Land Capability Assessment must be included with a septic tank application.

The code states that the feasibility of providing a reticulated sewerage system should be seriously considered for the development of individual lots and for subdivision proposals that would result in allotments smaller than 10,000 m2 (one hectare). The code specifies that this area should not be seen as a minimum lot size but as a risk threshold for lots smaller than 10,000 m2.

Code of Practice - Small Wastewater Treatment Plants 1997

This Code provides design and operational guidelines for treatment plants that serve less than 500 people.

Performance objectives

Small wastewater treatment plants should be designed, constructed and managed to achieve the following environmental performance objectives:

- Any discharges to surface waters are to meet all statutory requirements;
- Measures employed to deal with emergencies are to be without damage to any surface waters or to the soil/land;
- All wastewater is to be treated and retained on land wherever practicable and environmentally beneficial; and
- Measures employed should conserve water resources or provide for the re-use or recycling of treated wastewater.

Where a discharge to surface waters is the only option available, effluent quality must satisfy the principles set out in *Managing Sewage Discharges to Inland Waters* (EPA Publication 473) and requirements of *SEPP (Waters of Victoria)*. Where no quantitative nutrient objectives are specified in the SEPP, the discharge must not cause the nutrient levels in the receiving stream to exceed those specified in *Preliminary Nutrient Guidelines for Inland Streams* (EPA Publication 478).

Guidelines for Aerated On-site Wastewater Treatment Systems 2002

These guidelines outline the design criteria, construction requirements and performance objectives that Aerated Wastewater Treatment systems must achieve to gain approval for use in domestic and small commercial situations. The document provides information on approval procedures, systems design, test criteria and renewal of application.

Australian Standards

Onsite treatment systems and associated disposal/recycling systems must be designed, installed and operated in accordance with the following Australian Standards. If there is any inconsistency between the Australian Standards and relevant codes of practice, the latter takes precedence.

- AS/NZS 1546.1, On-site domestic wastewater treatment units, Septic tanks;

- AS/NZS 1546.2, On-site domestic wastewater treatment units, Waterless composting toilets;
- AS/NZS 1546.3, On-site domestic wastewater treatment units, Aerated wastewater treatment systems; and
- AS/NZS 1547, On-site domestic wastewater management.

4.1.1 Summary and Implications

The DWMP 2006 noted the following implications of legislation and policy, which still apply to the current context:

- There is some uncertainty about Council's legal power to require owners of septic tank systems to modify their septic tank systems, unless the systems are deemed to be causing a nuisance e.g. an effluent discharge that is causing an offensive odour; and
- The Local Government Act gives Councils the power to create local by-laws to regulate wastewater management as long as these laws are consistent with state policy and legislation; councils may introduce a special charge on homeowners to fund any 'genuine function if the function benefits the persons being charged'. Therefore, Council may be able to raise a charge to fund a domestic wastewater management program if it can demonstrate the 'genuineness' and benefits of the program.

Water Authorities have the power to inspect septic tank systems and order owners to repair and/or properly maintain their systems within their sewer districts. They also have the power to carry out works on septic systems and impose charges for these works (if a by-law is created). These provisions give Wannon Water, in its sewer district, equivalent powers to Council to facilitate the repair of septic systems.

5 Stakeholder Engagement

Engagement with stakeholders was undertaken to gather feedback on the preliminary options and general information on current wastewater management systems and practices in Branxholme. The following provides a summary of the engagement process and outcomes.

5.1 Community

5.1.1 Community Feedback Questionnaire

A community feedback questionnaire and information sheet was prepared and distributed to 65 property owners or occupants on 7th February 2012, and a reply paid envelope was provided. The information sheet also promoted the Community Information Session that was held on 8 March 2012. A copy of the Information Sheet and Questionnaire, and a summary of the responses from the survey, is provided in Appendix A. The respondents are not identified.

A total of 16 feedback forms were received, many of which were received during and immediately after the community information session (see below). This represents a response rate of approximately 25%, which means the results of the questionnaire can be considered a representative sample of the wider Branxholme community when referring to community perceptions. The following is a summary of the responses to questions:

- When asked how old their system is, 7 or 44% of respondents identified their system as being over 20 years old, which is consistent with previous findings that many systems in the township are aging;
- When asked how grey water and drainage water from their septic system is disposed of on their property the majority, i.e. 10 or 63%, identified gravity drainage trenches or beds as being the current practice, which is consistent with previous findings;
- When asked how well they consider their system to be working, 10 or 63% of respondents considered that there were no issues with their system and that the systems are operating well. A further 4, or 25%, of respondents did not respond to this question;
- When asked when they last had their septic tank pumped out, 6 or 37.5% of respondents either did not know or thought that the tank had never been pumped out;
- When asked whether they have enough information about their system to know whether it is working properly, 10 or 63% respondents felt they had enough information, 1 or 6% felt they did not and 5 or 31% did not respond to this question; and
- When asked where they get information about how to maintain their system, their plumber (4 or 25% of respondents) and the council (3 or 19% of respondents) were cited as the key information sources.

These preceding questions and corresponding responses are represented graphically in Figure 5-1.

- When asked how important (i.e. rating 4 and 5) certain aspects of a wastewater system is to them:
    - 10 or 63% of respondents considered meeting basic government health and environmental regulations to be important;

- 11 or 69% of respondents considered preventing health issues caused by inappropriate wastewater disposal to be important;
- 11 or 69% of respondents considered low maintenance costs to be important;
- 12 or 75% considered low upfront or upgrading costs to be important;
- 7 or 44% of respondents considered keeping their existing system with no change as being important;
- 9 or 56% of respondents indicated they wanted to learn more about making their system work better; and
- 7 or 44% of respondents considered being able to use wastewater for irrigation on their property to be important.

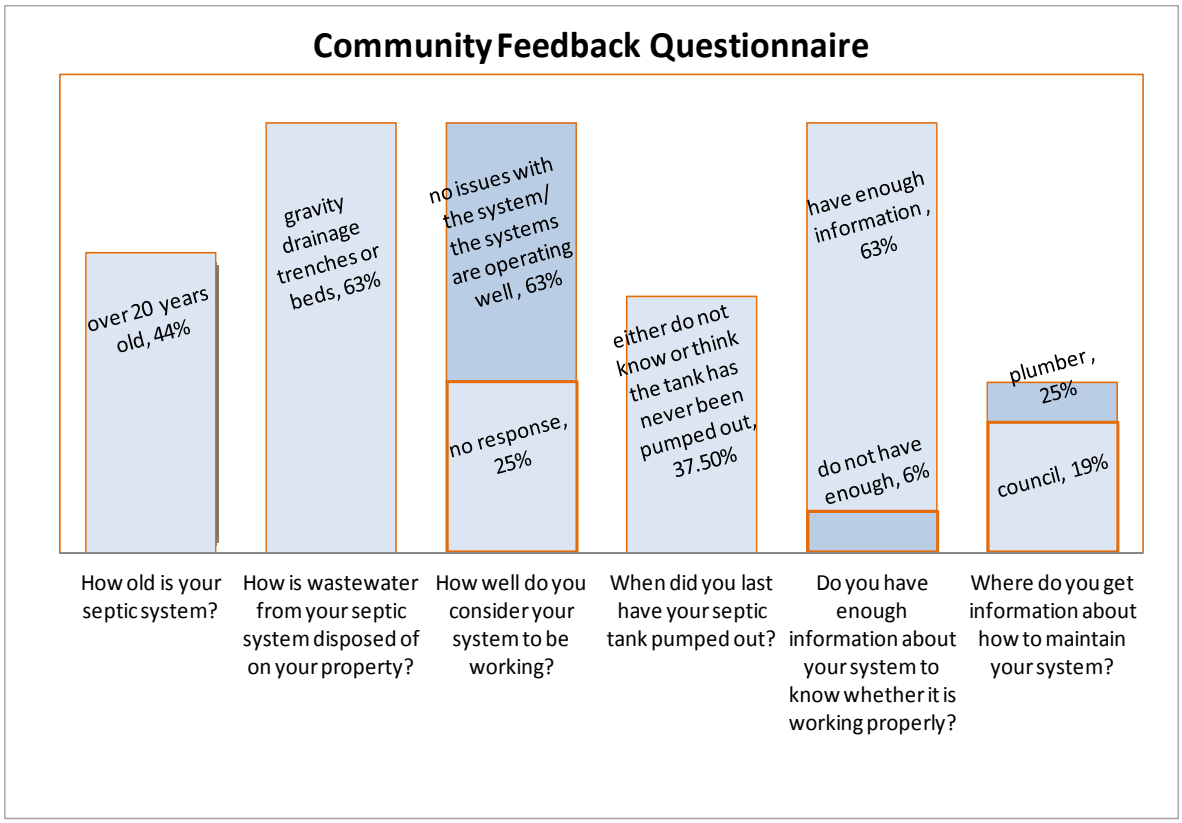


FIGURE 5-1 COMMUNITY QUESTIONNAIRE FEEDBACK - PART 1

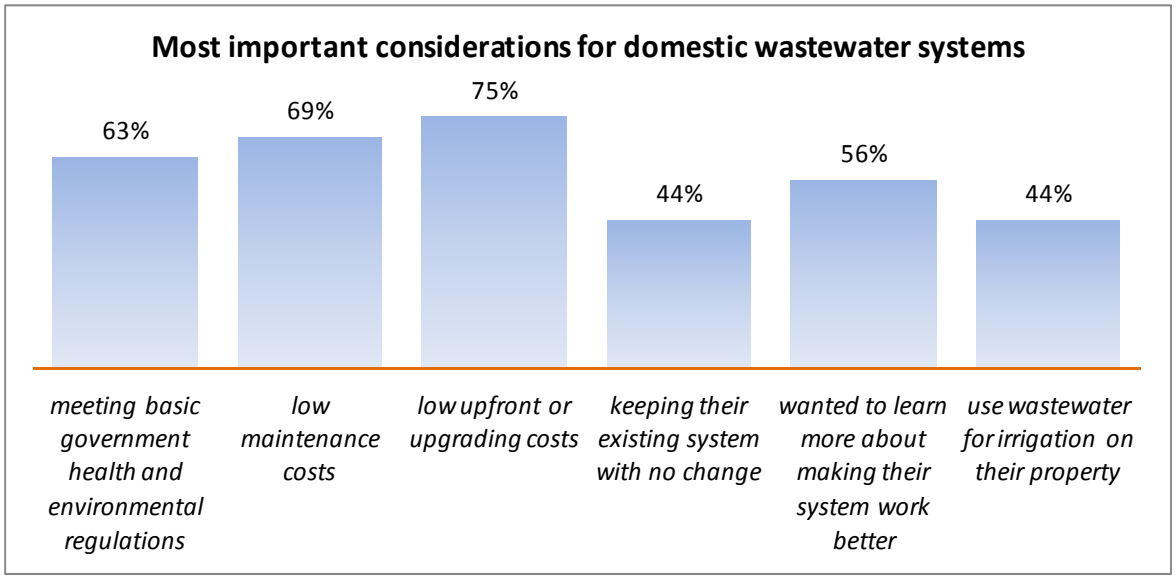


FIGURE 5-2 COMMUNITY QUESTIONNAIRE FEEDBACK - PART 2

In summary, the responses:

- Reinforce previous findings that the community values the protection of the environment and public health;
- Indicates that the community generally feels that their current systems are adequate and do not require change;
- Indicates that there is a notable lack of understanding regarding the maintenance of systems but a desire to learn more about making systems work better; and
- Highlights the community's concerns regarding incurring the costs of any required upgrade or imposed system change.

5.1.2 Community Information Session

An opportunity was provided for residents to meet with the project team at a community information session to hear about the outcomes of the questionnaire, discuss any issues or ideas, and to discuss the initial outcomes of the feasibility study. This was held on Thursday 8th March, 2012, between 4pm and 8 pm, at the Branxholme Community Hall.

A total of approximately 25 residents attended the session.

Although the original intention was to get specific feedback on the range of options for wastewater management in the township, the residents attending the session demonstrated a clear preference for no change to the current approach.

The discussion generally indicated there is a concern for the health of the environment and how wastewater management may have an influence on it. There was an acceptance by many that wastewater needs to be well managed, and, if left untreated, may be detrimental to the environment.

A few residents believe that there is little to no impact that wastewater has on the surrounds, and, unless the system was malfunctioning, would pose no problem.

There were some who felt that there is no issue at all, and that Branxholme should be left alone. The majority believed that their septic systems were functioning well, and that the length of time between pump-outs is testament to efficient operation.

5.1.3 Analysis of Community Feedback

The results of the questionnaire and feedback gathered in the community information session demonstrate that a large proportion of the community potentially does not want a change to the current systems. However, some of the resistance to change by the community may be tied to articulated concerns regarding 'who pays' and what the financial costs of this change would be.

Council's commissioning of this study was premised on the following objectives:

- Council and residents recognise that future growth in Branxholme will be dependent on having a better understanding of the infrastructure required to sustain growth; and
- Council and residents have identified that current domestic wastewater management in Branxholme may be substandard, and that existing septic systems are aging and increasingly prone to failure, presenting a potential future health and environmental risk to the community.

It would be fair to conclude that for these objectives to be met, any change in current systems and practices will need to be reinforced through a complement of educational, technical, financial and regulatory approaches. Additionally, Council will need to continue to take a leadership and facilitative role in ensuring a collective approach to implementing a preferred solution.

5.2 Agency Engagement

The following agencies were contacted to discuss the objectives of this study and wastewater management in small and unsewered communities generally. The following feedback has influenced the selection of wastewater management solutions for Branxholme:

Department of Sustainability and Environment (DSE)

- Current funding opportunities through DSE have expired, and there are no sources of funding available in the short term;
- The recently funded DSE project – *Better Practice in Domestic Wastewater Management* – was successful, with outcomes through its case studies that should provide valuable strategies for regional councils and Water Authorities for management of wastewater; and
- In the opinion of the DSE officer interviewed, it is understood that future funding opportunities for wastewater improvements would more likely become available where the issue is a risk to community health as a result of failing wastewater systems, rather than for environmental protection.

Wannon Water

- Issues for Wannon Water include: the cost to sewer small communities and network extensions that involve only a few houses; pipework to cover long distances; or where access or inadequate gradients are constraints;
- Wannon Water is responsible for water and wastewater infrastructure for any off site collection system; and

- Wannon Water understands the difficulty that small communities have, and is therefore willing to consider a range of options for wastewater management including alternative systems.

In addition to the above feedback provided during phone conversations, a meeting was held on 8 March 2012 with Wannon Water representatives and Council staff at the Council offices in Hamilton. At the meeting the representatives stated that any proposed option would be assessed on a range of economic, environmental and social criteria. Typically the cost of installation and operation of any system would be met by the Branxholme community. A communal style system e.g. Option 2A and Option 2B has not been implemented elsewhere by Wannon Water and would require detailed assessment before Wannon Water would commit to such a solution. In response to this the Council staff present at the meeting noted that the same options would be difficult for Council to manage and operate.

Environment Protection Authority

The EPA referred AWE to published legislation and regulations and stated that it is not their role to provide policy guidance to consultants.

Glenelg Hopkins Catchment Management Authority

The Glenelg Hopkins CMA was consulted in relation to their role in monitoring the health of inland waterways, particularly Arrandoovong Creek. Their stated position is that, with respect to water resource management, they provide a supportive and advisory role to council and stakeholders, but are not in a position to provide financial support for a water quality monitoring program. However, they do wish to partner in future water management initiatives.

5.3 Water Quality Testing

During the course of the stakeholder engagement, it was clear that there was a level of community concern regarding the need to protect the environment and public health. Consequently, it was determined that water quality testing needed to be undertaken to ascertain whether current wastewater management systems are in any way contaminating local water courses, notably the Arrandoovong Creek.

Three samples were commissioned as part of this project and undertaken by Council staff. The results of the water quality testing are provided in Appendix B. Replicates (water samples) were taken in the Arrandoovong Creek upstream and downstream of the Branxholme stormwater outlets and at each stormwater outlet adjacent Brown Street and Lynch Street. A map indicating sampling locations is shown in Figure 5-3.

FIGURE 5-3 WATER SAMPLING ARANDOOVONG CREEK AND STORMWATER OUTFALLS (IMAGE PROVIDED BY SGSC)

Evidence of E.coli bacteria, used as an indicator, was found in the first samples taken, prompting further sampling and DNA testing to determine its source. E.coli found in the second round of tests indicated the source was of human origin. The replicates for this test were taken in the Arrandoovong Creek, adjacent the Brown Street stormwater outlet whilst flowing, following a recent rain event. A third round of tests taken downstream of the stormwater outlet in the Creek indicated no presence of human E.Coli bacteria.

It should be made clear that the sampling grabs, and absence of a formal monitoring strategy, would generally render a water quality assessment as inconclusive. However, due to the presence of human E.Coli at this location, it would indicate that effluent from Branxholme may be entering the stormwater system. It is also possible that contamination entered the creek from the adjacent recreation ground's septic system. In any case, it is recommended that the implementation of a formal water quality monitoring program in Arrandoovong Creek is warranted, and would be essential in determining the source of contamination.

The DWMP 2006 discussed, at length, the limitations of Council's powers to require modifications to systems under the provisions of the Public Health and Wellbeing Act i.e. broad nuisance provisions (see pages 81 -83 of the Plan). Given the above water quality testing results have identified off site contamination of watercourses, it could be argued that the Environmental Duty provisions under Environment Protection Act 1970 may be invoked. It is recommended that Council seek further opinion on this matter, and the incidence of human derived E.coli be reported to the relevant agencies.

6 Options for Wastewater Management in Branxholme

There are a range of potential options for wastewater treatment and disposal systems that could be applicable to the Branxholme setting. Factors that were taken into consideration in determining these options are:

- The topography and available surface gradient that would suit gravity disposal systems. For instance, long distances of level ground would require additional pump stations to transfer sewage;
- The relatively long distance between properties that would require connection to a common collection system, which would mean a potentially high capital cost per each property connected;
- The type and capacity for surface soils to accommodate onsite land application;
- The age of existing septic systems and impact of likely levels of failure;
- The high number of 'split systems' requiring either separate treatment for each of effluent and sullage waste streams or the on-property work to combine wastes, and associated costs; and
- The financial costs associated with the maintenance and construction of each option.

Concepts for each of the options were developed for discussion with stakeholders. On the basis of stakeholder feedback and the outcomes of the policy review and the site assessment the following options were identified for further investigation:

- Option 1: Centralised sewage waste water system;
- Option 2A: Decentralised greywater system;
- Option 2B: Decentralised effluent collection and treatment;
- Option 3: Low pressure sewer system; and
- Option 4: Upgrade existing on site wastewater system.

Each proposed option is outlined below, including advantages and disadvantages, as well as indicative construction and maintenance costs. Note that the costs provided are of a general nature, obtained through experience of similar projects and industry standards, with an intended accuracy to inform a comparison between options. For this reason, a 40% contingency has been applied to the cost estimates for public infrastructure works, and 40% contingency for on-property works.

6.1 Option 1: Gravity Sewer with Treatment Plant

A centralised sewage treatment system collects and treated in a single sewage treatment plant. Once treated, the wastewater is suitable for a range of reuse purposes, depending on the level of treatment, such as outdoor household garden watering, toilet flushing, oval watering and irrigation of crops. Generally, centralised systems are municipal scale systems designed to treat large volumes of sewage in urban surroundings.

The following Figure 6-1 illustrates the concept of a centralised collection system.

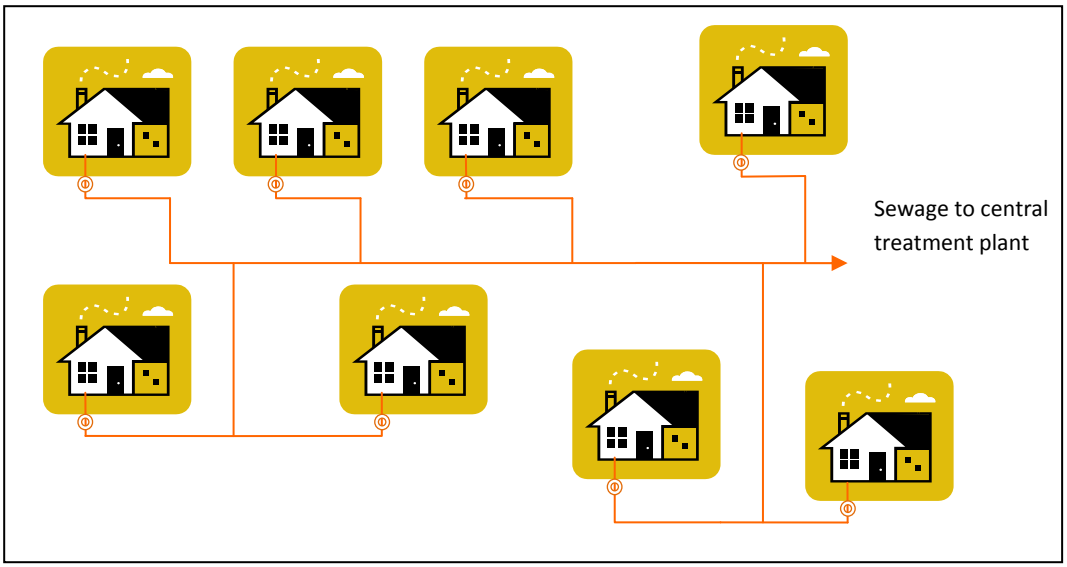


FIGURE 6-1 CENTRALISED SEWAGE TREATMENT SYSTEM

Option 1 has the following features and considerations:

- Existing septic tanks are abandoned and internal drains are directed to the street frontage for connection to a new gravity sewer network. Old septic tanks are made redundant;
- Where black water and greywater are currently disposed separately, the drains for each are combined into a single service within the property to discharge to the sewer;
- The gravity sewer network generally consists of a network of drain pipes laid at grade and connected by a series of pump stations. Pump stations are provided where the drain reaches its maximum depth and effectively lifts the sewage to a higher level to allow it to continue to be transferred by gravity, or pumped to the treatment plant;
- The wastewater treatment plant is generally located at the low end of the catchment to facilitate gravity drainage. Its location however would need to be carefully assessed, and must comply with EPA guidelines and setback distances, and meet with EPA approval. A possible suitable location for the Wastewater Treatment Plant may be within the Recreation Ground, possibly in an enclosure within the existing carpark area, as depicted in the concept layout. Alternative locations may be adjacent to the north end of the Recreation Ground if private land could be acquired to facilitate the plant or south-west of the town near the railway line;
- Given there are many unknown factors regarding the siting and construction of a Treatment Plant and winter storage at the oval it may be better to further investigate an option that utilises land adjacent the rail corridor for treatment and storage. This would mean a pump station in a suitable low lying location could collect sewage and transfer to the treatment plant at the higher level;
- Provision of winter storage will be required, consisting of a lined storage dam. Wannon Water advises that approximately 600 litres/household per day is required, amounting to approximately 30ML of storage capacity; and

- Reuse water for summer irrigation of the Recreation Ground oval is proposed, though other opportunities for reuse for irrigation in the town could also be considered.

Advantages

- Fully sewered system that meets SEPP guidelines;
- Replaces all septic tanks including failing systems;
- Treatment to a Class B standard (an effluent quality of <20 mg/L BOD_5, and <30mg/L suspended solids) which would suitable for subsurface irrigation use;
- No on-property maintenance, including septic tank pump outs; and
- Relatively low cost of on-property works required to connect sewer drains to the collection main.

Disadvantages

- Very high infrastructure costs. At present there is insufficient population, and too great a distance between properties to be a viable option;
- Drainage pipework requires deep trenches, and multiple pump stations, each requiring power;
- The system is not suited to low density development where there is considerable distance between connections; and
- Future possible extensions must be considered at the start, adding to the initial design cost.

Assumptions

- Wannon Water will assume ownership and operation of system;
- Wannon Water requires a 40% contingency on estimates at the feasibility stage;
- Life cycle costs should be considered in a detailed option analysis, which is beyond the scope of this study;
- Households would be required to contribute to the cost of the scheme. If construction costs are not taken in to consideration, on property works and ongoing operational costs would be a present value cost of around $850 per annum over a 25year term.

The following Table 6-1 provides indicative costs for Option 1.

TABLE 6-1 OPTION 1: CENTRALISED WASTEWATER TREATMENT SYSTEM COSTS

	Item	Quantity	Unit cost		Price
Public infrastructure	Wastewater Treatment Plant 100EP	1	350,000	$	350,000
	Services & commissioning	1	50,000	$	50,000
	Monitoring/ control	1	20,000	$	20,000
	Oval irrigation system	1	20,000	$	20,000
	Pump Stations (2L/s)	6	85,000	$	510,000
	Gravity drains 150mm	3500	150	$	525,000
	Drain access shafts	50	3,200	$	160,000
	Winter storage dam	8000	35	$	280,000
	Design and ancillary works		10%	$	191,500
			Subtotal	$	2,106,500
			40% Contingency	$	842,600
			Total public works	**$**	**2,949,100**
On-property works	Combine black/Greywater waste	33	2,500	$	82,500
	Common service connection	33	2,000	$	66,000
	Decommission existing Septic Tank	33	500	$	16,500
			Subtotal	**$**	**165,000**
			40% Contingency	$	66,000
			Total on-property works	**$**	**165,000**
			Total	**$**	**3,114,100**

Refer to following Figure 6-2 for the concept layout of Option 1.

OPTION 1: Centralised System: All properties Connected to Network

Option 1: Sewage Treatment System

Internal Works within Property
- Bypass existing septic tanks and connect to sewer.
- Septic tanks made redundant.
- Combine grey/black wastewater into single service.

External Works
- Gravity drainage pipe network and pump stations.
- Rising main to Recreation Ground.
- Sewage Wastewater Treatment Plant (WWTP) in Recreation Ground.
- Disposal via oval irrigation.

Future Extension

Package Pump Station

100mm Drain Pipe Network

Rising Main

Oval

Manhole

Option 1
Wastewater Treatment Plant (WWTP)

ELMS STREET
BASSETTS ROAD
COX STREET
RAILWAY AVENUE
BEST STREET
WYNDHAM STREET
HENTY STREET
ELLIOT STREET
SCOTT STREET
MORVEN BORE ROAD
BROWN STREET
MONROE STREET
MCNICHOL STREET
HENTY HIGHWAY
Arrandoovong Creek
MCKERRAL STREET
ARMSTRONG STREET
MORVEN ROAD
LYNCH STREET
WATTLETREE DRIVE
HAZLEWOOD STREET
CREEK STREET
ATKINSONS ROAD
BRANXHOLME-BYADUK ROAD
CHARLES STREET

569750 570000 570250 570500 570750 571000 571250 571500 571750

5810000 5809750 5809500 5809250 5809000

LEGEND

Wastewater Infrastructure
- Holding Tank
- Man Hole
- Pump Station
- Wastewater Treatment Plan

Pipes
- Main
- Rising Main
- Future Extension
- Railway
- Roads
- Watercourse

- Oval
- Cadastre
- 100 Year ARI Flood

Data Source:
Cadastre, Roads and Septic Tanks supplied by Southern Grampians Shire Council (SGSC); Wastewater Infrastructure, Pipes and Wisconsin Mound created by Australian Water Environments (AWE); Watercourse, Oval and 100 Year ARI Flood created by AWE from aerial photography and contours supplied by SGSC; Railway supplied by Geoscience Australia.

0 100 200
Meters, Scale: 1:6,000 on A3 Page

Australian WATER Environments

Branxholme Wastewater Feasibility Study

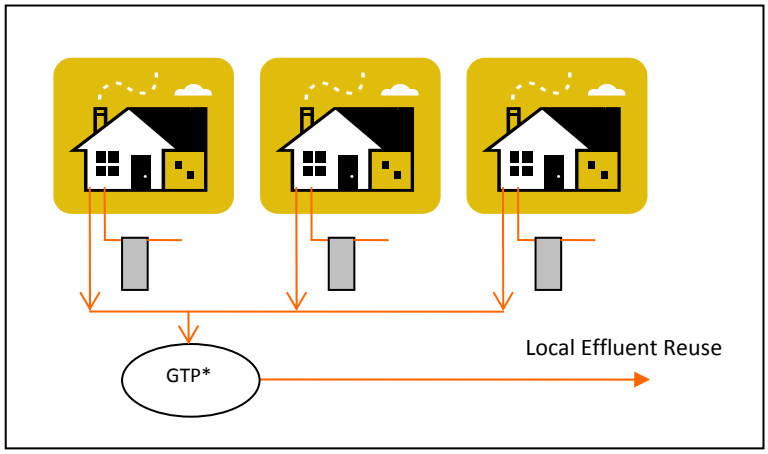
Option 1: Gravity Sewer System

Job No. 12096 - 007
121221

Figure 6.2

6.2 Option 2A: Decentralised Greywater System

De-centralised wastewater systems generally incorporate smaller sewage treatment plants that treat community scale sewerage , or clusters of houses, or a combination of systems types that can utilise reuse opportunities that are cost effective. The following Figure 6-2 illustrates a localised greywater collection and treatment system. Septic tank effluent is disposed on site.



* Note: GTP – Greywater Treatment Plant

FIGURE 6-3 CLUSTER SCALE GREYWATER TREATMENT AND REUSE

Option 2A has the following features and considerations:

- This option has been provided as an alternative to a conventional deep drainage system, as in Option 1. It incorporates collection and disposal of greywater from sites that are currently discharging to the street table drains or disposed to ground surface, and would need to be done in conjunction with replacement of existing septic tank disposal systems;
- The exact number of 'split' systems for which this applies would need to be established by an full audit. However, 33 properties have been used in this analysis, to maintain equivalence with the other 4 options. In fact there may be many more failing split systems in Branxholme that would need replacing;
- Greywater is collected by gravity drain to a greywater treatment plant (GTP) and pumped to subsurface irrigation of landscaped street verges. The Design of the disposal area would incorporate sufficient soil retention and Evapo-transpiration potential; and
- Replace existing 1800L Septic Tanks and failing disposal systems.

The following Table 6-2 indicates the costs associated with the system implementation.

TABLE 6-2 OPTION 2A: DECENTRALISED GREYWATER SYSTEM COSTS

	Item	Quantity	Unit cost		Price
Public infrastructure	Greywater Packaged Pump Station in street verge	7	35,000	$	245,000
	Common gravity collection main 100mm	700	120	$	84,000
	Landscaped disposal mounds 500m2	8	20,000	$	160,000
			Subtotal	**$**	**489,000**
			40% Contingency	$	195,600
				$	**684,600**
On-property works	Extension of greywater drains	33	1,500	$	49,500
	Common service connection	33	1,500	$	49,500
	Replace existing 1000L septic tank/ disposal	33	9,000	$	297,000
			Subtotal	**$**	**396,000**
			40% Contingency	$	158,400
				$	**554,400**
			Total	**$**	**1,239,000**

Advantages

- Mitigates offsite disposal of grey water from split systems;
- Local 'cluster' collection and subsurface irrigation of prepared street landscaping; and
- Reduces hydraulic load on site allowing for improved capacity for effluent disposal.

Disadvantages

- Similar expenditure would allow for individual onsite greywater treatment systems suitable for storage and reuse (e.g. for toilet flushing) within the property;
- Septic tank systems still require upgrading, and some properties have land that would still not support effluent disposal; and
- Relatively high cost of on-property works. (ie is higher than option 1)

Assumptions

- Failing septic systems and old septic tanks will still require replacement;
- Consideration would need to be given as to who maintains the system; and
- Households would be required to contribute to the cost of the scheme. If construction costs are not taken in to consideration, on property works and ongoing operational costs would be present value cost of around $1300 per annum over a 25year term.

6.3 Option 2B: Decentralised Effluent Collection and Treatment

Option 2B is similar to 2A, except that raw sewage is collected from clusters of houses and treated off site for reuse by sub surface irrigation.

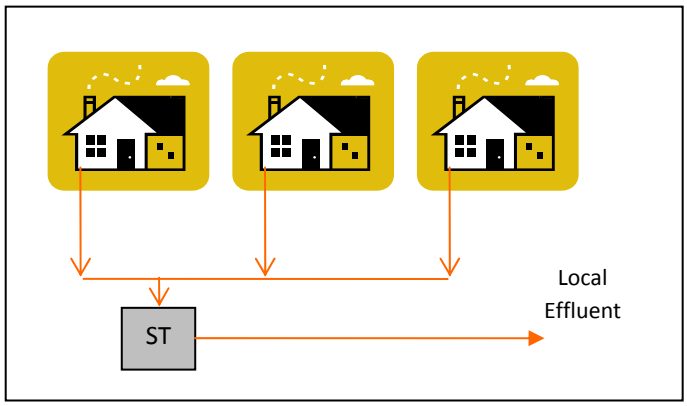


FIGURE 6-4 CLUSTER OF HOUSES CONNECTED TO COMMUNAL SEPTIC TANK WITH LOCAL EFFLUENT REUSE

Option 2B has the following features and considerations:

- Similar to Option 2A, however it provides a more cost effective solution to address small allotments or properties which have poor soil conditions;
- Sewage is directed to a communal scale septic tank primary treatment system and effluent is irrigated in dedicated subsurface landscaped areas. Design of the disposal area would incorporate sufficient soil retention, and Evapo-transpiration potential;
- Where black water and greywater are currently disposed separately, the drains for each are combined into a single service within the property to discharge to a common collection main; and
- Existing septic tanks made redundant.

The following Table 6-3 indicates the costs associated with the system implementation.

TABLE 6-3 OPTION 2B: DECENTRALISED WASTEWATER SYSTEM COSTS

	Item	Quantity	Unit cost		Price
Public infrastructure	20kL Septic Tank in street verge	7	15000	$	105,000
	Common gravity main - 150mm	700	120	$	84,000
	Landscaped Disposal Mounds 400m2	8	20000	$	160,000
	Pump stations and discharge pipes	7	5000	$	35,000
			Subtotal	$	384,000
			40% Contingency	$	153,600
			Total Public Works	**$**	**537,600**
On-property works	Combine Blackwater/Grey water drains	33	1,800	$	59,400
	Common service connection	33	1,500	$	49,500
	Decommission existing Septic Tank	33	500	$	16,500
			Subtotal	$	125,400
			40% Contingency	$	50,160
			Total On-property works	**$**	**175,560**
			Total	**$**	**713,160**

Advantages

- Allows for replacement of septic tanks and failing onsite systems;
- Local collection and subsurface irrigation of prepared street landscaping;
- Reduces effluent loading for onsite treatment within the properties;
- Replaces all septic tanks including failing systems;
- No on-property maintenance, including septic tank pump outs;
- Relatively low cost of on-property works; and
- Good access for pumping out.

Disadvantages

- Similar expenditure would allow for individual onsite greywater treatment systems suitable for storage and reuse (e.g. for toilet flushing).

Assumptions

- Failing septic systems will still require replacement; and
- Consideration would need to be given as to who maintains the system.
- Householders would be required to contribute to the cost of the scheme. If construction costs are not taken in to consideration, on property works and ongoing operational costs would be present value cost of around $600 per annum over a 25 year term.

Refer to Figure 6-5 for concept layout for Option 2A and 2B.

OPTION 2: Decentralised System

Option 2A

- Grey water collection clusters and reuse for irrigation of landscaped public areas.
- Replace failing septic tank and disposal systems.

Option 2B

- Communal septic tank and effluent disposal system to replace failing septic tank and disposal systems.

Option A - Grey water disposal area
Option B - Effluent disposal area

Option A - Grey water pump station
Option B - Communal septic tank

ELMS STREET
BASSETTS ROAD
COX STREET
FAIRWAY AVENUE
BEST STREET
WYNDHAM STREET
BROWN STREET
MORVEN BORE ROAD
MCNICHOL STREET
HENTY HIGHWAY
MORVEN ROAD
LYNCH STREET
WATTLE TREE DRIVE
HAZLEWOOD STREET
CREEK STREET
MCKELLAR STREET
STREET
Oval
Arrandoovong Creek
ELLIOT STREET
HENTY STREET
SCOTT STREET
MCKERRAL STREET
ARMSTRONG STREET
BRANXHOLME-BYADUK ROAD
ATKINSONS ROAD
CHARLES STREET

569750 570000 570250 570500 570750 571000 571250 571500 571750
5810000 5809750 5809500 5809250 5809000

LEGEND

- Option A - grey water pump station
- Option B - communal septic tank
- Septic Tanks

Pipes

- Option 2 Sewer Drain
- Option 2 Rising Main
- Railway
- Roads
- Watercourse
- *Option A - greywater disposal area*
  Option B - effluent disposal area
- Oval
- Cadastre
- 100 Year ARI Flood

Data Source:
Cadastre, Roads and Septic Tanks supplied by Southern Grampians Shire Council (SGSC); Option A - greywater pump station and Option B - communal septic tank and Pipes created by Australian Water Environments (AWE); Watercourse, Oval and 100 Year ARI Flood created by AWE from aerial photography and contours supplied by SGSC; Railway supplied by Geoscience Australia.

0 100 200
Meters, Scale: 1:6,000 on A3 Page

Australian WATER Environments

Branxholme Wastewater Feasibility Study

Option 2A/2B: Decentralised Wastewater System

Job No. 12096 - 009
121221

Figure 6.5

6.4 Option 3: Low Pressure Sewer System

Option 3 has the following features and considerations:

- Bypass existing Septic Tanks for direct sewer connection (Septic Tanks made redundant);
- Combine blackwater/greywater within property into single service;
- Install per allotment Pressure Sewer (PS) pump stations;
- Common Rising Main PS system from each allotment to MBR treatment plant in Recreation Ground; and
- Treated effluent can irrigate the Recreation Ground oval in the summer months, and winter storage will be required similarly as Option 1. Because the system is pressurised, it allows for flexibility in the location of the treatment plant, and winter storage dam.

TABLE 6-4 LOW PRESSURE SEWER SYSTEM COSTS

	Item	Quantity	Unit cost		Price
Public infrastructure	Wastewater Treatment Plant 100EP	1	350,000	$	350,000
	Install & commissioning	1	50,000	$	50,000
	Communication /control	1	20,000	$	20,000
	Oval irrigation system	1	20,000	$	20,000
	Pressure sewer collection main	2500	100	$	250,000
	Wetland/storage dam	8000	35	$	280,000
	Design and ancillary works		10%	$	97,000
			Subtotal	$	1,067,000
			40% Contingency	$	426,800
				$	**1,493,800**
On-property works	Consolidate sewer/greywater drains	33	1,800	$	59,400
	Decommission existing septic tanks	33	500	$	16,500
	Pump stations and allotment connections	33	6,500	$	214,500
	Electrical/ control box/ alarm	33	500	$	16,500
			Subtotal	$	306,900
			40% Contingency	$	122,760
				$	**429,660**
			Total	**$**	**1,923,460**

Advantages

- Fully sewered system meets SEPP guidelines;
- Replaces all septic tanks including failing systems;
- Treatment to Class B standard suitable for irrigation reuse;
- No on-property maintenance, including septic tank pump outs;
- Relatively low cost of on-property works;
- System has flexibility to extend for future developments and land division; and

- Main collection pipework is laid in shallow trenches (under 1 metre depth).

Disadvantages

- Relatively high CAPEX and OPEX; and
- Will require approvals from EPA for treatment, disposal and storage, in accordance with EPA – Code of Practice for Small Wastewater Treatment Plants.

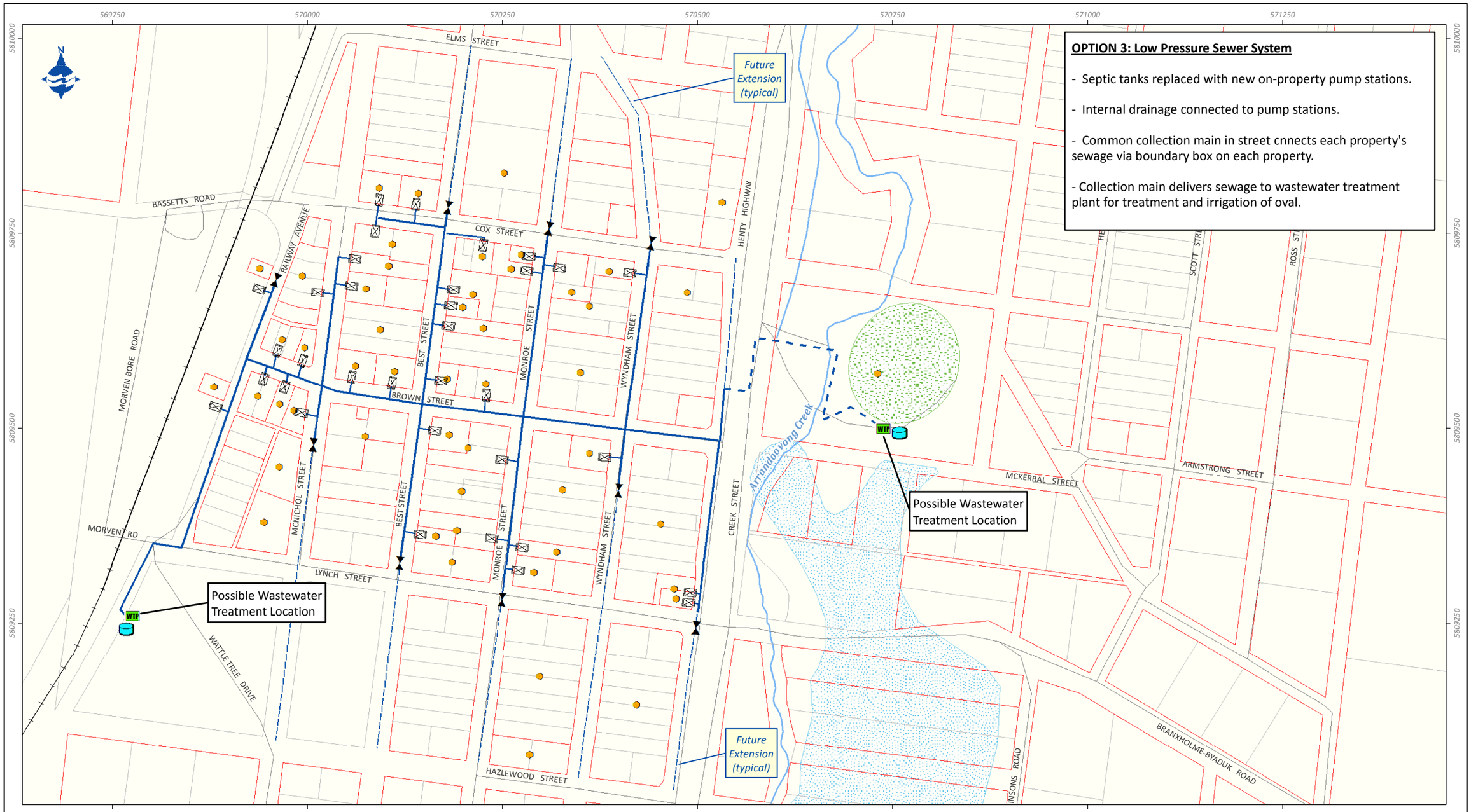
Assumptions

- Wannon Water will assume ownership and operation of system.
- Householders would be required to contribute to the cost of the scheme. If construction costs are not taken in to consideration, on property works and ongoing operational costs would be present value cost of around $1900 per annum over a 25year term.

Refer to Figure 6-6 for concept layout of Option 3.

OPTION 3: Low Pressure Sewer System

- Septic tanks replaced with new on-property pump stations.
- Internal drainage connected to pump stations.
- Common collection main in street cnnects each property's sewage via boundary box on each property.
- Collection main delivers sewage to wastewater treatment plant for treatment and irrigation of oval.



LEGEND

Wastewater Infrastructure
- Boundary Box
- Isolation Valve
- Holding Tank
- WTP — Wastewater Treatment Plant
- Septic Tank

Pipes
- Collection Main
- Collection Main - Optional
- Collection Main Connector
- Future Extension
- Railway
- Roads

- Parcels by Ownership
- Oval
- Cadastre
- Watercourse
- 100 Year ARI Flood Zone

0 50 100 150 200 250
Metres, Scale: 1:5,000 on A3 Page

Data Source:
Cadastre, Roads and Septic Tanks supplied by Southern Grampians Shire Council (SGSC); Waterwater Infrastructure, Pipes and Wisconsin Mound created by Australian Water Environments (AWE); Watercourse, Oval and 100 Year ARI Flood created by AWE from aerial photography and contours supplied by SGSC; Railway supplied by Geoscience Australia.

Australian WATER Environments

Branxholme Wastewater Feasibility Study

Option 3: Low Pressure Sewer System

Job No. 12096 - 012
121221

Figure 6.6

6.5 Option 4: Upgrade existing onsite wastewater systems

TABLE 6-5 UPGRADE EXISTING ONSITE WASTEWATER SYSTEM COSTS

	Item	Quantity	Unit cost		Price
On-property works	Consolidate sewer/greywater drains	33	1,800	$	59,400
	Decommission existing septic tanks	33	500	$	16,500
	Install new septic tank and disposal system	33	11,000	$	363,000
				$	**438,900**
			40% Contingency	$	175,560
			Total	**$**	**614,460**

This option could include either replacing septic systems with advanced treatment systems or upgrading existing septic tank and disposal system.

This option would require the following:

1. A full audit of all on-site systems to determine their current condition, and Land Capability Assessments conducted on all properties where necessary, to determine the most appropriate and compliant land disposal method;
2. Replacement of all old and failing septic systems with Aerated Wastewater Treatment Systems (AWTS) on properties less than 2200m^2;
3. Issue of maintenance orders as necessary, where clear breaches under the Health and Wellbeing Act remain unheeded;
4. A formal water testing and monitoring program of stormwater outlets and the Arrandoovong Creek, done in conjunction with the Glenelg Hopkins CMA; A centrally controlled desludging program for septic tanks that remain following the recommendations of the audit and ongoing monitoring;
5. Consideration of financial assistance for low income property owners to upgrade their systems; and
6. The development and delivery of an education program consistent with the recommendations made in the 2006 DWMP, including:
    - Education of the owners about their responsibilities with respect to the operation and maintenance of their systems;
    - Education of owners about the proper management of their septic tank systems; and
    - Activities organised within the industry, including briefing sessions and workshops with plumbers, land capability assessors and engineers, and the public, to raise awareness of the issues of wastewater management and the impacts on the health of the environment and public health.

Advantages

- No cost to households with acceptable systems; and

- No need for major works.

Disadvantages

- Does not address issue of small allotments; and
- Does not provide for subdivision or further development.

6.6 Present Value Analysis

The following analysis, provided in Table 6-6 indicates the present day cost over a 25 year term of capital and operational expenditure, and break even annual costs to recover the expense over the term. It is assumed that capital infrastructure expenditure would occur in Year 0, and annual revenue (sales) could offset the investment from Year 1.

No residual other than pump replacement has been considered in the analysis.

It is noted that this cost analysis is preliminary in nature, and meant to provide an indicative comparison between options. Life cycle costing should be the subject of detailed option analysis, which is beyond the scope of this study.

TABLE 6-6 PRESENT VALUE ANALYSIS OF OPTIONS

Present Value Analysis	Option 1	Option 2A	Option 2B	Option 3	Option 4
Study period (years)	25	25	25	25	25
Discount rate	7	7	7	7	7
Number of properties connected	33	33	33	33	33
Initial cost / investment	$ 3,114,100	$ 1,239,000	$ 713,160	$ 1,923,460	$ 614,460
Present Value Capital cost (CAPEX)	$ 2,961,066	$ 1,208,636	$ 717,197	$ 1,848,318	$ 624,954
Present Value Operation and Maintenance	$ 70,434	$ 11,654	$ 11,654	$ 70,434	$ 11,654
Present Value Power	$ 90,726	$ 21,658	$ 12,466	$ 56,038	$ 10,741
Present Value Cost	$ 3,122,226	$ 1,241,948	$ 741,317	$ 1,974,791	$ 647,348
Annual cost per property to achieve a Net Present Value (NPV) = 0	**$ 8,807**	**$ 3,503**	**$ 2,091**	**$ 5,570**	**$ 1,826**

Option 4 is the least expensive option, with lowest CAPEX; Option 1 is the most expensive option with both high CAPEX and ongoing operational (OPEX) costs. While Option 4 is the least expensive option, there may be properties that may not have the capacity to adequately manage wastewater onsite. A comprehensive audit of these properties would be required to determine this.

6.7 Option Assessment

The following Table 6-7 provides a summary of the options assessed.

Issues taken into consideration in determining preferred options include:

- Financial issues;
- Capital cost;
- Operational cost;

- Legislative issues;
- Environmental risk;
- Health risk;
- Compliance with policy; and
- Stakeholder feedback.

TABLE 6-7 SUMMARY OF OPTION ASSESSMENT

	Financial issues	Legislative issues	Design and Development issues	Stakeholder feedback
Option 1 **Centralised wastewater system**	High capital costs (CAPEX) and operating costs (OPEX).	Will require approvals from: EPA ; – WWTP discharge; and compliance with provisions of SEPP (Waters of Victoria) Department of Health – Water reuse	Requires concept design development; Power supply requirements not known; No restrictions for future land development	Wannon Water has indicated that in the absence of external funding, Branxholme residents would need to pay for scheme/upgrades. Resident feedback indicated a lack of support for this option given its high costs.
Option 2a **Decentralised greywater system**	Moderately low CAPEX and OPEX	Will require approvals from: EPA , – WWTP discharge; And compliance with provisions of SEPP (Waters of Victoria) Department of Health – Water reuse	Addresses all current wastewater management issues. Can be extended to meet future development needs. No restrictions for future land development	Wannon Water has not built such a scheme and this option would require more detailed assessment. Council lack resources or expertise to manage public domain wastewater systems Further community engagement would be required to explore this option
Option 2b **Decentralised effluent collection and treatment**	Moderately low CAPEX and OPEX	Will require approvals from: EPA , – WWTP discharge; And compliance with	Addresses all current wastewater management issues. Can be extended to meet future development	Wannon Water has not built such a scheme and this option would require detailed assessment.

		provisions of SEPP (Waters of Victoria) Department of Health – Water reuse	needs. No restrictions for future land development	Council lack resources or expertise to manage public domain wastewater systems. Further community engagement would be required to discuss this option further.
Option 3 **Low pressure sewer system**	Second most expensive option	Will require approvals from: EPA , – WWTP discharge; And compliance with provisions of SEPP (Waters of Victoria) Department of Health – Water reuse	Addresses all current wastewater management issues. Can be extended to meet future development needs. No restrictions for future land development Requires concept design development	Wannon Water has indicated that in the absence of external funding, Branxholme residents would need to pay for scheme/upgrades. Further community engagement required to discuss preferred option.
Option 4 **Upgrade existing on site wastewater systems**	The most cost effective option – approx. $1430 per annum per property.	Application of Public Health & Wellbeing Act and Environment Protection Act as required.	Does not address small allotments (<2200m^2) where onsite disposal may not be possible. Future minimum allotment size restriction.	This would probably be the community's preferred option given its relatively low cost.
Summary	Option 4 most cost effective from a financial perspective. Option 1 is the least cost effective.	Other options require canvassing with relevant authorities	Option 3 provides best value for future extension to meet growth demands.	The community is more likely to accept Option 4 as the least expensive option.

7 Preferred Option

The preferred option needs to take into account the likelihood of external funds being available to carry out capital works and the likely population growth.

If external funding becomes available for the required capital works, Option 3 would be preferred as it would provide an acceptable environmental outcome at a reasonable capital and ongoing maintenance cost over the longer term. It would provide for population growth and could be extended as required, should there be an increase in demand for building sites in Branxholme.

Option 2A and 2B provide a lower cost solution than Option 3 and in the absence of external funding may be a viable alternative, given the current population growth of the township. Consideration would need to be given as to who maintains and manages the system and it is recommended that Council consults further with Wannon Water.

Option 4 is the least expensive option, and may be more likely to receive support from the community. However it does not address the problem of small allotments which have insufficient area to manage the waste water generated on the site and would not provide for subdivision and further housing development in Branxholme.

Key aspects of the preferred option (Option 3) are:

- The low pressure sewer system is compliant with relevant legislation and standards and is a proven technology. A similar system was recommended for Merricks Beach in Mornington Peninsula Shire;
- The system is flexible and would enable a design that would immediately address the issue of failed and failing septic systems, which are especially evident on allotments under 2200m^2;
- Properties of 4000m^2 or less would also be required to install a pressure sewer system;
- Once constructed the system can expand to meet demand. The system will facilitate allotments of minimum size within the township zone;
- It is estimated that the on-property costs for 33 properties would be in the order of $12,000 (refer to the costings under Option 3);
- This type of system is preferred in environmentally sensitive and flat terrain settings where a mains sewer system is expensive and difficult to implement; and
- It would be expected that implementation could be achieved within a 2 year time frame, subject to funding being secured from relevant sources, and approvals being sought, including by Wannon Water.

Discussion

Option 4 would be considered as a short term fall back option where funding of a more centralised solution (Option 3), is problematic. Throughout the consultation period, a number of key factors which have an impact on determining the final preferred option include:

- Branxholme residents and the community are resistant to change though would be prepared to consider options that would reduce risks to public and environmental health where failing septic systems are the cause;
- Council will need to impose restrictions around the land capacity for further development in the town. Council has an obligation (EPA Act) to ensure that where any development is proposed the surrounding environment is protected. This would typically include restriction in the minimum size of future allotments within the township planning zone, and surrounding farming zone. The EPA COP recommends that dependent on prevailing conditions, land divisions resulting in allotments under 1ha should be carefully considered with respect to the environmental risk that onsite wastewater management would present; and
- Option 4 does not address the issue in Branxholme where upgrades to septic systems for properties under 2200m^2 would still not achieve adequate on site disposal and would be unsustainable in the long term.

8 Recommendations

8.1 Testing of preferred option

It is recommended that Council approve the preferred option identified in this study for further stakeholder engagement. If approved this engagement would need to occur in the context of a broader education program. For the preferred option to be successful it is recommended that Council give consideration to the following:

- Establishing a financial incentive or subsidy mechanism for the 33 affected properties to install the necessary infrastructure;
- Engaging Wannon Water and potentially a private sector partner in scoping the preferred option and developing a functioning design that complies with Wannon Water's identified business case model. Similar Private Public Partnership arrangements have been established in other states for the management of small scale centralised wastewater systems;
- Identifying potential external funding sources; and
- Using some Council funding as leverage to secure the necessary external funds to cover the capital costs to design and construct the preferred option.

It is clearly evident that a collective approach by stakeholders is required for this option to succeed. It is recommended that Council take an advocacy, leadership, facilitative and part funder role in progressing this option.

8.2 Other Recommended Actions

The following Table 8-1 summarises a number of supporting actions that are recommended for implementation by Council in partnership with relevant stakeholders. These supporting actions apply to all options and are seen as a fundamental part of any transition to a more effective approach to wastewater management in the township.

TABLE 8-1 SUGGESTED ACTIONS

	Action	Priority
Policy review	It is recommended that Council review and amend the current Planning Scheme to; a) incorporate minimum allotment sizes for unsewered residential land development; b) require system upgrades where appropriate when new development occurs.	High
Corrective actions	Work with relevant property owners to correct off site discharge of wastewater Report water quality test results to relevant regulatory bodies	High High
Education program	Given the findings of the stakeholder consultation, in particular the identified community resistance to change being tied to their concerns regarding who bears the cost, it is recommended that an education program is developed and implemented as a priority. This recommendation confirms the findings from the 2006 DWMP regarding the need for such a program. The program would focus on educating the residents on contemporary practice regarding domestic wastewater management and maintenance of existing systems.	Medium
Auditing	It is recommended that Council undertake a full audit of all properties including effluent outfall from septic tanks, disposal fields and sludge and scum measurements.	High
Assessment and mapping	It is recommended that a consistent approach is taken in undertaking Land Capability Assessments (LCAs) in all relevant planning and development decision making concerning wastewater management in Branxholme. Whole of township soil mapping.	Medium
Centralised desludging program	It is recommended that Council consider establishing a centralised desludging program, where the Council manages the pump out and passes the cost as part of the annual rates.	Medium
Monitoring	It is recommended that Council secure the support of the Glenelg Hopkins Catchment Management Board to undertake a comprehensive water quality monitoring program in the relevant watercourses.	High

9 References

AS/NZ1547:2012. *Onsite Domestic Wastewater Management.* Government of Australia, Canberra.

AS/NZS 1546.1., *Onsite domestic wastewater treatment units, Septic tanks.* Government of Australia, Canberra.

AS/NZS 1546.2. *Onsite Domestic Wastewater Treatment Units, Waterless Composting Toilets.* Government of Australia, Canberra.

AS/NZS 1546.3, On-site domestic wastewater treatment units, Aerated wastewater treatment systems. Government of Australia, Canberra.

AS/NZS 1547, On-site domestic wastewater management. Government of Australia, Canberra.

Auditor General Victoria (2006) *Protecting Our Environment and Community from Failing Septic Tanks*. Victorian Government, Melbourne.

Department of Natural Resources and Mines (2005) *Planning Guidelines for Water Supply and Sewage*. State of Queensland, Brisbane.

Department of Planning and Community Development. National Heritage Register of Victoria. Victorian Government, Melbourne.

Feehan P, Cullity P (2010) *Better Practice in Domestic Wastewater Management and Selected Case Studies*. Catchment and Water Service. Department of Sustainability and Environment. Victorian Government, East Melbourne.

GHD (2007) *Wannon Water Report for Proposed Sewage Scheme for Dutton Way.*

Glenelg Hopkins Catchment Management Authority (2002) *Health of the Catchment Report.* Hamilton, Victoria.

James C. Smith & Associates (2002) *Domestic Wastewater Management, A Planning Guide for Local Government. A literature review of the public health and environmental impacts of domestic wastewater.*

Municipal Association of Victoria (2005) *State Environmental Protection Policy (Waters of Victoria) Implementation Project, Final Report*. Reported by Ecological Engineering and Ark Partners.

Municipal Association of Victoria (2004) *Domestic Wastewater Management Practices in Victoria - Survey of Local Government Environmental Health Officers*.

Municipal Association of Victoria (2005) Pre Smart Septics Roadshow Survey Report,.

Municipal Association of Victoria (2008) *Vicotiran Local Government Costs and Capacity for Domestic Wastewater Management.*

Newman, G (2005) *Country Towns Water Supply and Sewage Program Domestic Wastewater Management Report on Branxholme Township*. Southern Grampians Shire Council, Hamilton,

Victoria.

SD Environmental Management Pty Ltd (2005) *Smart Septic Solutions Session Finding Report.*

Southern Grampians Shire Council (2006) *Domestic Wastewater Management Plan Final Report*. Hamilton, Victoria.

State of Victoria Environment Protection Authority (1997) *Code of Practice for Small Wastewater Treatments Plants*. Victorian Government, East Melbourne.

State of Victoria Environment Protection Authority Victoria (2010) *Draft EPA Code of Practice – On Site Wastewater Management.* Victorian Government, East Melbourne.

State of Victoria Environment Protection Authority (2009) *Guidelines for Risk Assessment of Wastewater Discharges to Waterways.* Victorian Government, East Melbourne.

State of Victoria Environment Protection Authority (2003). *State Environment Protection Policy (Waters of Victoria).* Victorian Government, Melbourne.

State of Victoria Environment Protection Authority. *Preliminary Nutrient Guidelines for Inland Streams* (EPA Publication 478).

State of Victoria Department of Sustainability and Environment (2011*) Western Region Sustainable Water Strategy*. Victorian Government, East Melbourne.

State of Victoria Environment Protection Authority (2003) *Information Bulletin Water Quality Objectives for Rivers and Streams – Ecosystem Protection.* Victorian Government, East Melbourne.

Sydney Catchment Authority (2012) *Designing and Installing Onsite Wastewater Systems*. NSW Government, Sydney.

Appendix A : Community Feedback Questionnaire

Southern Grampians
SHIRE COUNCIL

Australian
WATER
Environments

Branxholme

Wastewater Feasibility Study

Community Feedback Sheet

Purpose of Study

Southern Grampians Shire Council has engaged Australian Water Environments (AWE) to prepare a feasibility study of the options for managing domestic wastewater within the township of Branxholme.

One of the key findings of the 2006 Southern Grampians Domestic Wastewater Management Plan was that aging septic systems in Branxholme were going to contribute to a decline in environmental standards within the town. The cost of a reticulated sewerage system for the town would be costly, and so Council and the community, through the Branxholme Progress Association, are keen to look at all options to deal with this issue for the existing 45 developed properties within the town, and also allow for future development.

The Feasibility Study will assess the adequacy of the existing wastewater systems within the township to identify and prioritise potential approaches that could be implemented to ensure an appropriate level of environmental protection and public health for the township into the future.

Existing Wastewater Management in Branxholme

Wastewater is simply water that has been used for domestic or industrial purposes and then discharged as waste, and includes “greywater” and “blackwater”. Greywater is wastewater from sinks, showers, baths and washing machine. Blackwater is waste from toilets.

We understand that there are currently two main types of wastewater systems used in Branxholme: “split” systems and “all-waste” systems.

Split systems mean that greywater is taken separately along surface drains and pipes away from the house, for disposal (often to garden areas), and the blackwater is taken to a septic tank and disposed in an absorption drainage/trench.

All-waste systems mean that both greywater and blackwater is taken to a septic tank which then drains to an absorption trench.

Aerated Wastewater Treatment System (AWTS) is a system that treats the wastewater by aeration and disinfection to a standard that is suitable for surface irrigation.

Why the need for Change?

Replacement - Many of the wastewater systems in Branxholme are old and won’t last forever. At some stage in the future, upgrades to existing on-site wastewater systems will become unavoidable.

State Legislation – changes in legislation require more stringent conditions for wastewater treatment and disposal

Environment – better wastewater management can reduce the impact on the local environment and on the amenity of residents and to avoid problems in the future

New technologies – as new technologies are developed they allow for more cost effective management and improved wastewater re-use etc.

Funding – it is always worth having a preferred solution "ready to go" to maximize any available State or Federal government funding to convert, upgrade or replace old systems and infrastructure

Your Feedback

As part of the development of the feasibility study, Council is seeking your comments and feedback regarding any issues or concerns that you may have with wastewater management on your property and/or within the Branxholme area. This information will help us consider which wastewater management options would be most suitable for the Branxholme location and community.

There will also be an opportunity for you to meet with the project team at a **community information session** to hear about the outcomes of the questionnaire, discuss any issues or ideas that you have, and to discuss the initial outcomes of the feasibility study on Thursday 8th March, 2012, between 4pm and 8 pm, at the Branxholme Community Hall.

We would appreciate it if you could complete this feedback sheet and return it in the reply paid envelope to Council by Friday 24th February 2012. Alternatively, if preferred you can bring your feedback form to the Community Information Session on 8th March, where assistance will be available.

Please return the feedback sheet to Council by 24th February 2012.

Enquiries: Contact Dave Pennington, Senior Designer Infrastructure Services, Australian Water Environments. Phone 08 8378 8000.

Feedback Sheet

Please feel welcome to attach further pages if you require more space or if you wish to make comments relating to more than one property.

Contact Details (optional)

Name:.....

Property Address: .....

Are you the owner of the property?.....

Contact Address (if different from above):.....

Phone number: .....

Email Address:.....

Are you interested in coming to the information session on 8th March 2012 at 4-8 pm? Yes/No

1. **What type of septic system does your property have?** (Please refer to definitions on page 1)

   - ❑ All-waste
   - ❑ Split System
   - ❑ Aerated Wastewater Treatment System (AWTS)
   - ❑ Not sure
   - ❑ Other (please describe): ……

   .....

2. **Approximately how old is your septic system? (if known)……**

3. **How is greywater and drainage water from your septic system disposed of on your property?**

   - ❑ Gravity drainage trench or bed
   - ❑ Gravity drainage trench for blackwater and surface greywater runoff
   - ❑ Evapotranspiration, mound system, pressure dosed subsurface
   - ❑ Irrigation (surface or subsurface)
   - ❑ Not sure
   - ❑ Other (please describe): ……

   .....

4. **About your system:**

   a. **How well does your wastewater system work:**

      i. **What sort of issues have you had with your system (if any)?**

   .....

   .....

ii. **Do you have enough information about your system to know if it is working properly? Y/N**

iii. **Where do you access information about how to maintain your system?**

.....

.....

b. When was the last time your septic tank was pumped out?

.....

.....

c. Was the last time your septic tank pumped out because of:

i. **A blockage?**

Please describe…….

ii. **Routine maintenance?**

Please describe…….

d. Does your plumber carry out all maintenance of your system? Y/N

i. **What maintenance do you undertake yourself?**

Please describe…….

5. Other comments about the wastewater system on your property:

.....

.....

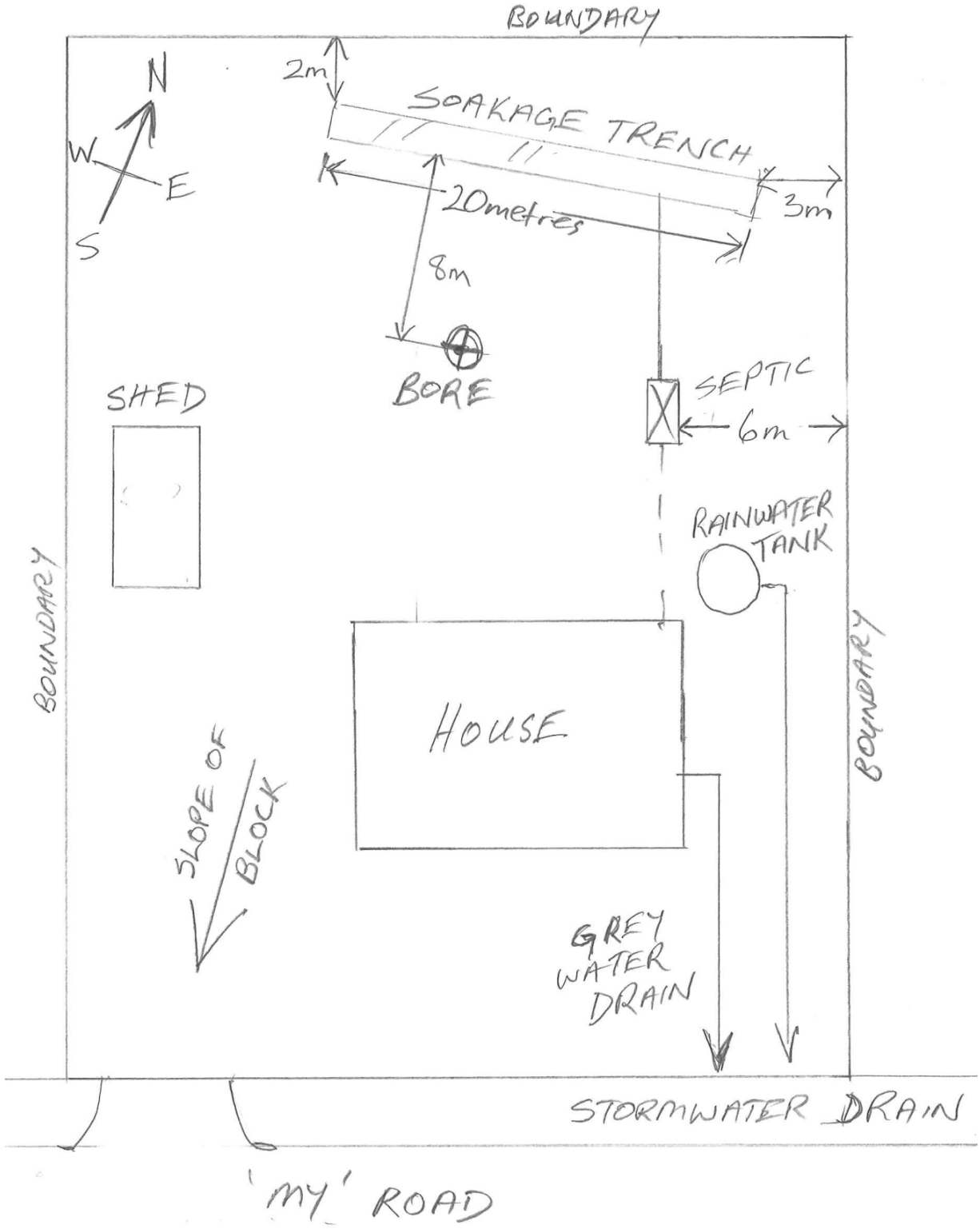
.....

6. Knowing where your septic tank and disposal area is located on your property will help us to suggest the most useful options for wastewater on your property and for the township as a whole.

Please spend a few minutes roughly drawing a "mud-map" of your property on the attached sheet, just showing the following details:

- Approximate location of boundary and where the road is
- Outline of the house and any sheds/outbuildings
- Location of septic tank and disposal area
- Location of bore (if you have one)
- Location of rainwater tank
- Slope across the block
- Direction of North
- Any other additional details, such as the approximate size of the disposal area, distance of the disposal area from the house and boundary.

An example is provided on the next page. The blank page for your site map drawing is provided on the last page of this questionnaire.


BOUNDARY
N
W
E
S
2m
SOAKAGE TRENCH
20metres
3m
8m
BORE
SHED
SEPTIC
6m
RAINWATER TANK
BOUNDARY
BOUNDARY
HOUSE
SLOPE OF BLOCK
GREY WATER DRAIN
STORMWATER DRAIN
'MY' ROAD

7. What is important to you?

It is important for us to understand what is important to you so that when we are developing options for wastewater management, we are respecting local needs and concerns.

For example, there is no point in us developing a state-of-the-art system which nobody can afford to install. Likewise, there would be no point in obtaining government funding to install a system which had really high operating and maintenance costs that the property owner might need to pay.

The options that we develop will need to consider a range of factors, such as:

- Meeting government regulations
- What existing infrastructure is in place
- Minimizing costs to landholders
- Minimizing costs to the rest of the community
- Understanding what maintenance activities property owners and residents are comfortable with or used to
- Providing long-term benefits to the local environment of Branxholme and the amenity of residents

This will affect the range of options that we will develop, so your answers to the following questions are important to us.

Please indicate how important the following aspects of a wastewater system are to you:

a) To meet basic government health and environmental regulations

Not important **1**…….. **2**…….. **3**…….. **4**…….. **5** Very important

b) To prevent health issues caused by inappropriate wastewater disposal

Not important **1**…….. **2**…….. **3**…….. **4**…….. **5** Very important

c) Low maintenance costs

Not important **1**…….. **2**…….. **3**…….. **4**…….. **5** Very important

d) Low up-front replacement or upgrading costs

Not important **1**…….. **2**…….. **3**…….. **4**…….. **5** Very important

e) Clean and healthy environment for the community

Not important **1**…….. **2**…….. **3**…….. **4**…….. **5** Very important

f) Safe and healthy environment on my property

Not important **1**…….. **2**…….. **3**…….. **4**…….. **5** Very important

g) To keep my existing system with no changes

Not important **1**…….. **2**…….. **3**…….. **4**…….. **5** Very important

h) To learn more about how to make my existing system work better

Not important **1**…….. **2**…….. **3**…….. **4**…….. **5** Very important

i) To be able to use wastewater for irrigation of my property

Not important **1**…….. **2**…….. **3**…….. **4**…….. **5** Very important

7. Other comments? Problems you may be aware of? Suggestions for improvement around the town? Please add additional pages if required.

.....

.....

.....

.....

.....

.....

.....

Thank you very much for your input!

Please return this survey form using the reply-paid envelope supplied by 24th February 2012 to:

Sustainability Coordinator

Southern Grampians Shire Council

Locked Bag 685

HAMILTON Vic 3300

If you require assistance completing the form, please bring it to the Community Information Session on 8th March.

****

Appendix B : Branxholme Residents Feedback

Feedback Sheet Outcomes

The responses provided on the feedback sheet are summarised below, without interpretation or comment. They are recorded in the same order as the questions were presented on the feedback sheet. The 'mud-maps' provided by respondents have not been included in this summary.

Summary of Outcomes

Are you interested in coming to the information session on 8th March 2012 4-8pm? Y/N

- Yes – 6
- No- 2
- No response - 6

1. **What type of septic system does your property have?**
    - All waste - 11
    - Split system - 3
    - Aerated wastewater treatment system (AWTS) - 1
    - Not sure - 0
    - Other - 2
        - Biocycle residence all waste station
        - Bathroom, kitchen, toilet wastewater goes into septic tank. Laundry trough and washing machine water enter into hose and water garden.
2. **Approximately how old is your system?**
    - No response - 3
    - Response – 13 (see response below)
        - 10 years
        - 4+7 years
        - Not known – maybe about 25-30 years
        - 20 years
        - 22 years
        - Not known
        - 16 years old
        - 50 plus
        - 27 years
        - 10 years
        - 20 years
        - 25 years ago
        - 18 years

3. **How is greywater and drainage water from your septic system disposed of on your property?**
    - No response - 3
    - Gravity drainage trench or bed - 10
    - Gravity drainage trench for blackwater and surface greywater runoff - 1
    - Evapotranspiration, mound system, pressure dosed subsurface - 1
    - Irrigation (surface or subsurface) - 0
    - Not sure - 0
    - Other (please describe) – 2 (see response below)
        - Through septic tank
        - Pump to absorption trenches
4. **About your system:**
    a) **How well does your wastewater system work:**
        i. **What sort of issues have you had with your system (if any)?**
            - No response – 4
            - Responses – 12 (see below for responses)
                - Very well
                - Reasonably well
                - All systems good at this present time
                - None
                - No issues
                - No issues
                - Tree roots getting into terracotta pipes
                - Extended trenches due to wet conditions 14 years ago and has worked well since
                - Works well
                - None
                - Had it pumped out once in 25 years have had no problems
                - none
        ii. **Do you have enough information about your system to know if it is working properly?**
            - No response – 5
            - Yes – 10
            - No - 1
        iii. **Where do you access information about how to maintain your system?**
            - No Response – 7

- Response – 9 (see below for response)
    - Common sense
    - Plumbers
    - General knowledge
    - Plumber
    - Plumber
    - Plumber – Finchett & Co Hamilton
    - Shire
    - Shire
    - Shire

b) When was the last time your septic tank was pumped out?

i. No response - 4

ii. Response – 12 (see below for response)

- November 2011
- Never to my knowledge
- Not known. This home shifted to property about 25 years ago. Frontier Settlement home originally owned by Salvation Army.
- Nil
- Sept 2011
- November 2011
- 4 years ago
- 14 years ago
- Not.
- Not sure
- About 10 years ago
- Not sure

c) Was the last time your septic tank pumped out because of:

i. A blockage? Please describe

- No response - 14
- Response – 2 (see below for response)
    - Not known
    - slow

ii. Routine maintenance? Please describe

- No response – 11
- Yes – 2

- No – 0
- Other response - 5 (see below for response)
  - Not known
  - Nil
  - Routine
  - Had not been pumped out for a while
  - Tank was full

d) Does your plumber carry out all maintenance of your system? Y/N

- No response – 7
- Yes – 5
- No - 2

i. What maintenance do you carry out yourself? Please describe

- No response – 9
- Response – 7 (see below for response)
  - Nil
  - Between myself and Finchetts Plumbing Hamilton
  - No problems, no maintenance required
  - None
  - Cut grass on top of trenches
  - Check on tree roots
  - nil

5. Other comments about the wastewater system on your property:

- No response – 8
- Response – 8 (see below for responses)
  - All waste is managed and dispersed on site.
  - All satisfactory at this time
  - With a front loader washing machine the system works well and biodegradable washing agents. We have no trouble with the system. Old top loader washing machine would 'muckup' septic tank.
  - Septic 16 years old
  - Very overengineered –seem to be well above need
  - Have owned the property for 11 years have had no problems
  - It helps keep my gardens and lawn watered
  - We have owned the property for about five years and have had no problems

6. Mud-map of property showing details:

- No response - 4
- Response – 12 (11 maps provided, 1 written response)
    - Written response:
        - No bore on my property
        - Rainwater tank located next to my house
        - Slope across the block is 10% from west to east

7. What is important to you? Please indicate how important the following aspects of a wastewater system are to you:

a) to meet basic government health and environmental regulations

Importance	**Number of responses**
1 (not important)	0
2	1
3	1
4	5
5 (important)	5
No Response	4

b) to prevent health issues caused by inappropriate wastewater disposal

Importance	**Number of responses**
1 (not important)	0
2	0
3	1
4	4
5 (important)	7
No Response	4

c) low maintenance costs

Importance	**Number of responses**
1 (not important)	0
2	0
3	1
4	1
5 (important)	10
No Response	4

d) low upfront replacement or upgrading costs

Importance	Number of responses
1 (not important)	0
2	0
3	0
4	1
5 (important)	11
No Response	4

e) clean and healthy environment for the community

Importance	Number of responses
1 (not important)	0
2	0
3	0
4	6
5 (important)	6
No Response	4

f) safe and healthy environment on my property

Importance	Number of responses
1 (not important)	0
2	0
3	0
4	5
5 (important)	6

g) to keep my existing system with no changes

Importance	Number of responses
1 (not important)	0
2	2
3	1
4	2
5 (important)	5
No Response	5

h) to learn more about how to make my existing system work better

Importance	Number of responses
1 (not important)	1
2	0
3	1
4	6
5 (important)	3
No Response	5

i) to be able to use wastewater for irrigation on my property

Importance	Number of responses
1 (not important)	2
2	1
3	1
4	5
5 (important)	2
No Response	5

8. Other Comments:

- No response – 7
- Responses – 9 (see below for responses)
    - Why should people with proper working septic systems be expected to pay for those who won't fix theirs?
    - We have a perfect working septic system and don't want to pay for anyone elses. We are not interested.
    - Not interested in town sewage. Rates are too high now.
    - I find my drainage and septic tank installations satisfactory at this present time. Thanks.
    - Would like to see wetland between stormwater drain on service road (adjacent to highway and Brown St) to clean water before entering creek.
    - Clean swale drains.
    - Happy with the way it is. Don't want change. Doesn't believe there is a problem.
    - If people around town do the wrong thing they should fix it.
    - Live here for cheaper living. Septic and wastewater was put in with shire.
    - If people are doing the wrong thing make them sort it out.

Appendix C : Water Quality Test Results

NATA Accredited Laboratory No. 992
Accredited for compliance with ISO/IEC 17025

Environmental Division (Water Resources Group)

CERTIFICATE OF ANALYSIS

Batch No:	**12-23232**	*Page*	**Page 1 of 2**
Replacement Report	**307267**		
This report replaces Report Number:	**307261**	*Laboratory*	Scoresby Laboratory
Client:	**Southern Grampians Shire Council**	*Address*	Caribbean Business Park, 22 Dalmore Drive, Scoresby, VIC 3179
Contact:	**Pauline Porter**		
Address:	PO Box 685 HAMILTON VIC 3300	*Phone*	03 8756 8000
		Fax	03 9763 1862
		Contact:	Linna Truong Client Manager Linna.Truong@alsglobal.com
PO No:	**Not Available**	Date Sampled:	**14-May-2012**
Sampler Name:		Date Samples Received:	**16-May-2012**
ALS Program Ref:	**STHGRAMPWQ**	*Date Issued:*	**28-May-2012**
Program Description:	**Water Quality Monitoring Program**		
Client Ref:	**Arrangdoovong/Branxholme**		

The sample(s) referred to in this report were analysed by the following method(s):
- NATA accreditation does not cover the performance of this service

Analysis		*Method*	*Laboratory*	*Analysis*	*Method*	*Laboratory*
Temp.	#	CLIENT	Melbourne	Colilert (2000)	VIC-MM514	Melbourne
EC		VIC-CM060 C	Melbourne	TCN	VIC-CM019	Melbourne
NOX as N (LL)		VIC-CM018	Melbourne	pH	VIC-CM060 B	Melbourne
TKN/TP (LL)		VIC-CM026	Melbourne			

Result for pH in water tested in the laboratory may be indicative only as holding time is generally not achievable. (6 hrs from time of sampling, AS5667.1)

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Please note that this is an amended report replacing the one originally sent on 23/5/12. The client reference detail has been amended in this report. The amendments were made by L.Truong on 28/5/12.

Signatories

These results have been electronically signed by the authorised signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11

Name	*Title*	*Name*	*Title*
Brad Snibson	**Client Manager**	**Dennis Carty**	**Senior Chemist**
Hoa Nguyen	**Analyst**	**Joel Nicholson**	**Analyst**
Michael Clahsen	**Principal Inorganic Chemist**		

NATA Accredited Laboratory No. 992
Accredited for compliance with ISO/IEC 17025

Samples collected according to ALS WRG procedures.

Soil results expressed in mg/kg dry weight unless specified otherwise.
Microbiological testing was commenced within 24 hours of sampling unless otherwise stated.
VIC-MM524: Plate count results <10 per mL and >300 per mL are deemed as approximate.
VIC-MM526: Plate count results <2,500 per mL and >250,000 per mL are deemed as approximate.
Calculated results are based on raw data.

Batch No: **12-23232**
Report Number: **307267**
Client: **Southern Grampians Shire Council**
ALS Program Ref: **STHGRAMPWQ**
Program Description: **Water Quality Monitoring Program**

Sample No	Site Code	Site Description	Sample Type	Sampled Date/Time
3037601		BA-3 Arrandoovong Creek-site 3	WATER	14/05/12 11:35
3037602		BA-4 Arrandoovong Creek-site 4	WATER	14/05/12 11:25
3037603		BA-5 Arrandoovong Creek-site 5	WATER	14/05/12 11:12

Analysis - Analyte	*Sample No. Site Code Units*	3037601	3037602	3037603
Temp. - Water Temperature (CS)	°C	11.1	11.1	12.5
pH - pH, units	Units	8.2	7.9	7.7
TKN/TP (LL) - Total Kjeldahl Nitrogen, as N	mg N / L	0.43	0.36	0.27
TKN/TP (LL) - Phosphorus, total as P	mg P / L	0.019	0.007	0.006
EC - Electrical Conductivity @ 25C	uS/cm	4000	3700	3600
TCN - Total Nitrogen as N (Calc)	mg/L	0.5	0.6	1.0
NOX as N (LL) - Nitrate + Nitrite, as N	mg N / L	0.020	0.27	0.72
Colilert (2000) - E.coli MPN Colilert	orgs/100mL	120	920	650

ALS Group

Environmental Division (Water Resources Group)

NATA Accredited Laboratory No. 992
Accredited for compliance with ISO/IEC 17025
WORLD RECOGNISED ACCREDITATION

CERTIFICATE OF ANALYSIS

Batch No:	**12-29496**	*Page*	**Page 1 of 2**
Final Report	**313292**	*Laboratory*	Scoresby Laboratory
Client:	**Southern Grampians Shire Council**	*Address*	Caribbean Business Park, 22 Dalmore Drive, Scoresby, VIC 3179
Contact:	**Pauline Porter**	*Phone*	03 8756 8000
Address:	PO Box 685 HAMILTON VIC 3300	*Fax*	03 9763 1862
		Contact:	Linna Truong Client Manager Linna.Truong@alsglobal.com
PO No:	**Not Available**	Date Sampled:	**25-Jun-2012**
Sampler Name:	**SGSC**	Date Samples Received:	**26-Jun-2012**
ALS Program Ref:	**STHGRAMPWQ**	*Date Issued:*	**02-Jul-2012**
Program Description:	**Water Quality Monitoring Program**		
Client Ref:	**Lake Hamilton WQ**		

The sample(s) referred to in this report were analysed by the following method(s):
- NATA accreditation does not cover the performance of this service

Analysis		*Method*	*Laboratory*	*Analysis*		*Method*	*Laboratory*
Temp.	#	CLIENT	Scoresby	Bacteroidales	#	MW563	Scoresby
Colilert (2000)		VIC-MM514	Scoresby	EC		VIC-CM060 C	Scoresby
Enterolert		VIC-MM517	Scoresby	MST-1	#	Calculation	Scoresby
MST-2	#	MW563	Scoresby	TCN		VIC-CM019	Scoresby
NH3 as N (LL)		VIC-CM010	Scoresby	NOX as N (LL)		VIC-CM018	Scoresby
pH		VIC-CM060 B	Scoresby	TKN/TP (LL)		VIC-CM026	Scoresby
Turbidity		VIC-CM013	Scoresby				

Result for pH in water tested in the laboratory may be indicative only as holding time is generally not achievable. (6 hrs from time of sampling, AS5667.1)

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Report Comments:

Human Marker equivalent in raw sewage: 1.3 x 10^10 ME/L

Animal Marker equivalent in raw sewage: 3.3 x 10^8 ME/L

Reported by Greg Sturbaum.

Signatories

These results have been electronically signed by the authorised signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11

Name	*Title*	*Name*	*Title*
Ana Luisa Child	**Senior Analyst**	**Brad Snibson**	**Client Manager**
Chatura Perera	**Team Leader, Nutrients**	**Heidi Marcelo**	**Analyst**
Hoa Nguyen	**Analyst**	**Joel Nicholson**	**Analyst**
Michael Clahsen	**Principal Inorganic Chemist**	**Stuart Paarman**	**Team Leader, General Chemistry**

NATA Accredited Laboratory No. 992
Accredited for compliance with ISO/IEC 17025
WORLD RECOGNISED ACCREDITATION

Samples tested as received.

Soil results expressed in mg/kg dry weight unless specified otherwise.
Microbiological testing was commenced within 24 hours of sampling unless otherwise stated.
VIC-MM524: Plate count results <10 per mL and >300 per mL are deemed as approximate.
VIC-MM526: Plate count results <2,500 per mL and >250,000 per mL are deemed as approximate.
Calculated results are based on raw data.

Page:	**Page 2 of 2**
Batch No:	**12-29496**
Report Number:	**313292**
Client:	**Southern Grampians Shire Council**
ALS Program Ref:	**STHGRAMPWQ**
Program Description:	**Water Quality Monitoring Program**

Sample No	Site Code	Site Description	Sample Type	Sampled Date/Time
3086863		BBL-Lynch Street Stormwater In	WATER	25/06/12 11:35
3086864		BA-3 Arrandoovong Creek-site 3	WATER	25/06/12 12:00
3086865		BA-4 Arrandoovong Creek-site 4	WATER	25/06/12 12:12
3086866		BA-5 Arrandoovong Creek-site 5	WATER	25/06/12 12:25

Analysis - Analyte	*Sample No. Site Code Units*	3086863	3086864	3086865	3086866
Temp. - Water Temperature (CS)	°C	11.3	12.2	11.2	10.4
NH3 as N (LL) - Ammonia, as N	mg N / L	0.006	0.006	0.008	0.018
pH - pH, units	Units	7.1	7.8	7.9	8.0
TKN/TP (LL) - Total Kjeldahl Nitrogen, as N	mg N / L	3.3	0.42	0.43	0.52
TKN/TP (LL) - Phosphorus, total as P	mg P / L	3.2	0.030	0.008	0.034
EC - Electrical Conductivity @ 25C	uS/cm	220	3600	3700	3600
Turbidity - Turbidity, NTU	NTU	67	4.2	4.2	9.5
TCN - Total Nitrogen as N (Calc)	mg/L	3.3	1.0	0.7	0.6
NOX as N (LL) - Nitrate + Nitrite, as N	mg N / L	<0.003	0.61	0.26	0.031
Colilert (2000) - E.coli MPN Colilert	orgs/100mL	390	170	150	41
Enterolert - Enterococci MPN Enterolert	orgs/100mL	500	97	160	150
Bacteroidales - Bacteroidales PCR		Detected	Detected	Detected	Detected
Bacteroidales - Human Bacteroides QPCR	copies/L	Not Detected	Not Detected	1850000	Not Detected
Bacteroidales - Animal Bacteroides QPCR	copies/L	8000000	740000	1200000	1400000
MST-1 - Total Weighted Risk		0.539	0	0	0.25
MST-1 - Risk Ranking		Medium	Low	Low	Medium
MST-2 - Human Bacteroides Marker Abundance		Low	Low	Medium	Low
MST-2 - Animal Bacteroides Marker Abundance		High	High	High	High

A blank space indicates no test performed.

ALS Group

Environmental Division (Water Resources Group)

NATA Accredited Laboratory No. 992
Accredited for compliance with ISO/IEC 17025
WORLD RECOGNISED ACCREDITATION

CERTIFICATE OF ANALYSIS

Batch No:	**12-36192**	*Page*	**Page 1 of 2**
Final Report	**321578**	*Laboratory*	Scoresby Laboratory
Client:	**Southern Grampians Shire Council**	*Address*	Caribbean Business Park, 22 Dalmore Drive, Scoresby, VIC 3179
Contact:	**Pauline Porter**	*Phone*	03 8756 8000
Address:	PO Box 685 HAMILTON VIC 3300	*Fax*	03 9763 1862
		Contact:	Linna Truong Client Manager Linna.Truong@alsglobal.com
PO No:	**Not Available**	Date Sampled:	**14-Aug-2012**
Sampler Name:		Date Samples Received:	**15-Aug-2012**
ALS Program Ref:	**STHGRAMPWQ**	*Date Issued:*	**23-Aug-2012**
Program Description:	**Water Quality Monitoring Program**		
Client Ref:	**Lake Hamilton WQ**		

The sample(s) referred to in this report were analysed by the following method(s):
- NATA accreditation does not cover the performance of this service

Analysis		*Method*	*Laboratory*	*Analysis*		*Method*	*Laboratory*
Temp.	#	CLIENT	Scoresby	Bacteroidales	#	MW563	Scoresby
Colilert (2000)		VIC-MM514	Scoresby	EC		VIC-CM060 C	Scoresby
Enterolert		VIC-MM517	Scoresby	MST-1	#	Calculation	Scoresby
MST-2	#	MW563	Scoresby	TCN		VIC-CM019	Scoresby
NH3 as N (LL)		VIC-CM010	Scoresby	NOX as N (LL)		VIC-CM018	Scoresby
pH		VIC-CM060 B	Scoresby	TKN/TP (LL)		VIC-CM026	Scoresby
Turbidity		VIC-CM013	Scoresby				

Result for pH in water tested in the laboratory may be indicative only as holding time is generally not achievable. (6 hrs from time of sampling, AS5667.1)

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Report Comments:

Bacteroides Human maker in raw sewage: 6.8 x 10^10

Bacteroides Animal maker in raw sewage: 1.9 x 10^8

Reported by: Greg Sturbaum

Signatories

These results have been electronically signed by the authorised signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11

Name	*Title*	*Name*	*Title*
Chatura Perera	**Team Leader, Nutrients**	**Greg Sturbaum**	**Manager Molecular Biology**
Hoa Nguyen	**Analyst**	**Michael Clahsen**	**Principal Inorganic Chemist**
Peter Bell	**Team Leader, General Chemistry**	**Tanya Dukhno**	**Analyst**

NATA Accredited Laboratory No. 992
Accredited for compliance with ISO/IEC 17025
WORLD RECOGNISED ACCREDITATION

Samples tested as received.

Soil results expressed in mg/kg dry weight unless specified otherwise.
Microbiological testing was commenced within 24 hours of sampling unless otherwise stated.
VIC-MM524: Plate count results <10 per mL and >300 per mL are deemed as approximate.
VIC-MM526: Plate count results <2,500 per mL and >250,000 per mL are deemed as approximate.
Calculated results are based on raw data.

Page:	**Page 2 of 2**
Batch No:	**12-36192**
Report Number:	**321578**
Client:	**Southern Grampians Shire Council**
ALS Program Ref:	**STHGRAMPWQ**
Program Description:	**Water Quality Monitoring Program**

Sample No	Site Code	Site Description	Sample Type	Sampled Date/Time
3142233		BBS - Brown St Stormwater inlet	WATER	14/08/12 10:50
3142234		BA-3 - Arrandoovong Creek - Site 3	WATER	14/08/12 11:50
3142235		BA-4 - Arrandoovong Creek - Site 4	WATER	14/08/12 11:38
3142236		BA-5 - Arrandoovong Creek - Site 5	WATER	14/08/12 11:25

Analysis - Analyte	*Sample No. Site Code Units*	3142233	3142234	3142235	3142236
Temp. - Water Temperature (CS)	°C	11.2	9.4	10	11.3
NH3 as N (LL) - Ammonia, as N	mg N / L	0.005	0.016	0.005	0.003
pH - pH, units	Units	7.8	7.9	7.9	7.7
TKN/TP (LL) - Total Kjeldahl Nitrogen, as N	mg N / L	1.5	0.60	0.47	0.52
TKN/TP (LL) - Phosphorus, total as P	mg P / L	0.14	0.020	0.012	0.014
EC - Electrical Conductivity @ 25C	uS/cm	700	2800	3000	3200
Turbidity - Turbidity, NTU	NTU	15	14	3.3	2.4
TCN - Total Nitrogen as N (Calc)	mg/L	1.8	0.6	0.6	1.0
NOX as N (LL) - Nitrate + Nitrite, as N	mg N / L	0.23	0.033	0.18	0.52
Colilert (2000) - E.coli MPN Colilert	orgs/100mL	<10	63	96	98
Enterolert - Enterococci MPN Enterolert	orgs/100mL	10	10	170	86
Bacteroidales - Bacteroidales PCR		Detected	Detected	Detected	Detected
Bacteroidales - Human Bacteroides QPCR	copies/L	Not Detected	Not Detected	Not Detected	Not Detected
Bacteroidales - Animal Bacteroides QPCR	copies/L	2200000	1100000	1100000	1700000
MST-1 - Total Weighted Risk		0.25	0.25	0	0
MST-1 - Risk Ranking		Medium	Medium	Low	Low
MST-2 - Human Bacteroides Marker Abundance		Low	Low	Low	Low
MST-2 - Animal Bacteroides Marker Abundance		High	High	High	High

A blank space indicates no test performed.

Appendix D : Public Health and Wellbeing Act 2008, - Section 38/39

Section 38 Functions of certain prescribed Consultative Councils

(1) This section applies to a prescribed Consultative Council established by Order under section 33(1)(a).

(2) The functions of a prescribed Consultative Council to which this section applies are to—

(a) monitor, analyse and report on matters specified for that prescribed Consultative Council in the Order which established that prescribed Consultative Council;

(b) consider, investigate and report on any matter specified by the Minister or the Secretary in a direction to the prescribed Consultative Council under section 37(2);

(c) liaise with any other Consultative Council on any matter relevant to the functions of the prescribed Consultative Council;

(d) improve public health and wellbeing by publishing and disseminating relevant information and practical strategies identified by the prescribed Consultative Council in the course of performing its functions;

(e) publish an annual report on the activities of the prescribed Consultative Council;

(f) perform any function specified in the Order which established that prescribed Consultative Council;

(g) perform any other prescribed function;

(h) collect information for the purpose of performing the functions specified in this subsection.

Section 39 Request to provide information to prescribed Consultative Council

(1) The Chairperson of a prescribed Consultative Council by written notice may request—

(a) a health service provider or a health service provider which is a member of a class of health service provider; or

(b) a pathology service or a pathology service which is a member of a class of pathology service—

to provide to the prescribed Consultative Council general or specific information as specified in the notice within the period or from time to time as specified in the notice which the Chairperson of the prescribed Consultative Council considers is necessary to enable the prescribed Consultative Council to perform its functions.

(2) A health service provider or pathology service to which subsection (1) applies is authorised to provide the information requested under subsection (1) to the Consultative Council.

Note

See section 227.