MANNINGHAM
BALANCE OF CITY AND COUNTRY

Domestic Wastewater Management Plan

(DWMP)

April 2015
(Update of November 2011 Plan)

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1.0 Introduction

Council has a significant role and legislative responsibility for protecting the health of residents, visitors and those working in the municipality. This has been recognised within the Council Plan and, amongst other things, there is a requirement to review the Domestic Wastewater Management Plan (DWMP) adopted by Council in July 2002 with reviews of the plan undertaken in October 2007 and November 2011, with the last plan adopted by Council in March 2012.

The State Government made changes to the environment protection legislation that regulates domestic wastewater management i.e. septic tank systems. One particular change involved the requirement for Councils to prepare and implement a Municipal DWMP. This plan forms part of a range of activities undertaken by Council in addressing the management of domestic wastewater within the municipal district. The plan also recognises the role of the local water authority (Yarra Valley Water) in providing reticulated sewer to unsewered properties in accordance with their Sewer Backlog Program responsibilities.

This document outlines the priorities and strategies Council must implement in order to minimise the impact of wastewater on human health and the environment.

A ‘Background Paper’ located in the appendices describes the features and profile of wastewater management in the municipality and provides data pertaining to domestic wastewater. The Strategic Water Management Plan 2008 identifies domestic wastewater as a key impact on the quality of stormwater in the areas of Manningham still using septic systems.

2.0 Wastewater Management Profile of Manningham

In 2002 there were approximately 6,000 septic systems in use in Manningham. In 2011 there were 4,652 septic systems on record and as of April 2015, the number had reduced to 3,669 in operation. This equates to 983 properties connecting to the available sewer since 2011.

2,935 of these properties have been referred to Yarra Valley Water for inclusion onto their community sewer program with services now declared available to the majority of properties in Warrandyte, Templestowe and Wonga Park (1,612 properties).

Of the 1,612 properties recently provided with reticulated sewer, 689 (43%) properties have not yet arranged connection to this service possibly due to the declaration only being recent and it is hoped owners will take advantage of YVW's incentive of waiving the $500 connection fee if properties connect within the first 12 months that sewer is declared.

Provision of Yarra Valley Water sewerage services are underway in the Donvale area (1,051 properties with septics) and it is anticipated the sewer will be declared by mid to late 2016.

YVW is in the initial planning stages of trialling a project in Park Orchards to assess the viability of an on-site wastewater servicing strategy. The trial involving 100 lots will assist Yarra Valley Water identify the most suitable servicing option for this area.

YVW has identified two possible servicing strategies for the Park Orchards community (1,095 lots in total). These are:

1. Upgrades to existing on-site wastewater systems.
2. Construction of a sewer reticulation network.

734 properties have not been programmed into YVW's Community Sewerage Program as they do not pose a significant risk to health or the environment. These properties are large enough to effectively contain all wastewater on-site and pose minimal risk to stormwater systems that may be some distance away. Their remoteness also means that sewer provision is currently impractical and cost prohibitive. As demographics and planning controls change throughout Manningham, these properties may need to be referred for inclusion into YVW's programmed works in future water plans in accordance with Council's obligations under Clause 32 of the State Environmental Protection Policy (Waters of Victoria) 2003.

These unsewered properties will require ongoing monitoring and management by Council in accordance with this plan.

Township	Reticulation Area	Septics on record 2011 data	Septics on record 2015 data	Septics still in use April 2015	Discharging off-site	Targeted Completion
Wonga Park	RA0005A	557	557	149	85	Declared available
	RA0005B			22	15	Declared available
Templestowe	RA0040C	47	47	13	8	Declared available
	RA0040N	121	121	28	11	Declared available
	RA0040S	325	325	81	47	Declared available
Warrandyte	RA0041C	83	83	36	26	Declared available
	RA0041D	89	89	63	37	Declared available
	RA0041E	232	232	179	124	Declared available
	RA0041G	16	16	4	3	Declared available
	RA0041H	35	35	31	15	Declared available
	RA0041I	57	57	56	29	Declared available
Ringwood North / Park Orchards	RA0017	24	24	17	16	Declared available
Donvale	RA0041A	1,045	1,043	1,043	723	2015/2016
	RA0041K	19	0	0	0	Complete
	RA5001	8	8	8	7	2015/2016
	RA0041B	18	18	7	6	Declared available
	RA02102B	8	8	3	0	Declared available
	RA0455	2	0	0	0	Complete
Park Orchards*	RA0039	1,182	1,195	1,195	768	TBD after trial
Not Programmed	Not Applicable	784	734	734	273	Not scheduled
Total		**4,652**	**4,592**	**3,669**	**2,193**	

*RA0039 Includes 107 properties in Warrandyte South and 100 properties in Ringwood North.

There are approximately 12 different combinations that make up the various types of septic systems in Manningham. Approximately 60% of all septic systems within the City discharge treated toilet wastes and/or sullage (wastewater from all fixtures other than the toilet, e.g. remaining bathroom fixtures, kitchen sink, and laundry fixtures) from the property into the stormwater drains/open channels/soakage pits at the bottom of the property. Half of these are ‘Split Systems’ and the other half are ‘All Waste Systems’. The most common type of septic system within the City of Manningham is the combination of a septic tank and sand filter or Split System discharging off-site. The following is an overview of system types, age and perceived impacts on the environment:

Overview of Septics Systems in Manningham	
Park Orchards **(Anderson Creek and Mullum Mullum Creek sub-catchments)**	▪ Raw sullage discharge into stormwater ▪ Offsite discharge of treated effluent ▪ Old septic systems (1940s+) higher probability of untreated effluent from failed systems and pollution of Anderson Creek ▪ Combination of a concentration of septic systems and normal residential blocks accounting for approx. 70% of total sullage discharge from the municipality ▪ Mullum Mullum Creek is one of the most polluted streams in the Yarra River catchment according to Melbourne Water data and Council’s water sampling results
Templestowe **(Ruffey Creek and Koonung Creek sub-catchments)**	▪ Raw sullage discharge into stormwater ▪ Offsite discharge of treated effluent ▪ Old septic systems (1940s+) higher probability of untreated effluent from failed systems and pollution of waterways
Donvale **(Jumping Creek & Brushy Creek sub-catchments & Mullum Mullum Creek)**	▪ Raw sullage discharge into stormwater ▪ Offsite discharge of treated effluent ▪ Old septic systems (1940s+) higher probability of untreated effluent from failed systems and pollution of waterways ▪ Large blocks with dispersion and distribution of effluent

Links have been established between water contaminated with human waste and illness *as was the case in the 'Wallis Lakes' outbreak (NSW) in January 2007.* Human wastes contain disease producing micro-organisms and septic systems are not always efficient at removing these.

As a result of ageing systems, failing systems and impacts on health and the environment, provision of reticulated sewerage is the preferred option for the majority of properties within Manningham's unsewered residential areas. However, Yarra Valley Water indications show that the implementation of the Community Sewerage Program within Manningham will not occur for a number of years.

YVW's prioritisation model utilises data obtained from YVW, Department of Sustainability & Environment (DSE), Environment Protection Authority (EPA), Melbourne Water and importantly; data obtained through Council's DWMP. The prioritisation process ranks each backlog area according to performance of septic systems, area demographics, customer interest / commitment to connect, sensitivity of receiving waterways, biodiversity, groundwater, public health, recreational uses, significance of the community or local industry, Council support, future development and cost per lot.

The review of the DWMP forms part of a range of management activities undertaken by Council in addressing domestic wastewater within the municipality. The DWMP is a key strategy within the umbrella of the Manningham Council Plan, and is consistent with the principles developed in the Municipal Public Health and Wellbeing Plan 2013-2017. It will link closely with the Stormwater Management Plan and the Manningham Planning Scheme and is an essential strategic planning tool in addressing both existing and future wastewater issues within the municipality.

3.0 Context, Aims and Objectives

3.1 Policy and planning context

The review of the DWMP has been guided by several policy and planning documents including:

- Council's Municipal Public Health & Wellbeing Plan 2013-2017 identifies sewerage management as a key determinant of the Health & Wellbeing of the community. The DWMP is also recognised as a strategic plan that integrates Health & Wellbeing across the wider community.

- Council's vision in the Council Plan 2013 - 2017 is to *'be a city that values people, heritage and resources. A city with a strong economy and diverse social and natural environment that will enrich our vibrant community'.* The DWMP is a supporting document that falls under the following category 'the natural environment'.

- Regarding sustainable management of non-urban areas, the Municipal Strategic Statement (MSS) states that Council's approach is to "ensure that land use, development and land management practices protect and enhance soil, water and air quality, native flora and fauna and the character of the non-urban area." The MSS specifically addresses domestic wastewater issues, with the statement;

  "Monitoring and improving the performance of the on-site treatment and disposal of sewerage, sullage and effluent will continue to be a challenge for Council in areas where there are no reticulated sewerage systems. Initiatives which improve the management of water quality and catchments will continue to be a high priority."

- The Manningham Planning Scheme takes into consideration sites where reticulated sewerage is unavailable, and requires that land use and development proposals demonstrate that, amongst other things, all effluent will be treated and contained on site. Conditions are applied to planning permits in the Rural Conservation Zones and Low Density Residential Zones to protect and enhance the environment. A range of overlays are also in place to provide additional protection in some areas. There are also restrictions on titles where effluent disposal envelopes exist. These restrictions are enforceable through Section 173 Agreements.

3.2 Legislation

Environment Protection Act 1970

This is the primary legislation that regulates and controls septic tank systems. It outlines council responsibilities in approving the installation, modification and use of septic tank systems, where the systems are designed to discharge up to 5000 litres of effluent per day. Treatment systems that are designed for and/or produce more than 5000 litres of effluent per day are scheduled premises under the Scheduled Premises Regulations and require Works Approval from the EPA for construction and an EPA discharge license to operate. The Environment Protection Act also outlines the Council annual returns lodgement process with the EPA.

Available at: www.legislation.vic.gov.au

EPA Code of Practice Onsite Wastewater Management - February 2013

The Code of Practice provides technical information for the assessment of land for its suitability to contain wastewater on-site. Together these set the framework by which the City of Manningham controls the installation and use of septic systems.
This document is essentially the manual for the design, construction, selection, installation and maintenance of septic tank systems. It contains information on land capability assessment, treatment and disposal options, the permit process, septic tank design, construction and maintenance, and effluent management.

The current legislation is markedly different from that of the past as all wastes from a household must reach a minimum of secondary treatment (sand filter, effluent disposal trenches or treatment plant) and be kept within the property boundaries. Testing of the effluent being dispersed on the land is required to demonstrate the treated effluent is reaching a suitable standard.

2.3.6.1 Existing offsite discharges of wastewater

Premises with an existing offsite discharge of wastewater (untreated greywater or treated sewage) to a waterway or stormwater drain should connect to reticulated sewerage when it is available. Eliminating offsite flows of wastewater *and raw greywater to stormwater drains will improve the health and quality of our waterways and the local amenity of suburbs and towns.*

For existing offsite discharges in unsewered areas, it is recommended that wastewater management systems are upgraded and the effluent utilised in a land application system onsite.

Available at: www.epa.vic.gov.au

In order for Council to ensure property owners comply with this part, Council should require the upgrade of a system and maximise onsite containment on consideration of the following factors:

- if the property is undergoing a renovation or addition of fixtures or fittings that generate wastewater (such as a bathroom, toilet, spa or swimming pool);
- the addition of a bedroom which would increase potential occupancy and therefore wastewater generated;
- the proposed sewer construction dates and water quality being discharged from site.
- the capability for the land to contain the wastewater generated by the household. A combination of Surface Irrigation, Sub Surface Irrigation & Agricultural Drains should be considered in determining land capability.

Public Health and Wellbeing Act 2008

The Public Health & Wellbeing Act (2008) states that it is the function of every council to prevent disease, prolong life and promote public health through programs that control or prevent environmental health dangers and disease. The Act requires councils to find solutions, where possible, to all nuisances within the municipality.

Available at: www.legislation.vic.gov.au

Water Act 1989 Part 9 S.180 Septic tank permit applications

The Water Act requires referral to water authorities if systems are proposed within drinking water catchments or if an application for a septic system is received in respect to land in a sewerage district. The Act also outlines the following functions of Water Authorities notably:

a) to provide, manage and operate systems for the conveyance, treatment and disposal of sewage;
b) to identify community needs relating to sewerage services and to plan for the future needs of the community relating to sewerage services.

Available at: www.legislation.vic.gov.au

EPA State Environment Protection Policy (Waters of Victoria)

Specific to the geographical area the City of Manningham falls within are three State Environmental Protection Policies (SEPP) *1) Waters of Victoria (2003); 2) Waters of the Yarra River and Tributaries (1991) and; 3) Ground Waters of Victoria (1997).* These SEPP's place significant restraints on land development in unsewered areas whereby a number of factors must be considered including:

- ground water aquifer water quality objectives;
- receiving water quality objectives;
- minimum standards for off-site discharges of sewage (being secondary treatment);
- odour control; and
- each allotment in a subdivision (new or existing) must be able to adequately contain all wastewater within the boundary of the allotment when reticulated sewerage cannot be provided.

Local Government Act 1989

The Local Government Act empowers councils to enact local laws and set special charges for council activities. Councils can use these powers to develop local regulations for wastewater management as long as these regulations are consistent with State policy and legislation and to raise revenue for its wastewater management programs.

Available at: www.legislation.vic.gov.au

Manningham's Community Local Law 2013

Manningham City Council has created a Community Local Law regarding domestic wastewater management in accordance with Part 5 of the Local Government Act (1989). This law contains provisions which aim to ensure that;

- A septic system is in place and operating effectively;
- No domestic wastewater is discharged from the land contrary to the requirements of Manningham's Domestic Wastewater Management Plan;
- The septic system is annually inspected and approved by a licensed plumber;
- Written evidence is provided for each annual inspection and approval on demand by an authorised officer and;
- The septic system is made available for inspection by an authorised officer.
- The septic system is maintained in accordance with the requirements of Manningham's Domestic Wastewater Management Plan; and
- The septic system is maintained in accordance with the requirements of the EPA Certificate of Approval issued for that system.

Available at: www.manningham.vic.gov.au

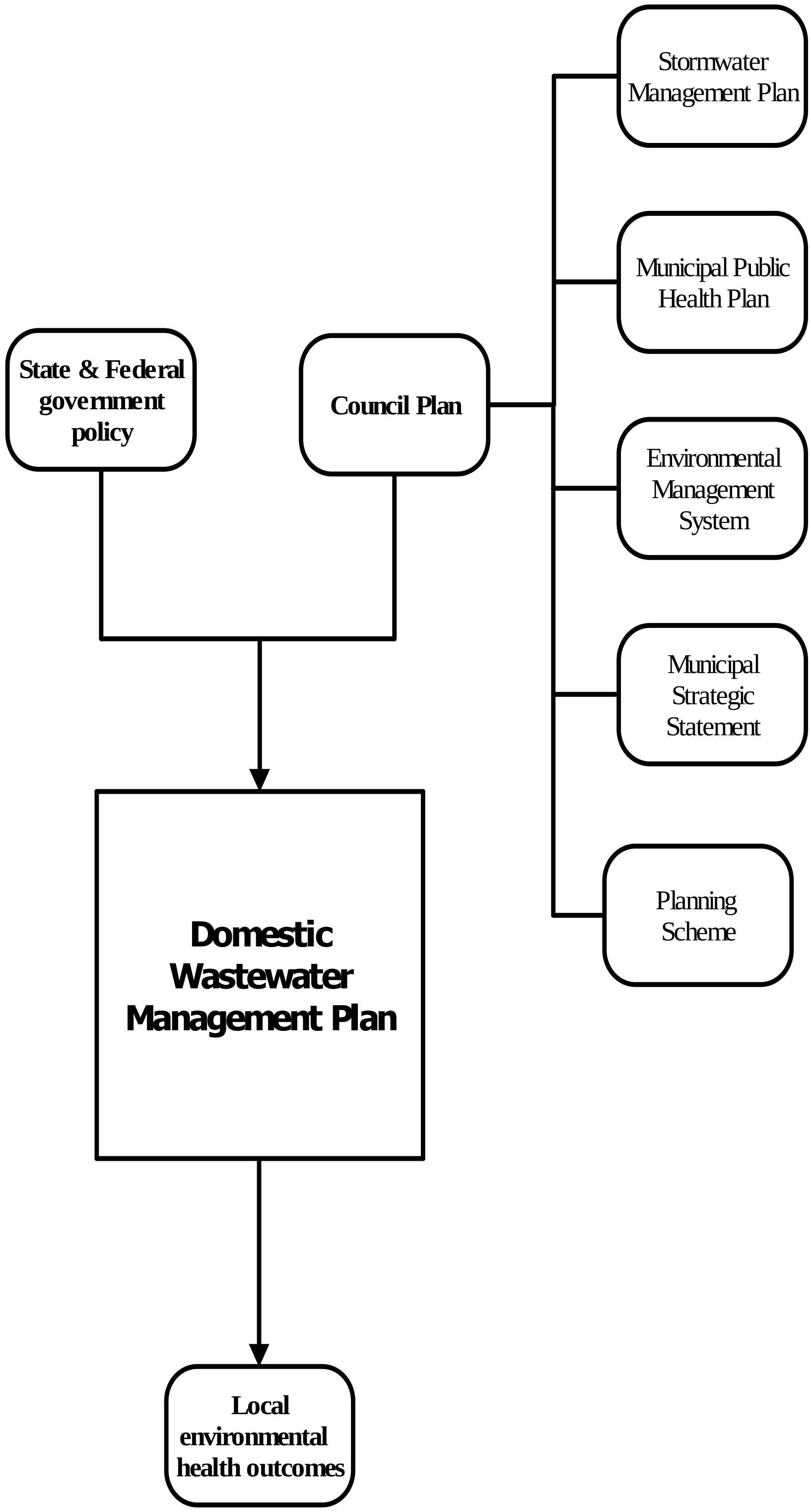
Australian Standards and Other Requirements

Below are the Australian standards relevant to wastewater disposal systems.

- AS139 - Safety signs for the occupational environment
- AS1546.1:1998 - On-site Domestic Wastewater Treatment Units, Part 1 (Septic Tanks)
- AS/NZS 1546.2:2001 - On-site Domestic Wastewater Treatment Units, Part 2 (Waterless Composting Toilets)
- AS/NZS 1546.3:2001 - On-site Domestic Wastewater Treatment Units, Part 3 (Aerated Wastewater Treatment Systems)
- AS/NZS 1547:2000 - On-site Domestic -Wastewater Management
- AS2698 - Plastic pipes and fittings for rural applications
- AS3000 - Wiring rules, electrical installations, buildings, structures and premises
- AS3500 - Plumbing and drainage code

All standards can be accessed directly from Standards Australia: www.standards.com.au

Figure 1: Inputs into Domestic Wastewater Planning Process



3.3 Aim

The overall aim of Manningham's Domestic Wastewater Management Plan is to:

- Improve and protect public health and;
- Promote the principles of environmental sustainability by reducing the impacts of domestic wastewater on local and remote receiving environments.
- Educate the community on septic tank management and ongoing maintenance requirements.

3.4 Objectives

The objectives of the DWMP are to;

- Develop Council's policy for the management of domestic waste water and a framework for consistent decision making for specific sites;
- Prioritise Council's short and long term strategies for the management of septic tank systems and greywater reuse;
- Provide a systematic approach for assessing the costs, impacts and barriers to Manningham Council in managing wastewater, and;
- Provide a framework for the liaison between external organisations and internal Units.

4.0 Management

4.1 DWMP Stakeholders

External stakeholders

Yarra Valley Water (YVW), the Environmental Protection Authority (EPA), Melbourne Water and the Department of Sustainability and Environment (DSE).

Internal Stakeholders

Council's GIS/GPS team, Statutory Planning, Economic and Environmental Planning, Strategic Projects.

4.2 DWMP Project Team (April 2015)

Project Manager:	Errol Wilkins **Manager Health and Local Laws**
Project Development Officer:	Travis Fitch **Coordinator Environmental Health**
Project Field Officer:	David Gardiner **DWMP Project Officer**
Technical Advisors:	Phil Harberts Claire Benzie **Environmental Health Officers**
	Neil Christie **GIS/GPS Project Officer**

The role of the DWMP Project Team is to ensure that:

- A project plan is developed and approved;
- Planning processes are integrated across the organisation;
- Relevant technical and policy information is obtained and collated;
- Planning process milestones are achieved at a satisfactory quality level; and
- The DWMP is reviewed on a regular basis.

5.0 Planning approach

It is essential that strong planning considerations are undertaken in the development and implementation of this program. All stakeholders should be involved in the consultation process to ensure all views are expressed and considered when rolling out the program.

5.1 Identification of issues

In taking a risk management approach it is necessary to identify wastewater threats and their likely impact on a range of public health, environmental and economic values. The following table identifies the potential threats and impacts arising from domestic wastewater in a residential setting.

Generic Domestic Wastewater Threats

Threat	Cause	Key Impacts
Failed systems with offsite discharge	• Damaged effluent disposal drains/trenches • Increased loading from extensions to dwellings • Design criteria not complied with • Faulty installation • New works & activities impacting on disposal envelope • Age • Septic tank full	• Nutrients • Pathogens • Odour • Visual amenity • Oxygen depleting material • Local land degradation (erosion) • Pollution of water courses • Damage to remnant bushland
Treated off site effluent discharge	• Permitted system	• Pollution of water courses • Local visual amenity
Treated on site effluent systems	• Permitted system	• Local visual amenity • Pollution of groundwater
Untreated off site sullage discharge	• Poorly maintained system: • sand filter not functioning • sand filter bypassed to stormwater • septic tank full	• Nutrients & pathogens • Odour • Visual amenity • Oxygen depleting material • Local land degradation • Pollution of water courses • Damage to remnant bushland
Ineffective regulation	• Failure to comply with permit conditions • Ineffective data base • Non-connection to sewer • Unclear regulatory responsibilities	• Liability • Increased incidence of preventable pollution and environmental degradation • Increased risk to public health
Re-use of waste water	• Allowed re-use • Low water supply • Poor management by individual residents	• Pathogens • Odour

5.2 Inspection Program Outcomes

As of April 2015, 4,533 septic tank inspections have been carried out and recorded since implementation of the program.

Of the 4,533 inspections recorded, 1,721 septic system components (38%) have been found unsatisfactory (*a property could have one or more components identified as failing).

1,522 septic tanks (88% of failing systems) have been rectified and are considered to be operating effectively or have connected to the available sewer (521 properties). 199 properties (9%) remain unsatisfactory and require repair (or connection to sewer if available).

Following is a breakdown of system component performance:

- 386 properties (39% of the 982 properties with a grease trap) had unsatisfactory grease traps. 367 have been rectified with 44 connecting to sewer. 19 Grease traps remain unsatisfactory and 231 still need to advise Council of routine servicing.
  Grease traps prevent food and grease particles from blocking the septic system and eventually entering the stormwater system.

- 589 septic systems required desludging. 544 have complied (with 173 connecting to sewer). 45 are overdue and 237 need to advise Council of the last desludge performed. *Desludging is required every 3 years as routine maintenance of a septic tank.*

- 205 properties (10% of the 1,957 properties with a sand filter) required sand filter maintenance. 132 have been rectified with 18 connecting to sewer. 62 remain over EPA water quality parameters. *Lack of 3 yearly maintenance can result in poor water quality / blockages and poor distribution.*

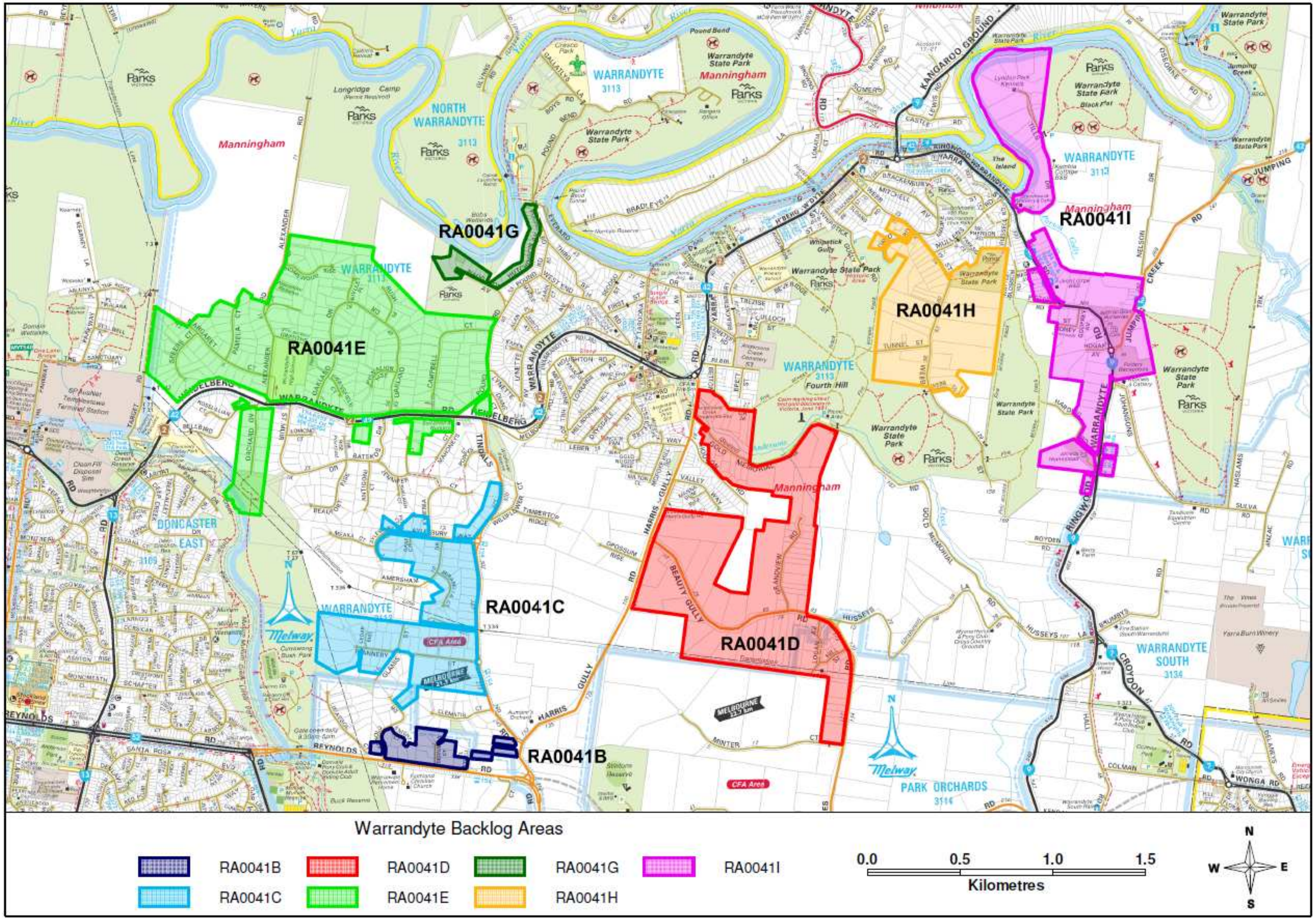
- 46 properties (2.3%) had bypassed their sand filters. 43 have been rectified. *3 remain in various stages of rectification.*

- 221 properties (9% of the 2,529 properties with effluent disposal areas) had unsatisfactory effluent disposal areas. 194 have been rectified. 27 *remain in progress of locating infrastructure, unblocking irrigation & distribution pits or arranging for connection to available sewer.*

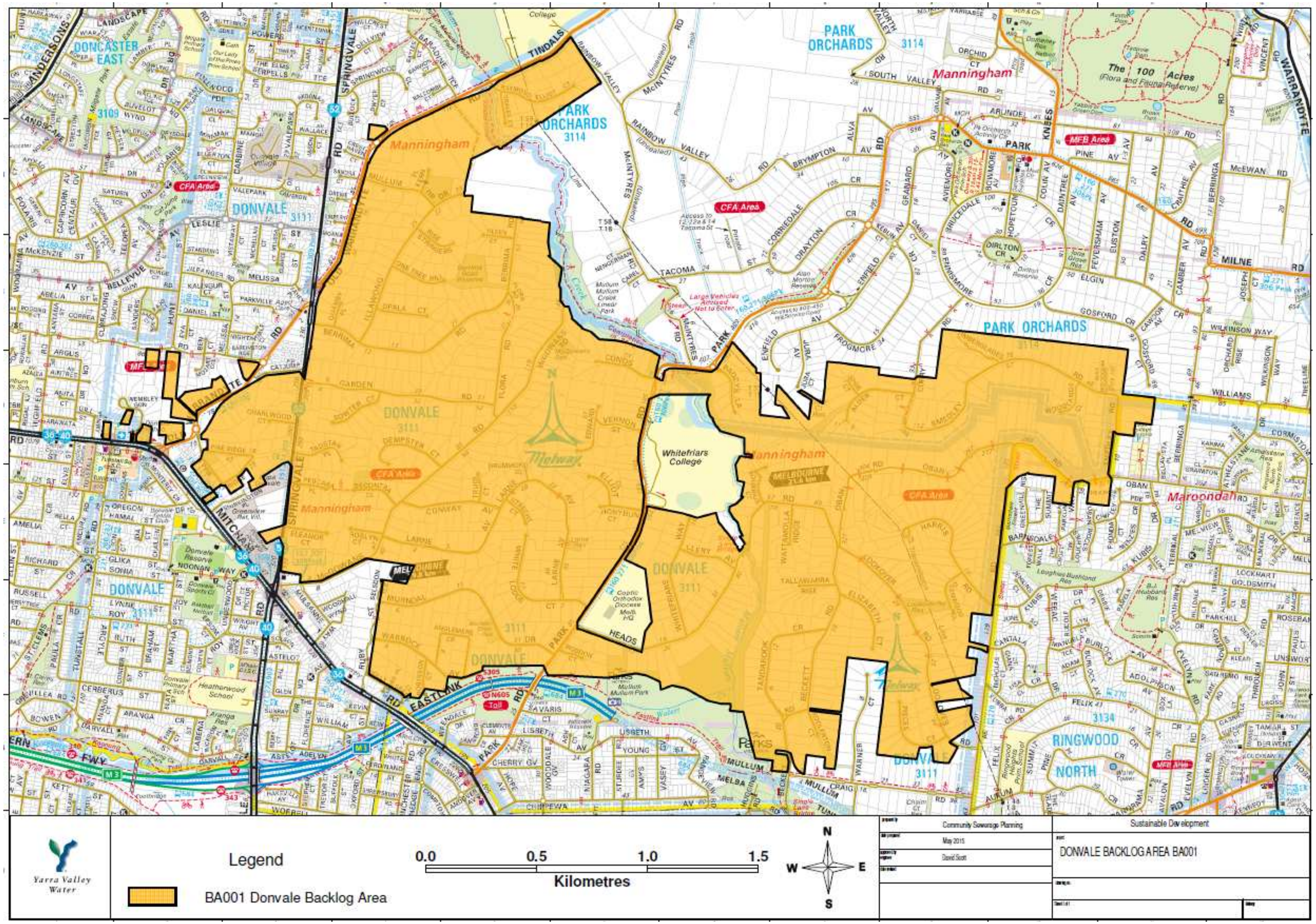
- 179 properties (3.9%) illegally connected their septic tank / effluent disposal area to stormwater. 174 have been rectified. *In most cases, agricultural drains have been bypassed. 5 remain in various stages of rectification / upgrade.*

- 95 properties (3.7%) had septic effluent overflowing across land. 68 have been rectified. *Agricultural drains blocked causing flooding in concentrated area. 27 remain 'in progress' of repair.*

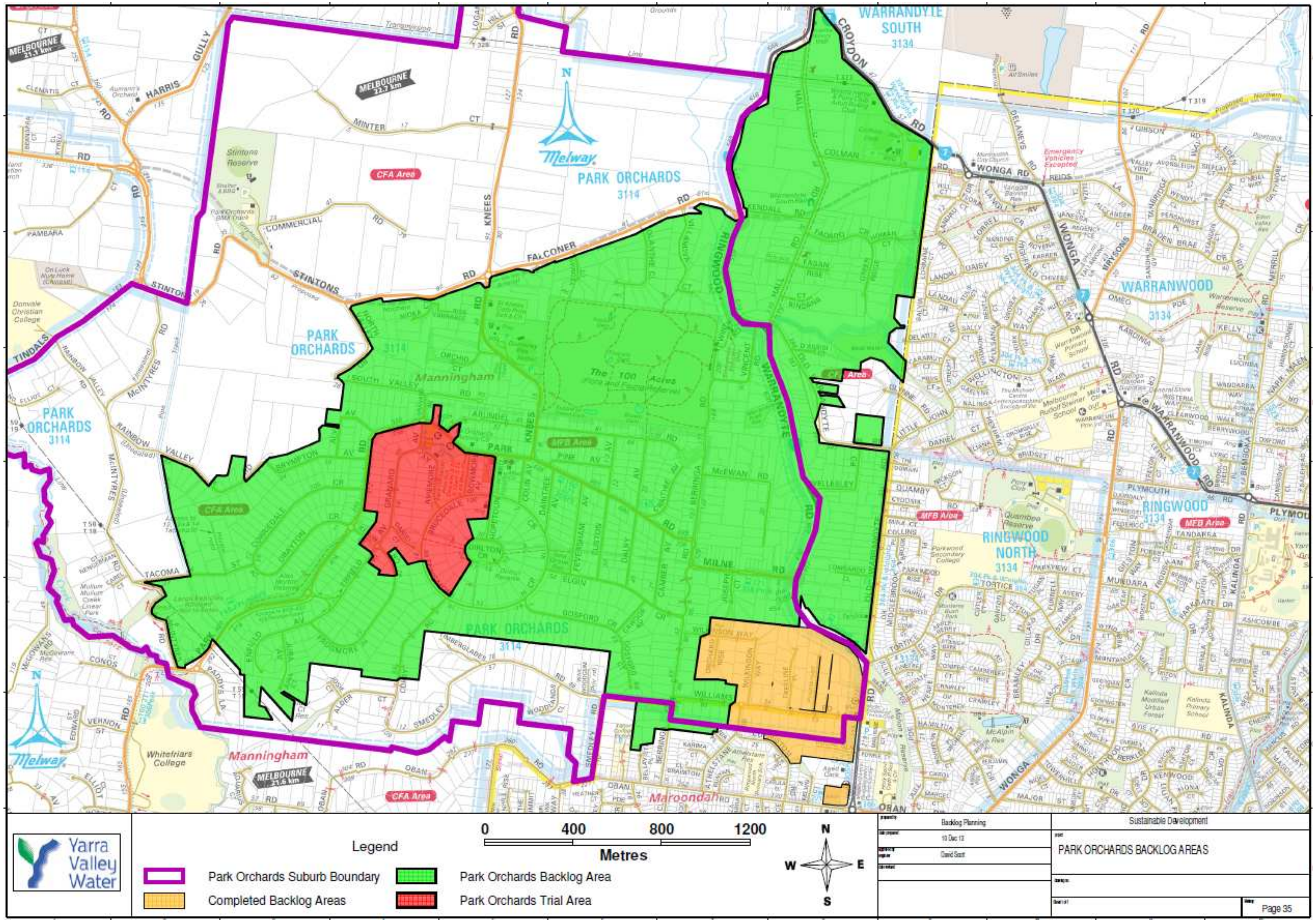
5.3 Manningham's Reticulation Areas (declared available)



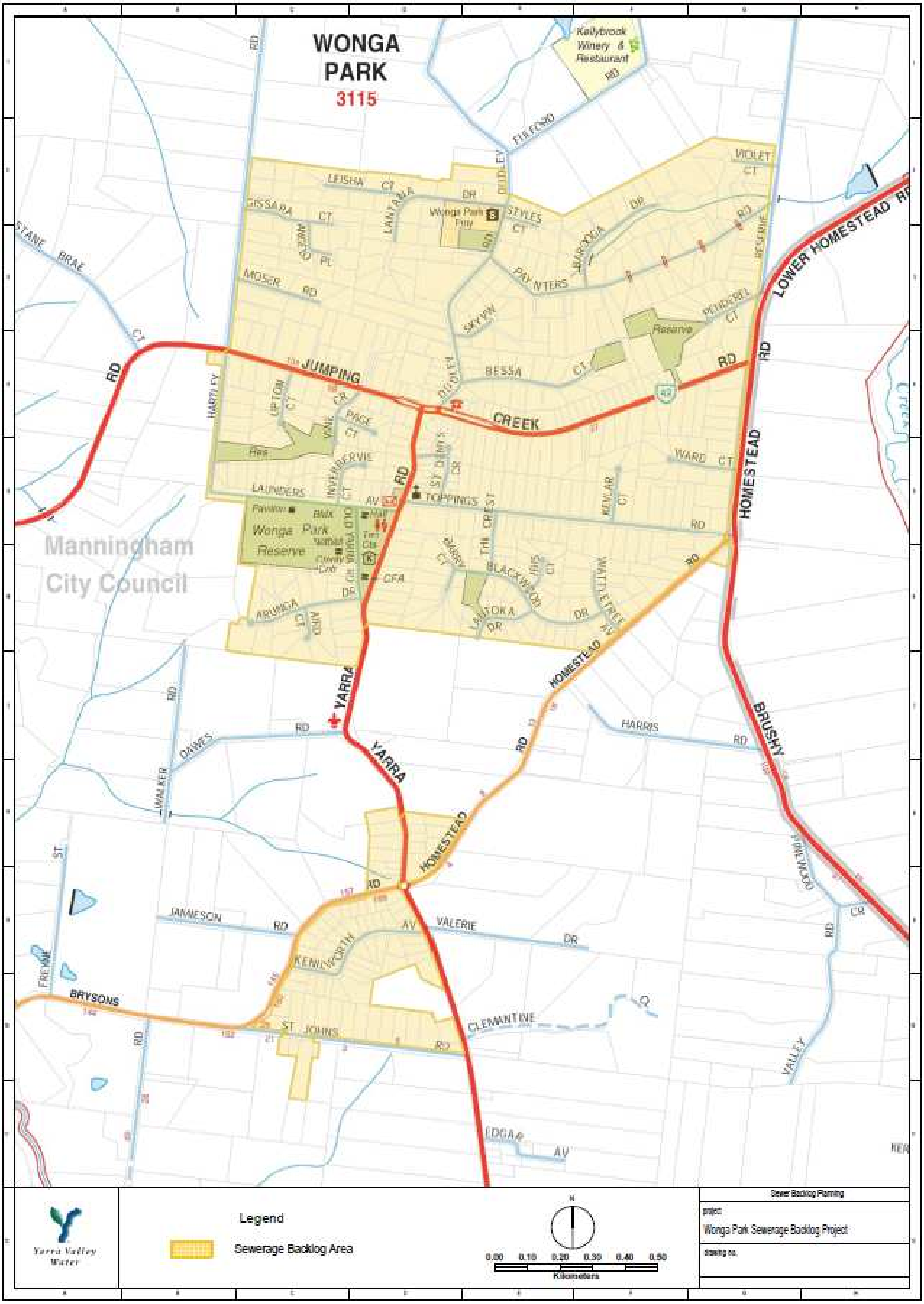
Donvale RA0041A (completion scheduled mid 2016)



Park Orchards RA0039 (onsite containment trial currently in progress)



Wonga Park RA0005 A & B (declared available)



5.4 GIS Mapping Technologies - Septic Tanks v's Reticulated Sewer

6.0 Action Plan

6.1 Strategies and actions performed since implementation of the DWMP

Development and implementation of the following:

- Electronic database capable of storing and managing septic information for each property. This information is considered vital in following up outstanding issues and managing septic tank systems now and into the future.

- Communications strategy to inform residents of the DWMP process and their obligations to ensure effective system operation.

- Integrated compliance approach for the installation and maintenance of septic systems.

- Inclusion of septic tank condition report into Council's *Land Information Certificates* for potential property buyers.

- Inspection process and checklist to consistently assess and record septic system deficiencies throughout each reticulation area.

- GIS compatible hand held database capable of recording in-field assessments.

- GPS (Global Positioning System) tools capable of accurately recording the in-ground location of system components for each property. Table 5.4 shows new technologies capable of showing the locations of septic tank, sand filter, effluent lines, property service drains and house connection points which allows Council staff to easily access information during on-site inspections. Residents and contractors can also gain the benefits of GPS mapping prior to developing land or constructing buildings on properties containing on-site septic systems.

- GIS compatible hand held database capable of recoding images of septic components which will provide officers a reference point for future / follow up inspections.

- Public Health Local Law relating to owners septic tank responsibilities.

- Enforcement process to assist in the management of owner responsibilities.
- Submission of data into Yarra Valley Water's Sewer Backlog Prioritisation Process.
- Information sessions on grey water reuse options for Manningham residents (facilitated by EEP).
- Development of "A Guide to Septic Systems and Operation Maintenance" to assist property owners.
- Development of a "Greywater Reuse Policy" to assist owners in complying with EPA requirements.
- Development of an ongoing reminder program where owners are notified of the requirement to carry out scheduled maintenance
- Development of "Unsewered News" to assist in the dissemination of information to owners operating a septic system.

6.2 Strategies for the future

Strategy	Targets	Resource
Continue to facilitate the repair / upgrade of systems identified as defective through a reminder and enforcement program.	Continuing	DWMP Project Team
Continue to roll out a regular maintenance reminder program for all properties utilising a septic system with respect to quarterly servicing and 3 yearly desludge requirements.	Ongoing	DWMP Project Team
Continue to produce "Unsewered News" to assist in the education of residents in unsewered areas of Manningham.	Ongoing	DWMP Project Team
Participate in EPA legislative reforms to ensure septic system management principles are practical to both Council and community needs.	Ongoing	DWMP Project Team
Continue to participate in Yarra Valley Water's trail of on-site solutions for the Park Orchards backlog area and support YVW's 'On-site servicing strategy' on the basis that YVW will manage septic systems now and into the future.	Ongoing	DWMP Project Team

6.3 Ongoing Priorities

- Continue to assess and monitor septic systems in accordance with this plan.

- Continue to facilitate the repair / upgrade of systems identified as defective through a reminder and enforcement program.

- Continue the clean up of septic tank data in conjunction with Yarra Valley Water records.

- Educate residents and owners on septic tank performance / maintenance requirements in conjunction with on-site inspections.

- Educate trader groups on potential impacts their business has on septic system and environment.

- Issue 'Conditions of Use' and associated maintenance requirements to all satisfactory systems that have been upgraded or do not have existing permit conditions associated with the property.

- Liaise with Statutory Planning Department regarding System Types, Effluent Disposal Requirements and Planning Requirements.

Appendix 1

7.0 Background Paper

1.0 Background and Wastewater Management Profile of Manningham

1.1 Environmental profile

The City of Manningham is located between 12km and 32km east of Melbourne City, has a population of approximately 117,000 people, and covers an area of 114km^2. A substantial amount of this area is unsewered necessitating the use of septic tank systems for the management of human waste.

The natural environment and biodiversity of Manningham help distinguish the municipality, and are key assets of high recreational, tourism and visual significance. These assets include the Yarra River and several creeks that feed into it, the general topography of the area, and open space, habitat and fauna links. The creeks that flow through the municipality are Brushy Creek, Jumping Creek, Andersons Creek, Mullum Mullum Creek, Ruffey Creek and Koonung Creek. The average annual rainfall for the City is approximately 900mm/year. The topography of Manningham's unsewered areas can vary considerably, ranging from very steep areas with shallow rock and little topsoil (generally unfavourable for on-site effluent disposal), to less severe slopes, with a deeper soil profile (favourable effluent disposal conditions). Some areas are undeveloped, environmentally sensitive bushland, and many of the areas have previously been orchards and farming land. It is rare to discover an allotment on an undisturbed, gently sloping parcel of land (ideal for effluent disposal).

1.2 Septic Tank Systems Profile

In 2002 there were approximately 6,000 septic systems in use in Manningham. In 2011 there were 4,652 septic systems on record and as of April 2015, the number had reduced to 3,669 in operation.

Within this number, there are approximately 12 different combinations that make up the various types of septic systems. Approximately 60% of all septic systems within the City discharge treated toilet wastes and/or sullage (wastewater from all fixtures other than the toilet, e.g. remaining bathroom fixtures, kitchen sink, and laundry fixtures) from the property into the stormwater drains/open channels/soakage pits at the bottom of the property. Half of these are 'Splits Systems' and the other half are 'All Waste'. The most common type of septic system within the City of Manningham is the combination of a septic tank and sand filter or Split System discharging off-site. Lack of knowledge as well as poor maintenance practices of septic systems by property owners is believed to be a major issue in the efficiency and life expectancy of a septic system.

Links have been established between contaminated water contact and the occurrence of illness such as gastrointestinal infections. Human wastes contain pathogens such as viruses (hepatitis A and E, rotaviruses), bacteria (*Salmonella* spp, pathogenic *Escherichia coli, Vibrio* spp), protozoa (*Cryptosporidium parvum, Giardia lamblia*), and helminth eggs.

Septic systems are not always efficient at removing these potentially harmful pathogens, as is demonstrated in the oyster food poisoning outbreak in New South Wales, 1997 (National Public Health Partnership, 1998). An estimated 444 reported cases of food poisoning and 1 death were associated with contaminated oysters harvested from Wallis Lake, NSW. The oysters contained the hepatitis A virus, traced back to human faecal contamination of water. The outbreak has been blamed in part on the many unsewered properties surrounding the estuary area. The Australian Federal Court ruled that the Great Lakes Council shared legal liability for the outbreak with the oyster producers and the NSW government, on the grounds that the Council had failed to discharge its obligations with respect to control of potential sources of sewage pollution including septic tanks (Maddock Lonie & Chisholm 1999). This clearly demonstrates the need for the safe management of sewage so as to protect and maintain public health, and to manage Council's legal obligations and duty of care.

In October 2011, Yarra Valley Water provided reticulated sewerage services to 66 lots in Donvale (RA0041K & RA0455) and 50 lots in Templestowe (RA0040C).

Construction in the unsewered areas of Templestowe (336 lots) and Wonga Park 557 lots was completed in 2012.

Current estimates for the provision of reticulated sewerage to Donvale is for completion in mid 2016.

The trial of onsite solutions (septic system upgrades) in Park Orchards is anticipated to run for 2 years and then a decision as to the best servicing solution will be made thereafter and hopefully rolled out before 2020.

Manningham faces the challenge of providing sustainable land use and development in its non-urban areas and to protect the physical character of the municipality and public health. The development of a Domestic Wastewater Management Plan (DWMP) forms part of a range of management activities undertaken by Manningham Council to address domestic wastewater within the municipality. The DWMP will be a key strategic plan within the umbrella of the Manningham Corporate Plan, and will be consistent with the principles developed in the Municipal Public Health and Wellbeing Plan 2013-2017 and the Municipal Strategic Statement. The plan provides an essential strategic planning tool to address both existing and future wastewater issues within the municipality.

1.3 Wastewater Systems installation trends

Consideration of the total types of systems known to have been used in the municipality from the beginning revealed 21 categories. The 12 main categories and installation trends are noted in the table below:

CODE	TYPE OF SYSTEM	USEAGE	No. Currently in use (April 2015)
1. TP/AGL	Treatment Plant with Absorb / Transpiration Trenches	1990 onwards - still used	170
2. TP/SI	Treatment Plant with Surface Irrigation	1997 onwards - still used.	110
3. TP/SSI	Treatment Plant with Sub Surface Irrigation	1997 onwards - still used.	378
4. SF/AGL	Sand Filter with Absorb / Transpiration Trenches	1990 onwards - still used.	360
5. SF/SI	Sand Filter with Surface Irrigation	Approx. 1997 - uncommon	5
6. SF/SSI	Sand Filter with Sub Surface Irrigation	1997 onwards - still used.	54
7. AW/AGL	All Waste to Absorb / Transpiration Trenches	1968 onwards - still used	357
8. AW/WF	All Waste to Worm Farm contained on site		5
9. AW/RB	All Waste to Reed bed contained on site	1992 - not used often.	6
10. TP/DIS	Treatment Plant discharging off site	1975 - Nov 1998	130
11. TWOAT	Toilet Waste Only to Absorption / Transpiration Trenches	1996 WC Composting AW biolytic film - not used often. 1950's No longer used	811
12. SF/DIS	Sand Filter Discharging Off Site	1970 to 1998.	1263

Th

The following data has been collected for the period 1994 through to 2014 and it shows installation trends for the municipality:

Type	**1994 1995**	**1995 1996**	**1996 1997**	**1997 1998**	**1998 1999**	**1999 2000**	**2000 2001**	**2001 2006**	**2007 2011**	**2011 2014**	**Total**
TP/AGL	5	4	5	15	17	18	8	79	18	16	185
TP/SI	2	2	7	24	30	25	18	68	5	0	181
TP/SSI	0	1	0	2	2	8	8	136	187	67	411
SF/AGL	26	33	39	34	34	28	14	73	47	34	362
SF/SI	0	0	0	0	1	1	0	2	4		8
SF/SSI	0	0	0	0	0	0	0	3	37	18	58
AW/AGL	9	3	7	4	5	4	3	51	44	25	155
Worm Farm	0	0	0	0	0	0	0	4	3	3	10
Reedbed	0	0	3	5	0	0	0	1	3	0	12
TP/DIS	20	21	20	5	0	1	0	3	3	0	73
TWOAT	0	0	0	1	0	1	0	27	178	0	207
SF/DIS	24	21	11	3	1	0	0	46	71	0	177
TOTAL	86	85	92	93	90	86	51	493	600	163	1,839

* All permits issued between 1994 and 2001 were obtained from permit books no longer in use in use. Permits issued from 2001 to date have been obtained from Council's electronic database.

SI = Surface Irrigation but refers to drip feed irrigation, which is the only sort of surface irrigation permitted in Manningham.

TP/DIS, TWOAT and SF/DIS permits issued between 2001 and Jan 2011 (for off-site discharge) were for existing properties with no 'permit conditions' on record. Permits were issued retrospectively to assist owners understand their operating / maintenance obligations.

Approximately 44% of permits issued from September 1994 until September 1997 were for off-site discharge following secondary treatment of the effluent through either a sand filter or a treatment plant. However, from October 1996 until September 2006, only 7.8% of all permits issued during this period were for off-site discharge after secondary treatment through either a sand filter or a treatment plant.

Thus, over the last 15 years there has been a steady decrease in off site discharges due to new dwellings and or additions requiring systems to meet today's standards for onsite containment. This demonstrates the trend in the municipality towards total containment on site of all effluent, in line with EPA guidelines and Council's commitment to sustainability. Since introduction of this plan in December 2002 no off-site discharge applications have been approved for any *new* dwellings.

The combination of sand filter to agricultural lines has remained constant over this period and is a popular method of effluent treatment and disposal still throughout the municipality. There is a noticeable increase in treatment plant installations since the end of 1997, which corresponds with Council's refusal to allow off site discharge. Drip feed irrigation or agricultural lines after a treatment plant is currently the most popular installation within the municipality.

2. Sub-catchment issues

2.1 Ruffey Creek sub-catchment

Description

Ruffey Creek originates in Doncaster East to the South East of Rieschieks Reserve. It is approximately 5.5 km long, and flows through the highly urbanised areas of Doncaster and Templestowe. The sub-catchment also includes the lower density areas of Templestowe, some of which is without reticulated sewerage and the large Westerfolds Park. Ruffey Creek joins the Yarra River at Finns Reserve. The upper and middle reaches of the sub-catchment are steep, with a floodplain on the lower reaches at the confluence of Ruffey Creek with the Yarra River and in the area of Westerfolds Park.

Water flows rapidly into the creek from its sub-catchment and has resulted in flooding problems in the past. Retardation basins have been constructed in the area known as Ruffey Lake Park to assist in the management of stormwater flows. The banks of the creek are steeply incised and carry little native vegetation.

2.2 Mullum Mullum Creek sub-catchment

Description

The total length of the Mullum Mullum Creek is approximately 16 km, with the final 10 km between Deep Creek Road and the Yarra River occurring within the municipality. The sub-catchment is long and narrow with numerous short tributaries.

There are two major physiographic units in the Mullum Mullum Creek sub-catchment within the municipality: a flat, low-lying area adjacent to the Yarra River, and an area of dissected topography in the central reaches of the creek. Mudstones, siltstones and sandstones of the Silurian and Dargile formations underlie the sub-catchment.

Mean annual runoff under pre-development conditions has been estimated at approximately 100 to 125 mm, but is likely to have increased two-to-four times since urbanisation (Biosis Research *et al*, 1992). In the lower reaches, downstream of Larne Avenue, Mullum Mullum Creek follows an irregular meandering course. The banks are typically composed of sandy silty sediments and soft to hard clays, with outcrops of the underlying rock being exposed where the creek channel meanders close to abutting hillsides. The creek banks are prone to erosion by flowing water when destabilised, usually as a result of vegetation disturbance.

Outcrops of sedimentary rock occur with increasing frequency towards Park Road. Beyond Park Road, the creek bed and lower banks are dominated by sedimentary rock that directs the channel along a straighter and steeper narrow incised valley. Upstream of Heads Road to the limit of the municipality, the creek channel is characterised by a succession of pools and rock falls on a bed of sedimentary rock. Extensive erosion appears to have occurred during the 1980s and is virtually continuous in the lower reaches of the creek below Park Road to the Yarra River.

Threats

Mullum Mullum Creek is one of the most polluted streams in the Yarra River catchment (Pettigrove *et al*, 1994), with high concentrations of nutrients and, during storm events, very high suspended solids and turbidities in the lower section. Although one of the smaller tributaries of the Yarra River, Mullum Mullum Creek has been identified as significantly raising the concentrations of nutrients, copper and zinc, turbidities, suspended solids (Melbourne Water Laboratories, 1992), faecal coliforms and *E. coli* (Melbourne Water, 1992) in the Yarra River.

Threats to the natural environment in the Mullum Mullum Creek sub-catchment are either direct threats to the waterway or indirect threats to flora and fauna which have an important role in protecting the land area and stream banks.

The greatest negative impact on water quality in Mullum Mullum Creek is the result of drainage from the Park Orchards area which contributes substantially to increased nutrients, including ammonia, nitrates, orthophosphates, total phosphorus and *E. coli*. In the Park Orchards area residential properties are serviced by septic systems. Septic systems currently in use in Park Orchards can be classified as follows:

<u>Toilet Waste Only Systems on reduce flush</u>

These systems were installed prior to the early 1970s and are generally in use on residential sites with limited site area (typically for sites 1,000 m^2 or less in area). At the time, these systems were considered to be an interim treatment until the area could be sewered. The system only treats toilet waste with all other wastewater being discharged off site as sullage. During the 1980s Environmental Health Officers investigated several properties in Corriedale Crescent area and found that while systems of this type were operating within guidelines, sullage from the same properties had unacceptable levels of pathogens.

<u>All Purpose Systems</u>

All Purpose Systems were installed on larger allotments prior to early 1970s and on most residential properties since the early 1970s. These systems treat all wastewater from the site to at least a secondary level of treatment. There is no requirement for systems installed prior to 1997 to contain treated wastewater on-site.

All Purpose System Containing Waste Water On-Site

Since 1997, EPA has required that all wastewater on unsewered sites must be contained on-site. All Purpose Systems that contained wastewater on-site were increasingly being used from the late 1980s.

Effectiveness of septic systems in treating waste varies according to the type, age, maintenance level, soil type, land slope, and property size (Brouwer, 1983 after Pettigrove & Coleman, 1998). Clayey soils have a low permeability and easily become waterlogged, resulting in overland flow into nearby drainage lines or streams if the necessary performance criteria are not met.

The Septic Tank Code of Practice specifies standards for the location, construction and maintenance of newly constructed septic tank systems, but the problems of older systems are not addressed.

Runoff from unsewered residential properties can have a considerable impact on stream water quality. Runoff from the unsewered Park Orchards area has a significant impact on water quality in Mullum Mullum Creek and Andersons Creek via the upper reaches of the sub-catchment and Harris Gully (Pettigrove *et al*., 1994). Historical water quality data indicates that the Mullum Mullum Creek has improved with the decommissioning of a sewage treatment plant in 1982 and the connection of large areas of the creek catchment to the sewerage system. The Victorian Stormwater Committee Report, *The water quality of Mullum Mullum Creek* (Pettigrove *et al*, 1994), stated that the primary issue influencing water quality in Mullum Mullum Creek is whether or not residential areas are connected to the reticulated sewerage system.

The diversity and composition of macroinvertebrate taxa recorded in Mullum Mullum Creek appears to be correlated with the physical condition of the waterway rather than with changes in water quality. The fauna was dominated by aquatic worms, chironomids, aquatic snails, aquatic beetle species and bugs, with small numbers of mayflies, stoneflies and caddis-flies recorded at some sites. The low diversity of taxa and absence of pollution sensitive species indicates that the creek is in poor condition (Pettigrove *et al*, 1994).

2.3 Andersons Creek sub-catchment

Description

Andersons Creek flows a total of 9 km to the Yarra River at Warrandyte from its headwaters in North Ringwood in the neighbouring municipality of Maroondah. Andersons Creek has two major tributaries that drain approximately half of the sub-catchment; the Andersons Creek East Branch and Harris Gully. The sub-catchment is roughly 'Y' shaped with numerous short tributaries on each branch.

There are two major physiographic units in the Andersons Creek sub-catchment: a flat, low-lying floodplain adjacent to the Yarra River and an area of dissected topography, formed in the post-Pliocene period, in the central reaches of the creek. Yellow duplex Silurian soils are found on slopes and dissected terrain. The soil profile is typically a grey or grey-brown clayey silt horizon to approximately 25 cm, overlying a mottled yellow clay horizon and weathered bedrock.

A large area of alluvium occurs in Andersons Creek downstream of Harris Gully Road. Between Harris Gully Road and the Warrandyte-Ringwood Road the dominant substrate is weathered bedrock. Upstream of the Warrandyte-Ringwood Road and in Harris Gully clay soils predominate (Pettigrove & Coleman, 1998). The banks are composed of clay or clayey silt, with outcrops of the underlying rock exposed adjacent to hillsides. The creek banks are prone to erosion when destabilised. Within the lower reaches of Andersons Creek and Harris Gully channel diversity is low.

The hydrology of Andersons Creek is determined by the natural rainfall patterns within the sub-catchment. Urbanisation and small rural land uses have changed the natural flow rates and timing within the streams. Two large retention basins have been constructed in the upper sub-catchment to assist in mitigation of flooding impacts on the lower sub-catchment areas. The retention basins are located in the headwaters of Andersons Creek upstream of the Warrandyte-Ringwood Road and on Andersons Creek East Branch. Occasional flooding of the lower reaches of Andersons Creek within Warrandyte is exacerbated by flooding in the Yarra River (ID&A & Water Ecoscience, 2000).

Channel stability is rated as moderate to good (ID&A & Water Ecoscience, 2000), but is described as highly modified from its natural condition. The lower floodplain has been affected by historical gold mining activities and instream activities including straightening, desnagging and toe de-stabilisation, however channel instability is not a major problem. Isolated areas of bank erosion caused by stream power and a lack of soil binding vegetation occur within the sub-catchment. Sediment has been deposited at the junction of the Yarra River and Andersons Creek as a result of sediment erosion and transportation downstream.

Threats

Andersons Creek has generally poor water quality, however the lower sub-catchment has significantly improved since 1992, which correlates with sewering of some areas of Warrandyte nearest to the Yarra River. Nutrient levels are still considered high and turbidities and suspended solids are often elevated, particularly after storms. The Harris Gully tributary is a major source of nutrients, suspended solids and E. coli to the lower reaches of Andersons Creek.

Pettigrove & Coleman (1998) state that considerable improvements to the water quality in the lower reaches of Andersons Creek and the Yarra River could be achieved if the water quality problems in Harris Gully were addressed. The most likely source of poor water quality in Harris Gully is sediment runoff from degraded sections of the sub-catchment, a poorly vegetated riparian zone, runoff from septic tanks, faecal contamination from livestock and possible leachates from a disused tip (now Stintons Reserve) (Pettigrove & Coleman, 1998). Weed infestation is also a significant problem throughout the riparian zone of Andersons Creek and its tributaries.

As with the Mullum Mullum catchment, unsewered areas in Park Orchards are likely to impact on stormwater quality in the Andersons Creek sub-catchment. Runoff from roads appears to contribute a large quantity of suspended solids to waterways within the Andersons Creek sub-catchment and is suspected to elevate the levels of lead and some other metals, mainly copper and zinc, in stream sediments (Pettigrove & Coleman, 1998).

The majority of roads in the area are sealed but the verges and roadside drains are not. Major arterial roads such as the Warrandyte-Ringwood Road and Harris Gully Road are amongst those with unsealed edges. Due to the steep terrain and extent of use, these roads contribute a large amount of sediment into Andersons Creek. Runoff from roads also contains contaminants from road transport, including heavy metals such as lead, and petroleum products.

Sections of streams within the Andersons Creek sub-catchment which are likely to receive the greatest impacts from road sediment and associated contaminants are the Harris Gully tributary which receives runoff from Harris Gully Road, Andersons Creek where it flows adjacent to Gold Memorial Road, the junction of Husseys Lane with Gold Memorial Road at Andersons Creek, and where Andersons Creek flows adjacent to the Warrandyte-Ringwood Road.

Rabbit populations appear to be high in the Andersons Creek sub-catchment (ID&A & Water Ecoscience, 2000). The threat posed by rabbits to reduced stream water quality is difficult to quantify but is likely to be significant as rabbit density is usually greatest near waterways. Grazing of indigenous vegetation, including seedlings, by rabbits causes ageing of the community due to limited addition of seedlings and increased opportunity for the spread of weeds. The removal of vegetation by rabbits contributes to increased rainfall runoff and erosion, thereby contributing quantities of soil and attached nutrients and other pollutants to streams (ID&A & Water Ecoscience, 2000).

A large number of weed species are recorded for the Andersons Creek sub-catchment. The dominant species are Blackberry, English Ivy, Honeysuckle, Angled Onion, Sweet Pittosporum and *Tradescantia*. Weeds threaten biological integrity by habitat loss and invasion of significant vegetation remnants. The lower reaches of Andersons Creek are the most dominated by weed species, particularly along Gold Memorial Road. Although there is good coverage of native overstorey, the understorey and groundcover riparian values are seriously threatened by English Ivy, and to a lesser extent Blackberry and Angled Onion (Pettigrove & Coleman, 1998).

A former municipal tip was located near Commercial Road in Harris Gully. Further surveys are required to determine whether leachates are discharged from the tip into Harris Gully.

Other threats to riparian and aquatic vegetation include vegetation clearance, sediment movement in urban areas, agricultural land use and unrestricted access by livestock to waterways. Urban development in the upper sub-catchment has resulted in the clearance of indigenous riparian vegetation, mobilisation of sediments and increased poor quality runoff to Andersons Creek. Degradation and reduction of the vegetation buffer on upper subcatchment waterways has reduced species diversity (ID&A & Water Ecoscience, 2000). Unrestricted access to waterways by livestock is likely to contribute to poor water quality, particularly in Harris Gully (ID&A & Water Ecoscience, 2000).

Platypuses have been recorded in Andersons Creek, but are threatened by impacts associated with increasing urbanisation of the sub-catchment. These include predation by domestic animals and foxes, stream channelling and de-snagging, and construction of road culverts (ID&A & Water Ecoscience, 2000).

Most threats to the Andersons Creek sub-catchment as a result of recreational use are concentrated in the riparian zone where vegetation is damaged, soil disturbed and litter discarded. The most impacted area is the junction of Andersons Creek with the Yarra River. In the middle and upper reaches, the major recreational impact occurs in scattered areas where vegetation and soils are damaged along pathways adjacent to waterways (ID&A & Water Ecoscience, 2000).

2.4 Jumping Creek subcatchment

Description

The headwaters of Jumping Creek are in Croydon Hills, beyond the municipality in the City of Maroondah. The lower and middle sections of the sub-catchment are within the City of Manningham. Jumping Creek flows a total length of approximately 17.5 km to the Yarra River in Warrandyte State Park near the semi-rural suburb of Wonga Park. Two major tributaries (Drain 5451 and 5452) drain sections of Warrandyte South and Wonga Park into Jumping Creek at points between Jumping Creek Road and Brysons Road within the municipality.

There is one major physiographic unit in the Jumping Creek sub-catchment: a dissected topography formed in the post-Pliocene period. Jumping Creek flows through a particularly steep catchment and appears to lack a floodplain near its junction with the Yarra River (Pettigrove & Coleman, 1998). Mottled yellow duplex Silurian soils usually occur on slopes in the area. A typical profile is a light grey or grey-brown clayey-silt horizon to 20 to 30 cm, overlying a mottled yellow clay horizon and weathered bedrock (MMBW, 1978 after Pettigrove & Coleman, 1998). The clays occurring in the sub-catchment are readily dispersible in water and have a high erosion potential (Thomas, 1994 after Pettigrove & Coleman, 1998).

Weathered bedrock is the dominant substratum in Jumping Creek, with clays becoming more prevalent in the upper reaches (Pettigrove & Coleman, 1998). The lower reaches of Jumping Creek have received only minor disturbance and the physical condition and riparian cover of the stream is good, particularly through Warrandyte State Park.

The Jumping Creek sub-catchment is quite stable despite extensive modification of the upper tributaries from piping of sections of the waterways, channelisation and increasing runoff volumes and peak flows as a result of increasing urbanisation (Pettigrove & Coleman, 1998). The frequent occurrence of bedrock in the waterways of the sub-catchment has limited the impact of erosion, as have the numerous retarding basins which have been constructed in the upper urban reaches of the sub-catchment and been integrated with on-stream pondages and wetlands. Retarding basins have significantly reduced the potential hydrologic problems related to urbanisation that could have occurred within the sub-catchment. The middle and lower reaches of the waterway are in good condition except for extensive weed invasion in some areas, particularly in the middle reaches (Pettigrove & Coleman, 1998).

Threats

Jumping Creek sub-catchment is less developed than the similar Andersons Creek sub-catchment and its general health is therefore slightly better than Andersons Creek. Although varying nutrient levels have been recorded in the sub-catchment, they have not had a significant impact on stream health. Jumping Creek has relatively low levels of phosphorus, nitrogen, faecal contamination, suspended solids and turbidities during base flows. The density of benthic diatoms is lower in Jumping Creek than in Andersons Creek and a greater diversity of invertebrates is recorded for Jumping Creek than in Andersons Creek, but the composition of diatom flora, macroinvertebrate and macroalgal assemblages were very similar. Under higher flow conditions, there are substantial increases in turbidity, suspended solids, E. coli and inorganic nitrogen (Pettigrove & Coleman, 1998).

Despite extensive modification of the upper reaches of Jumping Creek, including piping, channelisation and increasing runoff, increased urbanisation has not greatly destabilised the waterway due to the prevalence of bedrock that has minimised erosion. Several retarding basins constructed in the upper urbanised section of the sub-catchment have been integrated with on-stream pondages and wetlands and have successfully mitigated many of the potential hydrologic problems that are common to many urbanised waterways.

Further residential subdivisions planned in the Jumping Creek sub-catchment need to control and minimise potential impact on the waterway. Past residential subdivisions in the area have included drainage infrastructure mechanisms which have resulted in minimal impacts on Jumping Creek. Future projects should incorporate similar drainage controls.

Although there is excessive weed growth along the waterway in this sub-catchment, the problem is not as extensive as in the Andersons Creek sub-catchment. A variety of garden escapee species and blackberry occur in the urbanised upper reaches, but blackberry is dominant in the rural downstream reaches. The stream is in good condition through Warrandyte State Park with a good cover of riparian vegetation and only minor weed invasions.

Sediment and associated contaminants from unsealed roads and sealed roads with unsealed verges and roadside drainage are significant impacts on water quality in the sub-catchment. Sites of particular concern include the steep roads in the upper urbanised sub-catchment where paved surfaces increase runoff and potential scouring of roadside drains.

Agricultural activities are widespread in the Jumping Creek sub-catchment. Direct impacts on the waterway result from unrestricted stock access that causes extensive degradation of creek banks, and loss of riparian vegetation, faecal contamination and nutrient enrichment. Fertilisers and pesticides can degrade water quality and poison fish. Limited fish kills have been recorded in Jumping Creek (Pettigrove & Coleman, 1998).

Most threats to the Jumping Creek sub-catchment as a result of recreational use are concentrated in the riparian zone where vegetation is damaged, soil disturbed and litter discarded. The most heavily used area is the junction of Jumping Creek with the Yarra River.

2.5 Brushy Creek sub-catchment

Description

The Brushy Creek sub-catchment is the smallest in the municipality. Brushy Creek rises in the Dandenong Ranges in the suburbs of Montrose and Mooroolbark, and in the municipality of Manningham, it flows through the low density area of Wonga Park. It has been separated from the Jumping Creek sub-catchment for the purposes of this stormwater management planning exercise as the Yarra Valley Water Brushy Creek Sewage Treatment Plant specifically influences it.

Threats

Given that only a relatively small portion of Brushy Creek is within the municipality of Manningham, and that development in the sub-catchment is relatively low key, the greatest stormwater threats result from upstream inflows. However, unsealed roads in the steep topography of the upper reaches of the sub-catchment contribute to sediment input, as does the unsealed car park near the Yarra River.

3.0 Failing Septic Tank Systems

3.1 Ageing systems

What is not generally recognised is that the majority of septic systems (approximately 60%) installed in Manningham from the late 1950's up until 1997 were temporary waste systems permitted to discharge treated black water or untreated greywater from site as an interim measure while the construction of Melbourne's sewerage network was realised. These systems were not designed as a sustainable long term solution and through Council's inspection program, it is apparent that a large proportion of older systems have been found to be defective.

3.2 Land Use History

Land that has been previously used for agricultural purposes can also create problems for effluent disposal. At the end of World War 2, the then City of Doncaster and Templestowe experienced an influx of people, resulting in rapid development of areas previously used as orchards. Today there are only a handful of orchards left in the municipality. However, on some allotments being developed today the old agricultural pipes previously used to irrigate crops still exist and may be collecting water and transporting it vertically down a slope. Old orchard agricultural pipes short circuit a septic system's horizontal effluent disposal trenches, allowing effluent to travel directly down slope untreated, generally into a neighbouring property. Unless the history of the land is known, it can be impossible to determine if these pipes exist until excavation begins. Even then, the excavation must be deep enough, and in the right places to discover old agricultural pipes.

If such pipes are discovered, they require sealing with cement, with the cement extending along the down slope bank of the effluent trench so that liquid will not be channelled through the old agricultural pipes - a difficult task to achieve in practice.

3.3 Property Development and Subdivisions

Council has many problems relating to properties being developed in unsewered areas, where the owners do not realise that reticulated sewerage is unavailable to their property. In many cases the property is 'cut and filled' (the process of levelling a sloped block of land by cutting into the side of the slope, and using the excavated material to fill below the cut) before Council has a chance to advise owners of the requirements and application is made for the installation of a septic system. In general, the disposal field from a septic system cannot be located in filled ground, which is one factor that restricts the area available for a system. This creates many difficulties for Council and the owner of the property when they discover that they cannot meet Council and EPA requirements. In many of these cases it means more expensive alternatives are required to treat wastewater, and it may also mean that the 'tennis court or swimming pool' may have to be sacrificed in order to be able to contain effluent on-site.

Furthermore, the only areas of undeveloped land left in the municipality are generally small, steep blocks that have developed properties bordering on every side, and are not ideal for the installation of a septic system. Similarly, recent subdivisions are also being carried out on increasingly unsuitable or undersized land. Current planning legislation (The Planning and Environment Act via the Victorian Planning Provisions) allows for an average of $4000m^2$ per lot for the entire subdivision, rather than each lot being a minimum of $4000m^2$. This creates many problems with some lots being only $3000m^2$, which is generally not enough land to contain a dwelling and all wastewater on-site. Similar situations exist in a number of municipalities across Australia.

4.0 Changing legislation

In recent times the Environment Protection Authority has become more stringent regarding the installation and ongoing monitoring and maintenance of septic systems. A recent EPA direction requires that all new properties MUST contain ALL wastewater within the boundaries of the property (EPA Bulletin No. 629, Nov. 1998). Council has attempted to do this wherever possible, however, as highlighted above, it is becoming increasingly difficult to meet these EPA requirements.

Certificates of Approval issued by the EPA for approved types of septic systems have also been altered for many septic systems (February, 1999). Previously, the Certificate of Approval conditions required annual effluent analysis by a registered National Association of Testing Analysts (NATA) laboratory if off-site discharge occurred. It is now a requirement for the owner of any new septic system discharging off-site to have the effluent analysed on a quarterly basis by a registered NATA laboratory, with results submitted to Council within 14 days. It is also a requirement for owners of new systems that contain effluent on-site to have the effluent analysed annually by a registered NATA laboratory, with results submitted to Council within 14 days. All new systems must also be inspected by a competently trained person (details of frequency of inspection vary with the type of system installed).

These requirements discourage off-site discharge by creating economic and management issues for homeowners. However, they also create regulatory and resourcing issues for Councils.

In October 2014, the EPA announced the need to reform its administration of the onsite wastewater program and intends to remove the requirement for individual treatment systems to hold an EPA certificate of approval (CA). Instead, the EPA will approve only *types* of systems, as required by the *Environment Protection Act 1970*.

Council is currently participating in regulatory reform workshops to determine how this will affect Local Governments administration of septic systems and permit responsibilities.

5.0 Modifications and alterations to properties

It is becoming increasingly common for Council Officers to discover that a property has been extended, or a large permanent structure has been installed on a property that has disturbed the septic system. Reasons why these situations arise include:

- The works have been conducted without the building surveyor first notifying and obtaining prior comment and/or consent from Council's Environmental Health Unit before issuing a building permit. This is a legal requirement under Part 6.1 of the Building (Amendment) Act 1996, but in practice rarely occurs. This section states:

  "The consent and report of the relevant council must be obtained to an application for a building permit which requires the installation of any soil or waste disposal reticulation system in an unsewered area."

  (Building (Amendment) Act 1996, Part 6.1)

  If the proposed alteration involves the upgrading or relocation of the septic system, a Permit to Alter the system is required to be obtained by the owner of the property.

- The modifications to a property have been conducted illegally by the owner who may be unaware that a permit is required to conduct works (such as concreting a courtyard area or constructing a balcony that effects the septic system), and the owner either;

  (1) does not know the location of the septic system,
  (2) does not realise he/she is living in an unsewered area, or
  (3) uses a building surveyor who is unaware that the property is in an unsewered area (or is aware of this but is unfamiliar with the workings of a septic system and therefore does not consider the location of the system with respect to the proposed works).

6.0 Information management

6.1 Inaccurate records

There are several factors that influence the accuracy of a septic tank record held by Council. These factors are discussed in the next subsections;

Obtaining accurate plans of a septic system location can be difficult to achieve. For instance, measurements of distances between the septic tank and the house, the septic tank and the type of secondary treatment and/or disposal field, and the distance from a boundary or other permanent land use feature such as a tennis court or swimming pool. This information is desirable, but not always obtainable at the time of installation of the septic system. Some reasons why include:

- The septic system being installed prior to the house construction, usually because vehicles and machinery cannot access the effluent disposal area if house construction begins first. The location of the house is required on a septic tank application form, but may change during construction of the house for a variety of reasons;

- The owner of the property has not thought about, or is unsure where the driveway and other recreational structures or gardens will be placed in relation to the disposal area; and

- A property is very large, and the nearest boundary is very far away, making boundary measurements meaningless.

6.2 In the field changes

The method of data recording lends itself to human error, as there are inconsistencies because different people are using the same system. External variables exist which Council has no control over. Council may approve a plan, but on-site there are changes that have been made. It is problematic to get applicants to resubmit a plan for minor alterations if they already have an approved plan. Septic systems are one facet of the overall functions of the Environmental Health Unit at Manningham, and only a limited amount of time can be devoted to applications.

Situations that arise where modifications to an approved plan require the approved plan to be updated include;

- The plumber or drainer on-site changes the alignment of a drain because the planned alignment did not provide enough fall. The Environmental Health Officer may not discern this change during an installation inspection. This situation may be compounded when different officers inspect different stages of the same installation, and may not always have the job card on-site.

- A property is subdivided and the existing card for the original property is not altered to reflect the change in boundaries.

- A septic system is installed prior to the house being constructed, and when a final inspection is conducted before a Permit to Use the system is issued, measurements or subsequent details are not noted on the job card.

APPENDIX II

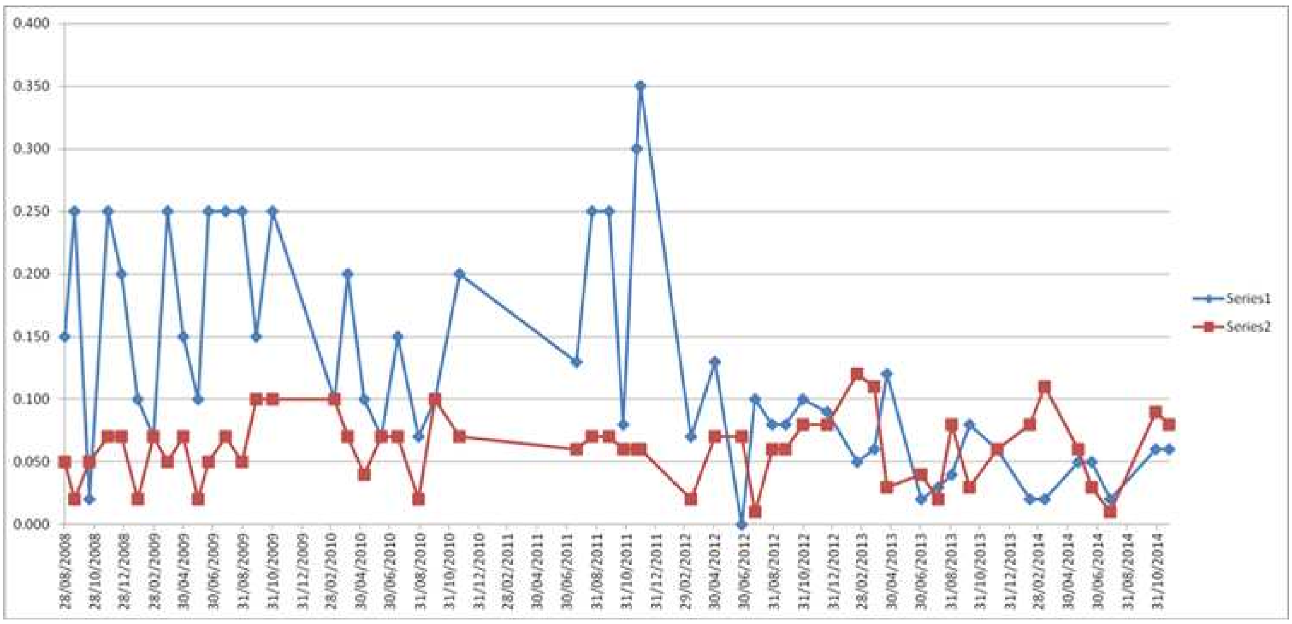
Waterwatch

The Manningham Waterwatch Monitoring Network is a community coalition that aims to monitor the health of our local waterways, detecting changes and promote improvements in the health of local streams and catchments.

The Manningham Waterwatch Monitoring Network consists of 30 volunteers who monitor 29 sites across the municipality once per month. As monitoring is repeated over consecutive months and years, trends in waterway condition can be detected and used to identify and implement on-ground environmental activities leading to the improved health of local creeks, rivers and catchments.

More information on waterwatch results and publications can be found at www.manningham.vic.gov.au/waterwatch-program

The graph below highlights the consistent drop in Ortho-phosphorus entering Ruffey Creek at Delfield Drive (blue line) compared with King Street (red line). From Feb 2012 onwards the input of phosphorus entering the Ruffey Creek has reduced considerably. Yarra Valley Water provided reticulated sewer to the Templestowe backlog areas between October 2011 and 2012. It is assumed that the high connection rates (75% of properties connected to date) are responsible for the improvement in water quality at this location.



Water Sampling Results

Water sampling has been conducted by Council since 2003 at several locations along creeks running throughout Manningham. Samples were taken 30cm below the surface to obtain a consistent sample representative of the water quality in that area. The table below indicates high levels of E.coli present in Manningham's creeks and is indicative of faecal contamination. In some instances, levels were considerably higher than those levels recommended for swimming.

Adults, children and animals that come into contact with contaminated creek or river water may experience diarrhoea, stomach infections, ear, eye and throat infections as a result of high levels of E.coli present in the water.

Following are the water quality parameters set by State Environmental Protection Policy in relation to E.coli levels:

- E.coli levels above 200/100ml are not recommended for swimming.
- Levels above 1000/100ml are not recommended for fishing or boating activities.

Although not conclusive, there appears to be an improvement in water quality results for the Penderal Court drain & creek and the Violet Court drain compared to water sampling performed in previous years. The Penderal and Violet court drains are located in the Wonga Park backlog areas RA0005A & RA0005B where approximately 386 properties (70%) of properties have connected to sewer in the past 2 years.

Water sampling results & Indications for recreational activities

Sampling Location	Date	BOD mg/l (20 max)	Suspended Solids mg/l (30 max)	E. Coli / 100ml (200 max swimming) (1000 max boat / fishing)
Ruffey Creek Outlet	18/03/03	6	-	200
	18/05/04	<5	6	200
	26/08/04	<5	6	900
	03/03/05	<5	6	1,000
	03/08/05	<3	14	500
	20/12/05	<5	2	1,600
	21/03/06	<3	6	400
	27/07/06	<5	15	200
	30/11/06	<5	4	1,800 (no flow)
	15/05/07	<5	2	2,400
	26/09/07	<5	10	1,500
	05/03/08	<5	4	22,000
	17/06/08	<5	4	2,200
	16/10/08	<5	3	500
	19/02/09	<5	4	500
	01/06/09	<5	2	4,100
	29/10/09	<5	5	700
	01/03/10	<5	6	1,400
	24/05/10	<5	14	200
	01/10/10	<5	7	200
	01/04/11	<5	8	1200
	24/08/11	<5	7	400
	3/7/14	<5	6	1200
	10/12/14	<5	1	410
	17/3/15	<5	10	120
Ruffey Creek Drain	03/08/05	<3	6	12,000
	20/12/05	<5	3	300
	21/03/06	<3	18	1,200
	27/07/06	<5	2	800
	30/11/06	<5	17	9,000 (no flow)
	15/05/07	<5	4	1,000
	26/09/07	<5	4	17,000
	05/03/08	<5	17	3,600
	17/06/08	170	18	24,000
	16/10/08	<5	22	1,600
	19/02/09	<5	36	900
	01/06/09	46	2	10,000
	29/10/09	<5	4	1,500
	01/03/10	No Flow		
	24/05/10	<5	3	<100
	01/10/10	<5	12	100
	01/04/11	<5	5	1,000
	24/08/11	<5	8	100
	3/7/14	<5	11	<10
	10/12/14	<5	<1	310
	17/3/15	<5	8	75
Mullum Mullum Creek Outlet (Crystalbrook)	18/03/03	21	2	400
	18/05/04	<5	12	300
	03/03/05	5	14	400
	03/08/05	<3	6	<100
	18/08/05	<5	2	300
	21/03/06	<3	17	1,400

	27/07/06	<5	12	11,000
	30/11/06	<5	12	1,500 (no flow)
	15/05/07	<5	12	900
	26/09/07	<5	10	200
	05/03/08	<5	23	800
	17/06/08	<5	14	3,000
	16/10/08	<5	12	700
	19/02/09	<5	6	<100
	01/06/09	<5	20	3,100
	29/10/09	<5	14	500
	01/03/10	<5	32	1,100
	24/05/10	<5	14	800
	01/10/10	<5	2	2,300
	01/04/11	<5	13	900
	24/08/11	<5	14	600
	3/7/14	<5	11	380
	10/12/14	<5	14	570
	17/3/15	<5	12	180
Mullum Mullum Creek Inlet (deep creek Rd / Loughlan Rd)	21/03/06	<3	5	500 (deep creek)
	27/07/06	<5	4	800
	30/11/06	>5	3	1,000 (no flow)
	15/05/07	<5	4	300
	26/09/07	<5	3	200
	05/03/08	<5	8	1,000
	17/06/08	<5	5	1,000
	19/02/09	<5	2	100
	01/06/09	<5	3	8,200
	29/10/09	<5	7	100
	01/03/10	<5	1	300
	24/05/10	<5	2	500
	01/10/10	<5	17	800
	01/04/11	10	2	200
	24/08/11	<5	2	100
	3/7/14	<5	1	63
	10/12/14	<5	2	280
	17/3/15	<5	4	41
Brushy Creek Outlet (Wonga Park – Yarra end)	18/03/03	7	6	900
	18/05/04	<5	13	100
	26/08/04	<5	9	100
	03/03/05	<5	26	200
	03/08/05	<3	12	400
	18/08/05	<5	6	170
	20/12/05	<5	5	100
	21/03/06	<3	10	900
	27/07/06	<5	10	100
	08/12/06	<5	5	400
	15/05/07	<5	28	1,000
	26/09/07	<5	20	900
	05/03/08	<5	12	900
	17/06/08	<5	16	1,100
	16/10/08	<5	10	1,000
	19/02/09	<5	4	400
	01/06/09	<5	10	2,600
	29/10/09	<5	7	500
	01/03/10	<5	14	300
	24/05/10	<5	16	400
	01/10/10	<5	150	1,100
	01/04/11	<5	20	700
	24/08/11	<5	28	500
	3/7/14	<5	18	160

	10/12/14	<5	19	360
	17/3/15	<5	26	270
Brushy Creek Inlet (Paynes Rd Bridge)	21/03/06	<3	8	1,200
	27/07/06	<5	15	200
	08/12/06	<5	7	500
	15/05/07	<5	19	600
	26/09/07	<5	9	600
	05/03/08	<5	15	1,700
	17/06/08	<5	12	500
	16/10/08	<5	11	200
	19/02/09	<5	16	2,500
	01/06/09	<5	22	3,800
	29/10/09	<5	33	1,500
	01/03/10	<5	14	300
	24/05/10	<5	12	400
	01/10/10	<5	27	200
	01/04/11	<5	21	2,100
	24/08/11	<5	28	100
	3/7/14	<5	14	230
	10/12/14	<5	28	260
	17/3/15	<5	50	290
Jumping Creek Outlet (Bridge - Yarra end)	18/03/03	17	2	-
	18/05/04	<5	2	<100
	26/08/04	<5	4	100
	03/03/05	<5	28	<100
	03/08/05	<3	2	<100
	18/08/05	<5	6	70
	20/12/05	<5	4	300
	27/07/06	<5	3	<100
	08/12/06	<5	4	<100
	15/05/07	<5	<1	<100
	26/09/07	<5	4	100
	05/03/08	<5	8	200
	17/06/08	<5	5	<100
	16/10/08	<5	4	100
	19/02/09	No Flow		
	01/06/09	<5	4	1,200
	29/10/09	<5	2	200
	01/03/10	No Flow		
	24/05/10	10	9	<100
	01/10/10	<5	20	300
	01/04/11	<5	10	800
	24/08/11	<5	19	100
	3/7/14	<5	8	130
	10/12/14	<5	6	97
	17/3/15	No Flow		
Jumping Creek Inlet (Brysons Rd)	21/03/06	<3	6	100
	05/04/06	<3	5	700
	27/07/06	<5	2	<100
	08/12/06	<5	2	<100
	15/05/07	<5	4	200
	26/09/07	<5	5	1,100
	05/03/08	<5	6	300
	17/06/08	<5	<1	400
	16/10/08	<5	2	100
	19/02/09	No Flow		
	01/06/09	<5	2	200
	29/10/09	<5	10	100
	01/03/10	<5	15	100
	24/05/10	<5	2	<100

	01/10/10	<5	2	600
	01/04/11	<5	3	600
	24/08/11	<5	<1	<100
	3/7/14	<5	4	52
	10/12/14	<5	<1	200
	17/3/15	<5	5	170
Anderson Creek Outlet Taroona (Warrandyte)	18/03/03	22	5	300
	18/05/04	<5	2	100
	26/08/04	<5	4	100
	03/03/05	<5	7	500
	03/08/05	<3	6	<100
	20/12/05	<5	4	800
	21/03/06	<3	10	1,900
	27/07/06	<5	8	300
	30/11/06	<5	2	300 (no flow)
	15/05/07	<5	2	300
	26/09/07	<5	4	1,300
	05/03/08	<5	10	1,200
	17/06/08	<5	11	1,500
	16/10/08	<5	4	2,300
	19/02/09	<5	6	1,000
	01/06/09	<5	2	1,600
	29/10/09	<5	2	1,500
	01/03/10	17	25	800
	24/05/10	<5	6	2,700
	01/10/10	<5	18	1,200
	01/04/11	<5	20	1,600
	24/08/11	<5	12	100
	3/7/14	<5	4	960
	10/12/14	<3	52	1,100
	17/3/15	<5	22	170
Andersons Creek Inlet (Milne Rd)	27/07/06	<5	2	800
	08/12/06	7	4	<100
	15/05/07	<5	10	1200
	26/09/07	<5	4	700
	05/03/08	<5	8	1,600
	17/06/08	<5	26	600
	16/10/08	<5	4	600
	19/02/09	<5	2	200
	01/06/09	<5	4	600
	29/10/09	<5	6	<100
	01/03/10	<5	4	700
	24/05/10	<5	4	<100
	01/10/10	<5	1	700
	01/04/11	<5	4	300
	24/08/11	<5	4	1000
	3/7/14	<5	<1	41
	10/12/14	<5	13	10
	17/3/15	<5	3	120
Head Rd Bridge (Mullum Mullum)	18/05/04	<5	2	200
	26/08/04	<5	2	700
	03/03/05	<5	4	1,500
	03/08/05	<3	3	6,100
	20/12/05	<5	1	300
	05/04/06	<3	14	1,100
	27/07/06	<5	6	1,600
	08/12/06	<5	2	1,100
	15/05/07	<5	4	400
	26/09/07	<5	2	3,600
	05/03/08	<5	5	1,300

	17/06/08	<5	2	5,400
	16/10/08	<5	4	700
	19/02/09	<5	4	600
	01/06/09	<5	1	2,800
	29/10/09	<5	8	200
	01/03/10	<5	4	400
	24/05/10	<5	5	2,100
	01/10/10	<5	3	400
	01/04/11	<5	2	800
	24/08/11	<5	2	400
	3/7/14	<5	2	120
	10/12/14	<5	2	360
	17/3/15	<5	6	31
Heads Rd Drain	20/12/05	<5	14	34,000
	05/04/06	16	46	95,000
	27/07/06	26	65	9,800
	08/12/06	70	35	240,000
	15/05/07	24	25	130,000
	26/09/07	45	42	720,000
	05/03/08	27	31	120,000
	17/06/08	35	39	310,000
	16/10/08	95	120	360,000
	19/02/09	60	95	600,000
	01/06/09	11	27	41,000
	29/10/09	49	50	140,000
	01/03/10	47	29	270,000
	24/05/10	56	20	190,000
	01/10/10	22	30	20,000
	01/04/11	9	26	13,000
	24/08/11	33	52	1200
	3/7/14	15	26	990
	10/12/14	11	30	13,000
	17/3/15	60	400	>24,000
Penderal Court Drain	29/05/03	22	18	94,000
	06/05/04	10	18	31,000
	07/06/04	19	28	88,000
	21/03/06	19	23	80,000
	08/12/06	21	18	48,000
	15/05/07	26	30	190,000
	26/09/07	21	37	1,000,000
	05/03/08	33	48	140,000
	17/06/08	35	46	160,000
	16/10/08	38	65	360,000
	19/02/09	25	40	240,000
	01/06/09	14	32	360,000
	29/10/09	27	32	160,000
	01/03/10	26	24	84,000
	24/05/10	40	34	44,000
	01/10/10	37	53	92,000
	01/04/11	15	29	220,000
	24/08/11	17	28	58,000
	3/7/14	<5	8	9200
	10/12/14	<5	32	>24,000
	17/3/15	7	12	390
Penderal Creek	19/02/09	7	78	60,000
	01/06/09	9	26	160,000
	29/10/09	<5	20	2,800
	01/03/10	<5	34	2,000
	24/05/10	14	55	2,000
	01/10/10	8	40	19,000

	01/04/11	10	23	35,000
	24/08/11	<5	22	11,000
	3/7/14	<5	2	230
	10/12/14	<5	20	590
	17/3/15	<5	40	160
Violet Court Drain	06/05/04	53	60	27,000
	21/03/06	4	28	3,500
	08/12/06	80	64	100,000
	15/05/07	<5	11	3,300
	26/09/07	8	14	52,000
	05/03/08	<5	10	240,000
	17/06/08	<5	12	5,700
	16/10/08	<5	53	200
	01/06/09	<5	18	7,800
	29/10/09	13	36	49,000
	01/03/10	<5	28	74,000
	24/05/10	31	34	10,000
	01/10/10	<5	27	2,600
	01/04/11	<5	79	17,000
	24/08/11	14	97	26,000
	3/7/14	<5	22	52
	10/12/14	<5	14	790
	17/3/15	No Flow		
Koonung Creek Outlet (Bulleen Rd)	18/08/05	<5	<1	310
	21/03/06	<3	11	400
	27/07/06	<5	6	900
	30/11/06	<5	11	500 (no flow)
	15/05/07	<5	10	300
	26/09/07	<5	13	55,000
	05/03/08	8	10	83,000
	17/06/08	<5	5	4,700
	16/10/08	<5	6	1,500
	19/02/09	<5	36	4,600
	01/06/09	<5	12	4,300
	29/10/09	<5	11	19,000
	01/03/10	<5	12	1,600
	24/05/10	<5	24	100
	01/10/10	<5	22	600
	01/04/11	<5	47	1,100
	24/08/11	<5	9	600
	3/7/14	<5	4	600
	10/12/14	<5	12	4,600
	17/3/15	<5	12	1,200

Koonung Creek Inlet (Foot bridge in Donvale)	05/04/06	<3	2	4,200
	27/07/06	<5	3	2,500
	30/11/06	<5	8	500 (no flow)
	15/05/07	<5	18	2,100
	26/09/07	<5	18	1,400
	05/03/08	<5	24	4,000
	17/06/08	<5	16	140,000
	16/10/08	<5	4	200
	19/02/09	<5	14	11,000
	01/06/09	<5	74	5,100
	29/10/09	<5	17	<100
	01/03/10	<5	6	1,400
	24/05/10	<5	8	900
	01/10/10	<5	3	100
	01/04/11	<5	8	2,800
	24/08/11	<5	50	2,300
	3/7/14	<5	<1	>24,000
	10/12/14	<5	4	380
	17/3/15	<5	16	260
Glenvale Road	19/02/09	<5	12	12,000
	01/06/09	<5	6	150,000
	24/08/11	<5	10	1,900

APPENDIX III

Installation Costs V's Reticulated Sewerage Costs

Costs associated with installing an on-site septic system are generally expensive due to costs of hiring excavation machinery, installing the septic tank, sand filter and laying effluent lines. Labour and materials usually range from $10,000 to $15,000 per system.

Ongoing maintenance costs (depending on the type of system) are approximately $350 every 3 years to carry out desludging. These costs double for treatment plants consisting of two chambers as both tanks require desludging. Service fees for treatment plants are approximately $400 per year and include quarterly servicing. Power costs also apply to operate pumps and aerators on a regular basis.

Provision of Yarra Valley Water's sewer infrastructure includes a contribution fee. The contribution fee is a contribution customers pay towards the cost of Yarra Valley Water bringing sewerage infrastructure into their area. The fee is currently $500 for all areas declared before 8 April 2014. All areas declared thereafter have a contribution of $1,543.94 (in 2014/15). The fee is waived if connection is made within the first 12 months.

Connection to sewer includes an annual service charge of $348.48 as of 1 October 2014 (charged quarterly). Sewerage disposal fees are charged at $2.0999 per kilolitre of water used. The charge is applied to an estimated volume of sewage that is disposed into the sewerage system from inside your home based on your water usage and adjusted for seasonal variations. More information on can be found on Yarra Valley Waters website under 'Sewage Disposal Charges'.

The owner is also responsible for providing a service drain to the sewer point located on the property boundary. Costs will depend on the distance the house is from this service point.

Advantages of connecting to sewer

- No maintenance required by owners
- Connection costs cheaper than installation costs
- Cheaper maintenance costs in long run
- Reduces mosquito / vector breeding grounds
- Reduces risk of disease transmission
- Improved use of land (tennis courts, gardens, trees etc.)
- Prevents land from becoming water logged or contaminated
- Reduces foul odours emanating from the property

Disadvantages of connecting to sewer

- Water is discharged off-site and cannot be reused on garden (*Grey water may be re-used if installed correctly).
- Exorbitant installation costs for some inaccessible properties
- Reinstatement expenses of assets
- Damage to environment during sewer construction

Appendix IV

CODE	TYPE OF SYSTEM	OPERATING PROCEDURES / MAINTENANCE REQUIREMENTS
1 to 12	All Systems	Where applicable, the effluent absorption area must be maintained as a permanent, dedicated area. Vehicles and livestock must be excluded from the effluent absorption area. Unless a permit for offsite discharge is held, effluent from the septic tank must be contained onsite and must not be discharged beyond the boundaries of the allotment. Buildings, driveways, concrete, tennis courts, swimming pools, garden beds, large trees and the like must not be placed in or on effluent areas. The system must not be altered or modified, except with the approval of the Council. A *Permit to Alter the Septic Tank System* must be obtained from the Council before making any alterations to the system. Unless an owner of a property is operating an EPA approved secondary treatment system that contains all effluent onsite all-year round, the owner must arrange for connection to reticulated sewer as soon as reticulated sewer is made available. All access openings for the septic tank system must be brought up to ground level and comply with Australian Standard 1546, On-site domestic wastewater treatment units. All irrigation pipework and fittings must comply with Australian Standard 2698 Plastic pipes and fittings for irrigation and rural applications.
1. TP/AGL	Treatment Plant with Absorbtion / Transpiration Trenches	The treatment plant is to be maintained by an annual service contract by the manufacturer or serving agent and a copy of the contract forwarded to Council each year. A maintenance and service report is to be submitted to Council once every three months. The septic tank system must be desludged (pumped out) at least every three years. Written evidence that this has occurred is to be provided to Council. A licensed plumber/drainer must inspect the septic system every three years and written evidence of each inspection must be forwarded to Council

CODE	TYPE OF SYSTEM	OPERATING PROCEDURES / MAINTENANCE REQUIREMENTS
2. TP/SI	Treatment Plant with Surface Irrigation	A sample of effluent must be taken every 12 months and analysed by a laboratory registered with the National Association of Testing Authorities (NATA) for the following tests: 1. Biological Oxygen Demand (BOD); 2. Suspended Solids (SS); 3. E.Coli bacteria; 4. Free Residual Chlorine. The treatment plant is to be maintained by an annual service contract by the manufacturer or serving agent and a copy of the contract forwarded to Council each year. A maintenance and service report is to be submitted to Council once every three months. The septic tank system must be desludged (pumped out) at least every three years. Written evidence that this has occurred is to be provided to Council. A licensed plumber/drainer must inspect the septic system every three years and written evidence of each inspection must be forwarded to Council.
3. TP/SSI	Treatment Plant with Sub Surface Irrigation	A sample of effluent must be taken every 12 months and analysed by a laboratory registered with the National Association of Testing Authorities (NATA) for the following tests: 1. Biological Oxygen Demand (BOD); 2. Suspended Solids (SS). The septic tank system must be desludged (pumped out) at least every three years. Written evidence that this has occurred is to be provided to Council. The treatment plant is to be maintained by an annual service contract by the manufacturer or serving agent and a copy of the contract forwarded to Council each year. A maintenance and service report is to be submitted to Council once every three months. A licensed plumber/drainer must inspect the septic system every three years and written evidence of each inspection must be forwarded to Council.
4. SF/AGL	Sand Filter with Absorbtion / Transpiration Trenches	A sample of effluent must be taken every 12 months and analysed by a laboratory registered with the National Association of Testing Authorities (NATA) for the following tests: 1. Biological Oxygen Demand (BOD); 2. Suspended Solids (SS). The septic tank system must be desludged (pumped out) at least every three years. Written evidence that this has occurred is to be provided to Council. A licensed plumber/drainer must inspect the septic system every three years and written evidence of each inspection must be forwarded to Council.

CODE	TYPE OF SYSTEM	OPERATING PROCEDURES / MAINTENANCE REQUIREMENTS
5. SF/SI	Sand Filter with Surface Irrigation	A sample of effluent must be taken every 12 months and analysed by a laboratory registered with the National Association of Testing Authorities (NATA) for the following tests: 1. Biological Oxygen Demand (BOD); 2. Suspended Solids (SS); 3. E.Coli bacteria; 4. Free Residual Chlorine. The septic tank system must be desludged (pumped out) at least every three years. Written evidence that this has occurred is to be provided to Council. A licensed plumber/drainer must inspect the septic system every three years and written evidence of each inspection must be forwarded to Council.
6. SF/SSI	Sand Filter with Sub Surface Irrigation	A sample of effluent must be taken every 12 months and analysed by a laboratory registered with the National Association of Testing Authorities (NATA) for the following tests: 1. Biological Oxygen Demand (BOD); 2. Suspended Solids (SS). The septic tank system must be desludged (pumped out) at least every three years. Written evidence that this has occurred is to be provided to Council. A licensed plumber/drainer must inspect the septic system every three years and written evidence of each inspection must be forwarded to Council.
7. AW/AGL	All Waste to Absorbtion / Transpiration Trenches	The septic tank system must be desludged (pumped out) at least every three years. Written evidence that this has occurred is to be provided to Council. A licensed plumber/drainer must inspect the septic system every three years and written evidence of each inspection must be forwarded to Council.
8. AW/WF	All Waste to Worm Farm contained on site	A sample of effluent must be taken every 12 months and analysed by a laboratory registered with the National Association of Testing Authorities (NATA) for the following tests: 1. Biological Oxygen Demand (BOD); 2. Suspended Solids (SS). The septic tank system must be desludged (pumped out) at least every three years. Written evidence that this has occurred is to be provided to Council. A licensed plumber/drainer must inspect the septic system every three years and written evidence of each inspection must be forwarded to Council.

CODE	TYPE OF SYSTEM	OPERATING PROCEDURES / MAINTENANCE REQUIREMENTS
9. AW/RB	All Waste to Reed bed contained on site	A sample of effluent must be taken every 12 months and analysed by a laboratory registered with the National Association of Testing Authorities (NATA) for the following tests: 1. Biological Oxygen Demand (BOD); 2. Suspended Solids (SS). The septic tank system must be desludged (pumped out) at least every three years. Written evidence that this has occurred is to be provided to Council. A licensed plumber/drainer must inspect the septic system every three years and written evidence of each inspection must be forwarded to Council.
10. TP/DIS	Treatment Plant discharging off site	The treatment plant is to be maintained by an annual service contract by the manufacturer or serving agent and a copy of the contract forwarded to Council each year. A maintenance and service report is to be submitted to Council once every three months. A sample of effluent must be taken every 12 months and analysed by a laboratory registered with the National Association of Testing Authorities (NATA) for the following tests: 1. Biological Oxygen Demand (BOD); 2. Suspended Solids (SS); 3. E.Coli bacteria; 4. Total Residual Chlorine. The septic tank system must be desludged (pumped out) at least every three years. Written evidence that this has occurred is to be provided to Council. A licensed plumber/drainer must inspect the septic system every three years and written evidence of each inspection must be forwarded to Council.

CODE	TYPE OF SYSTEM	OPERATING PROCEDURES / MAINTENANCE REQUIREMENTS
11. WC/AGL	Water closet to Absorbtion / Transpiration Trenches	The grease trap must be cleaned as required and the baffles replaced when necessary. The septic tank system must be desludged (pumped out) at least every three years. Written evidence that this has occurred is to be provided to Council. A licensed plumber/drainer must inspect the septic system every three years and written evidence of each inspection must be forwarded to Council.
12. SF/DIS	Sand Filter Discharging Off Site	A sample of effluent must be taken every 12 months and analysed by a laboratory registered with the National Association of Testing Authorities (NATA) for the following tests: 1. Biological Oxygen Demand (BOD); 2. Suspended Solids (SS); 3. E.Coli bacteria; 4. Total Residual Chlorine. The septic tank system must be desludged (pumped out) at least every three years. Written evidence that this has occurred is to be provided to Council. A licensed plumber/drainer must inspect the septic system every three years and written evidence of each inspection must be forwarded to Council.

8.0 Conclusion

Based on inspection data and water quality results obtained through Council's DWMP and Melbourne Water, it is in Councils interest to protect the community from the adverse health effects associated with exposure to domestic wastewater. It is also important to reduce the risk posed to the environment from domestic wastewater entering local creeks and streams.

Council should continue to advocate for improved sewerage services in Manningham and continue to work with YVW in determining the best outcomes for our communities with respect to practicality, cost and protection of the environment and public health.

Where reticulated sewer is provided, residents should be encouraged to connect as this will ultimately save money and time maintaining an on-site disposal system. Connecting to the sewer will reduce the potential for sewage run off and improve the current level of pollution entering creeks and rivers in Manningham.