Domestic Wastewater Management Plan 2019

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MANNINGHAM

TABLE OF CONTENTS

MANNINGHAM

LIST OF TABLES

LIST OF FIGURES

1. 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 2017-2021* to review the Domestic Wastewater Management Plan (DWMP) adopted by Council in July 2002 with reviews of the plan undertaken in October 2007, November 2011, April 2015 and the current review (July 2019).

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 (YVW) in 'Sewerage Planning' where the DWMP identifies reticulated sewerage (or an alternative servicing solution) as a management option to meet community needs.

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 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* identified domestic wastewater as a key impact on the quality of storm water in the areas of Manningham still using septic systems.

Figure 1: *Soapy discharge entering Andersons Creek (May 2018)*

2. 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. In April 2015, the number had reduced to 3,669 and in July 2019, 3,222 were still in operation. This equates to 1,430 properties (30%) connecting to the available sewer since 2011.

Table 1: *Snapshot of systems in use over time.*

YEAR	*PROPERTIES USING A SEPTIC SYSTEM*
2002	Approx. 6,000
2011	4,652
2015	3,669
2019	3,222

2,935 of these properties were referred to YVW for inclusion onto their community sewer program with services declared available to the majority of properties in Warrandyte, Templestowe and Wonga Park between 2011 and 2014 (1,612 properties).

In 2015, 689 properties had not connected to the sewerage service however the sewer had only recently been declared available in the areas of Warrandyte, Templestowe and Wonga Park.

In July 2019, there were 268 properties that had not connected to the sewerage service. 161 of these discharge to storm water and are considered a major contributor to poor water quality in Manningham's creeks and streams.

Provision of YVW sewerage services are underway in the Donvale area (1,051 properties with septics) and it is anticipated the sewer will be declared in late 2019.

736 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 storm water systems that are some distance away. The 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 Clause 30 of the *State Environmental Protection Policy (Waters) 2018.*

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

2.1. Park Orchards Trial

In 2009, properties in Park Orchards and Ringwood North were prioritised for servicing under the Community Sewerage Program. YVW proposed to deliver a reticulated sewerage network. Early community engagement to this proposal met with significant opposition.

In response to community feedback and with the support of Manningham City Council, the Department of Environment, Water, Plan and Planning (DEWLP) and the Environmental Protection Authority (EPA), YVW investigated an alternative servicing option involving the upgrade of existing septic systems. This study found that using onsite systems instead of a reticulated sewer network had the potential to reduce servicing costs, achieve similar environmental outcomes to reticulated sewerage and would likely allay community concerns regarding subdivision and the preservation of local amenity.

There were, however, many uncertainties associated with implementation of this approach. YVW proposed a trial to better understand the benefits, challenges and feasibility of servicing properties in Park Orchards and Ringwood North using onsite wastewater treatment systems.

61 properties have received upgraded / new onsite treatment systems as part of the trial. Trial results, including a preferred sewer servicing strategy for the area are expected to be available by the end of 2020.

More information on the trial can be found at www.yvw.com.au/faults-works/community-sewerage-program/areas/park-orchards-sewerage-project.

Figure 2: Treatment Plant with sub-surface irrigation

2.2. Overview of septic systems in Manningham

The below table lists the number of septic systems in each reticulation area and change over time. There has been a slow transition to reticulated sewer however a number of properties have no incentive to connect and continue to discharge to storm water. A lack of enforcement around connection to sewer is considered a main factor in the number of properties continuing to discharge off-site.

Through our inspection program, a number of properties were identified as a type that discharge off-site and 114 of these have been referred to YVW for inclusion onto the Community Sewerage Program as they were in close proximity to existing sewerage infrastructure. YVW have decided not to include these properties onto their Community Sewerage Program.

A number of systems on larger rural blocks are also a type that 'discharge off-site' however, these usually terminate in paddocks and not directly to storm water. An action identified as part of this review is to revisit these properties and encourage better management of these systems into the future.

There are approximately 12 different combinations that make up the various types of septic systems in Manningham. As of July 2019 approximately 56% of all septic systems within the municipality discharge some form of waste water offsite to storm water which enter our creeks and rivers. Half of these are 'Split Systems' and the other half are 'All Waste Systems'. The most common type of septic system within the municipality is the combination of a septic tank and sand filter or Split System discharging off-site.

Table 2: *Number of septic systems in use by reticulation area*

Township	Reticulation area	Septic systems in use			Sewer available (year)	Number of properties discharging to storm water
		2011	2015	2019		
Wonga Park	RA0005A	557	149	55	2013	32
	RA0005B	n/a	22	13	2013	10
Templestowe	RA0040C	47	13	8	2011	4
	RA0040N	121	28	21	2010	9
	RA0040S	325	81	59	2011	39
Warrandyte	RA0041C	83	36	16	2013	9
	RA0041D	89	63	11	2014	8
	RA0041E	232	179	39	2014	25
	RA0041G	16	4	1	2013	1
	RA0041H	35	31	11	2014	5
	RA0041I	57	56	18	2014	6
Ringwood North/Park Orchards	RA0017	24	17	5	2013	4

DONVALE	RA0041A	1,045	1,043	1,043	DUE FOR COMPLETION 2019	707
	RA0041K	19	0	0	2009	0
	RA5001	8	8	4	2017	4
	RA0041B	18	7	5	2014	5
	RA02102B	8	3	2	2003	0
	RA0455	2	0	0	2005	0
Park Orchards (*RA0039 Includes 107 properties in Warrandyte South and 100 properties in Ringwood North.)	RA0039	1,182	1,195	1,175	ON-SITE TRIAL ENDING 2019	665
Not programmed for sewer	Not Applicable	784	734	736	NOT APPLICABLE	258
Totals		**4,652**	**3,669**	**3,222**		**1,791** **(sewer available to 162 properties)**

The following table provides an overview of system types by area, their age and perceived impacts to the environment:

Table 3: Septic systems in Manningham

OVERVIEW OF SEPTICS SYSTEMS IN MANNINGHAM	
Park Orchards (Anderson Creek and Mullum Mullum Creek sub-catchments)	• Old septic systems (1940s+) higher probability of untreated effluent from failed systems and pollution of Anderson Creek • 56% of properties permitted to discharge raw sullage or treated effluent to stormwater pending arrival of the Melbourne sewerage network. • Combination of a concentration of septic systems and normal residential blocks. • 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)	• Old septic systems (1940s+) higher probability of untreated effluent from failed systems and pollution of waterways. • Reticulated sewer declared available in 2010 - 2011. • 59% of remaining unsewered properties discharge raw sullage/treated effluent to stormwater
Donvale (Jumping Creek & Brushy Creek sub-catchments & Mullum Mullum Creek)	• Old septic systems (1940s+) higher probability of untreated effluent from failed systems and pollution of waterways

	• 68% of properties permitted to discharge raw sullage or treated effluent to stormwater pending the arrival of the Melbourne Sewerage network. • Large blocks with dispersion and distribution of effluent
Warrandyte (Yarra River)	• Old septic systems (1940s+) higher probability of untreated effluent from failed systems and pollution of waterways. • Reticulated sewer declared available in 2013 - 2014 (residential areas). • 56% of remaining unsewered properties discharge raw sullage or treated effluent to stormwater. • High e-coli levels observed following rain events. Refer to EPA Yarra & Bay website: https://yarraandbay.vic.gov.au/weeklywatersamples?type=yarra&site=4991

As a result of ageing and failing septic systems they are not always efficient in removing human wastes containing disease producing micro-organisms which impacts on health and the environment. In the 'Wallis Lakes' outbreak (NSW) in January 1997, links were established between human waste contaminating water with confirmed cases of Hepatitis A.

A large percentage of properties where permitted to discharge sullage or treated toilet waste to stormwater pending arrival of the Melbourne sewerage network. Unfortunately areas such as Park Orchards and Donvale where by-passed and it wasn't until 2002 when Council adopted its first DWMP and raised concerns with YVW, that a formal process was used to prioritise sewerage services.

In 2005, 2011 and 2016, Council participated in YVW's sewer backlog / Community Sewerage Program prioritisation process. YVW's prioritisation model utilised data obtained from YVW, Department of Environment, Land, Water & Planning (DELWP), Environment Protection Authority (EPA), Melbourne Water and importantly; data obtained through Council's DWMP. The prioritisation process ranks each Community Sewerage (backlog) area using the following criteria:

- 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

Through this process, Park Orchards and Donvale were identified as priority areas for sewerage services due to the number of properties discharging off-site.

YVW designed and installed sewerage services in the areas of Templestowe, Warrandyte & Wonga Park between 2010 and 2014. Current sewerage works in Donvale are expected to be completed at end of 2019 and Park Orchards is subject to an onsite domestic wastewater trial.

Figure 3: *Septic system components in various stage of construction/installation*

MANNINGHAM

3. Context, aims and objectives

3.1. Policy and planning context

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 to manage domestic wastewater systems. It links 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

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

- Council's *Healthy City Strategy 2017-2021* (Municipal Public Health and Wellbeing Plan)
- *Strategic Water Management Plan 2008* - identifies Councils DWMP as a key document in managing impacts on storm water in Manningham.
- 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 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.
  - Restrictions on titles where effluent disposal envelopes exist. These restrictions are enforceable through Section 173 Agreements.

Figure 4: *Lay-down of sub-surface irrigation*

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 5,000 litres of effluent per day.

Treatment systems that are designed for and/or produce more than 5,000 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 lodgment process with the EPA.

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

EPA State Environment Protection Policy (Waters) 2018

Clause 28 – Subdivision Applications

Refers to Councils responsibilities in considering applications for subdivision and onsite domestic wastewater management systems. Councils must ensure reticulated sewerage or an alternative system is provided where sewage can be sustainably managed and dispersed within the property boundaries over the system's lifetime, Councils also need to ensure permits are consistent with EPA guidance and the Code of Practice - Onsite Wastewater Management.

Clause 29 - Domestic Wastewater Management Plans

Refers to Councils obligation to develop and implement a DWMP that identifies the public health and environmental risks associated with the septic systems; and sets out strategies to minimise those risks.

It also outlines the consultation process and review process every 5 years and internal audit requirements every 3 years.

Clause 30 - Sewerage Planning

Refers to Sewerage Planning and where a DWMP identifies reticulated sewerage (or an alternative system) as a management option to meet community needs, the relevant water corporation must prepare a response that identifies the preferred solution, how this fits in with the waste hierarchy, outlines costs, strategies and timelines for implementation and justifies the preferred solution.

Clause 31 - Connection to Sewerage

Applies to properties that cannot contain wastewater on the property, owners must connect to the sewerage system and the relevant water corporation can require the owner to connect in accordance with Section 147 of the Water Act 1989. The EPA may provide written advice to the water corporation that discharges pose a risk.

Available at: https://www.epa.vic.gov.au/about-us/legislation/water-legislation/water-related-policies

EPA Code of Practice Onsite Wastewater Management – Publication 891.4 July 2016

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 storm water drain should connect to reticulated sewerage when it is available. Eliminating offsite flows of wastewater and raw greywater to storm water 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

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.

Section 147 also gives water corporations the power to require a property to connect to sewer under certain conditions.

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

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.

- AS/NZS 139 - Safety signs for the occupational environment
- AS/NZS 1546.1: On-site domestic wastewater treatment units — Part 1: Septic Tanks
- AS/NZS 1546.2: On-site domestic wastewater treatment units — Part 2: Waterless composting toilets.
- AS/NZS 1546.3: On-site domestic wastewater treatment units — Part 3: Aerated wastewater treatment systems.
- AS/NZS 1546.4: Greywater Treatment Systems (noting that this standard is yet to be ratified)
- AS/NZS 4130: Polyethylene (PE) pipes for pressure applications.
- AS/NZS 1319: Safety signs for the occupational environment.
- AS/NZS 3500 [set]: Plumbing and Drainage.
- AS/NZS 1547: On-site domestic-wastewater management.
- AS/NZS 2698 - Plastic pipes and fittings for rural applications.
- AS/NZS 3000 - Wiring rules, electrical installations, buildings, structures and premises.

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

4. Domestic Waste Water Framework

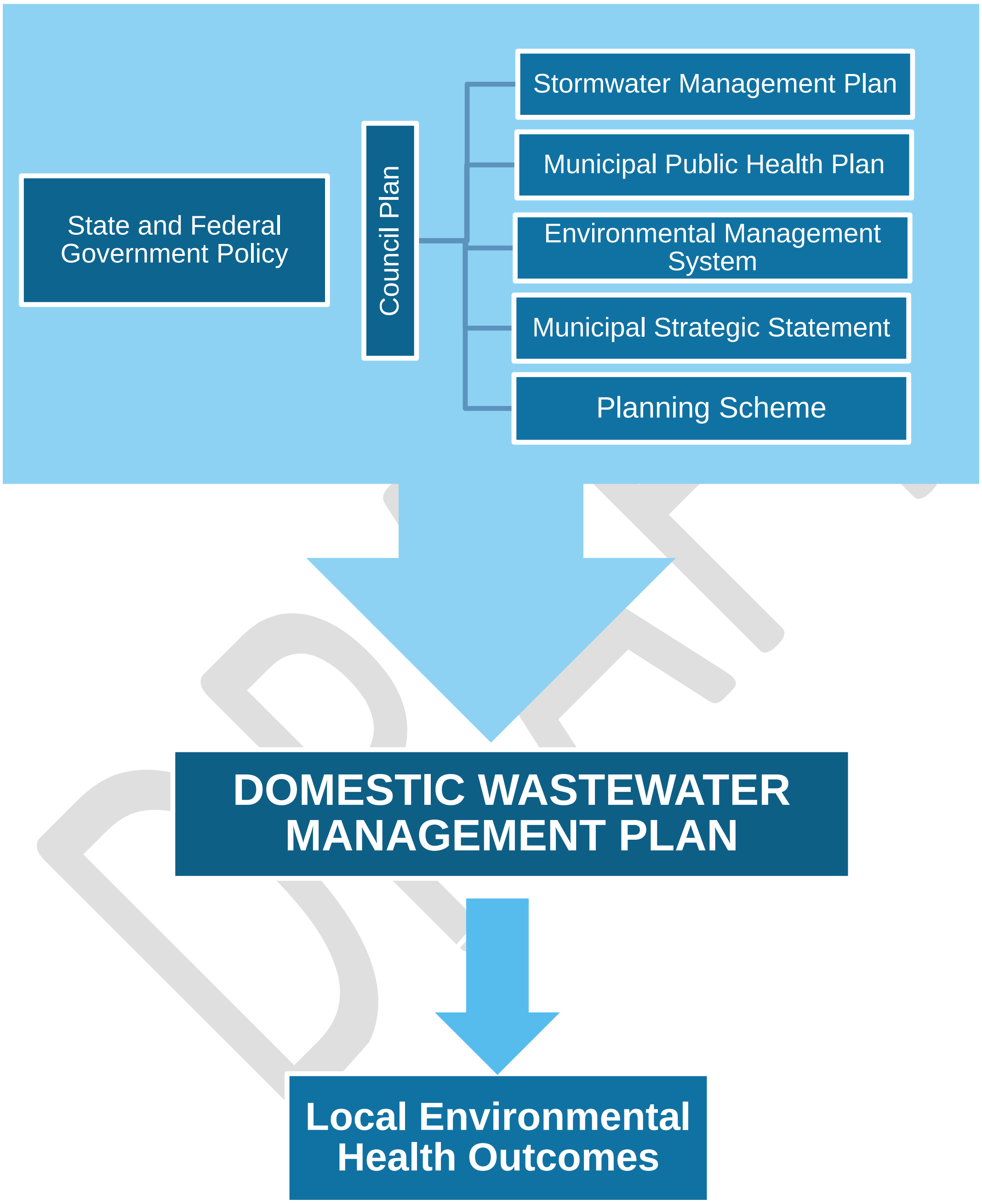

Chart 1 – Domestic Wastewater Framework

4.1. Aims

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

- Improve and protect public health;
- Promote the principles of environmental sustainability by reducing the impacts of domestic wastewater on local creeks, steams and remote receiving environments;
- Continue to engage with property owners on septic tank management and ongoing maintenance responsibilities;
- Identify properties that would benefit from an alternative sewerage solution and refer these to YVW for inclusion onto their Community Sewerage Program;
- Advocate on behalf of the community to ensure they have the same access to sewerage infrastructure (reticulated or onsite solutions) as the rest of the Melbourne population.
- Support YVW in applying their powers of enforcement granted under S.147 of the *Water Act 1989* (connection to sewer) for properties that continue to discharge to stormwater.

4.2. 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.

Figure 5: *Local resident of waterway*

5. Management

5.1. DWMP Stakeholders

External stakeholders

- Yarra Valley Water (YVW)
- Environmental Protection Authority (EPA)
- Melbourne Water
- Department of Environment, Land, Water and Planning (DELWP)
- Department of Health & Human Services (DHHS)

Internal stakeholders

- Council's GIS/GPS team
- Statutory Planning
- City Strategy, Environment Team
- Integrated Planning

5.2. DWMP Project Team

Table 4: *Project team roles*

ROLE	POSITION
Project Manager	Coordinator Environmental Health
Project Development Officer	Team Leader Environmental Health
Project Field Officer	DWMP Project Officer
Technical Advisors	Environmental Health Officers 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.

6. Planning Approach

6.1. 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:

Table 5: *Generic Domestic Wastewater Risks*

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

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6.2. Inspection Program Outcomes

As of July 2019, 4,731 properties have received 1 or more septic system assessments. The total number of inspections on record since the program commenced in 2003 exceeds 10,500. This includes follow up of non-compliant systems, responding to complaints and assessing new installations.

Of the 4,731 properties assessed, 2,429 septic system components (48%) were found to be unsatisfactory (a property could have one or more components identified as failing). Out of all these properties 56% were disposing off-site.

2,147 septic tanks (88% of failing systems) have been rectified and are considered to be operating effectively or have connected to the available sewer (793 properties). 282 properties (6%) remain unsatisfactory and require repair or connection to sewer if available.

6.2.1. Initial issues

The main issues found when the inspection program was initially rolled out generally related to:

- Grease traps missing baffles resulting in grease and food particles entering storm water systems.
- Effluent disposal fields saturated and / or ineffective at distributing effluent resulting in effluent flowing overland.
- Plumbers bypassing defective septic system components and sending it to storm water as a cheaper option to repairing a defective system.
- Septic system Infrastructure buried / hidden under ground.

6.2.2. Ongoing and current issues

The current and ongoing issues found during and after the inspection program related to:

- Sand filter blockages from tree roots (general maintenance required)
- Treatment plants not being serviced as no service contract in place
- Properties failing to desludge the septic tank every 3 years
- Redirected / bypassed irrigation systems offsite.
- Flush valves and inline cartridge filters being tampered with.

Figure 6: *Burst dripper line and septic effluent flowing over footpath*

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6.3. Reticulation Areas

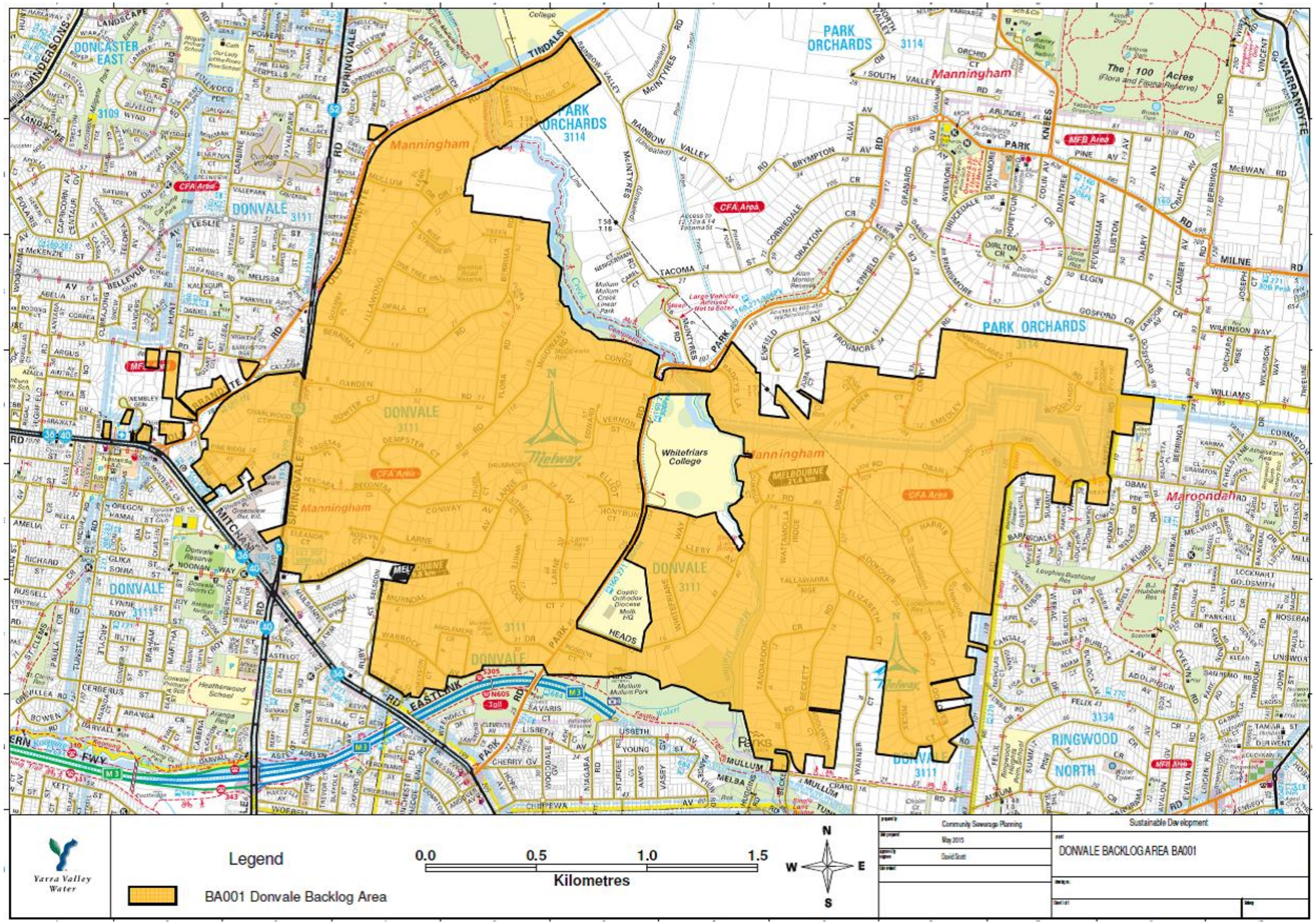


Figure 7: Donvale RA0041A (completion scheduled late 2019)

MANNINGHAM

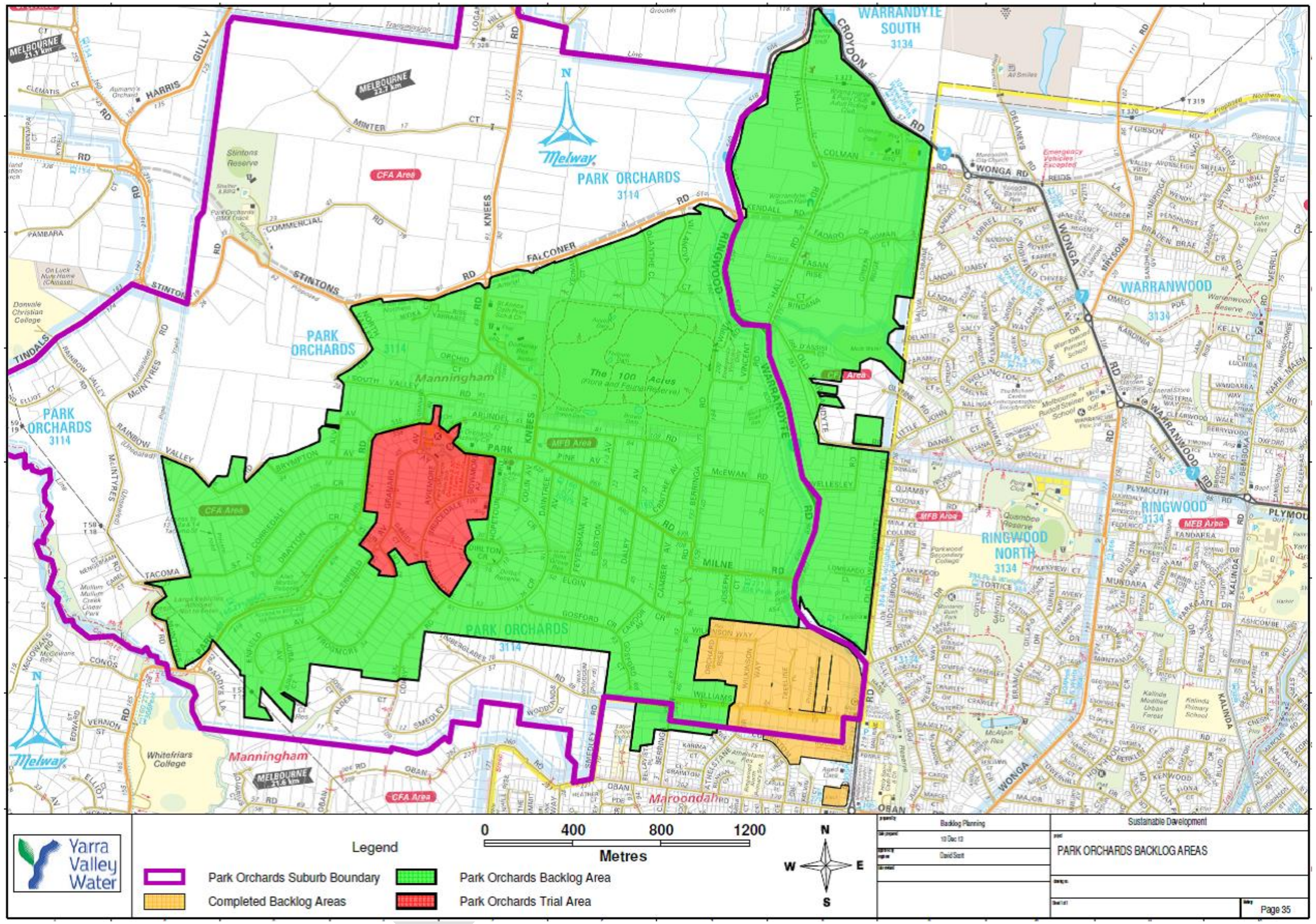
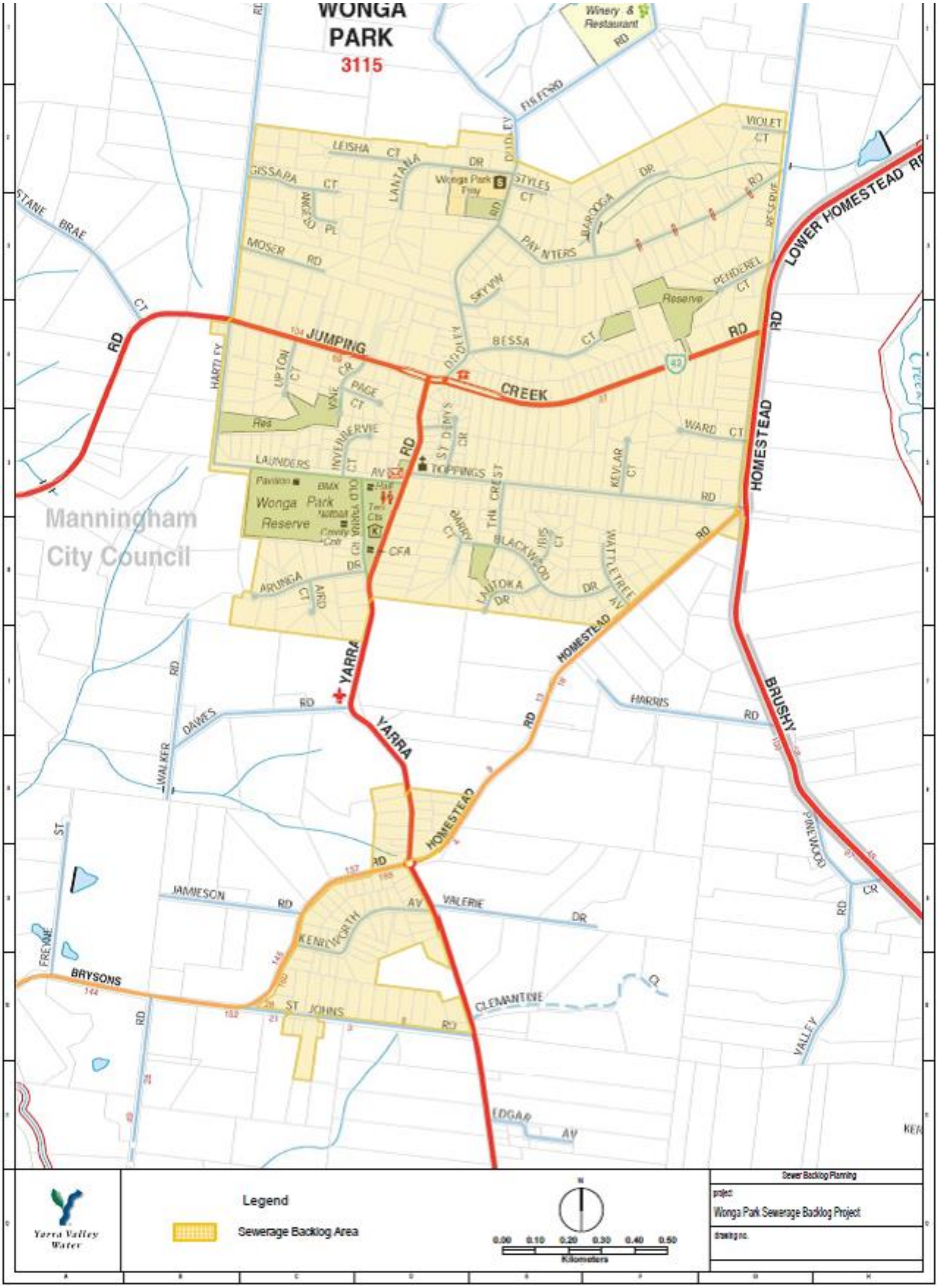


Figure 8: Park Orchards RA0039 (onsite containment trial currently in progress)

Figure 9: Wonga Park RA0005 A & B (declared available)



The image below shows Councils GIS overlay of septic systems in use. GPS is used to capture the exact location of system components (indicated by various pink symbols). The orange circles represent properties connected to sewer.

Figure 10: GIS overlay of septic system components in use (Donvale RA0041A)

7. Actions

7.1. Development and Actions since Implementation

7.1.1. Electronic Database

- 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.
- GIS compatible hand held database capable of recording in-field assessments.
- GPS tools capable of accurately recording the in-ground location of system components for each property. Figure 10 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.

7.1.2. Communication and Educational Strategies

- Communications strategy to inform residents of the DWMP process and their obligations to ensure effective system operation.
- Information sessions for Manningham City residents.
- 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 / 3 year desludge.
- Development of *Unsewered News* to assist in the dissemination of information to owners operating a septic system.

7.1.3. Compliance Approach

- 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.
- Community Local Law relating to owners septic tank responsibilities.
- Enforcement process to assist in the management of owner responsibilities.

7.1.4. External Liaison

- Submission of data into Yarra Valley Water's Community Sewerage Prioritisation Process.
- Participation in the Working Group and Steering Committee for the Park Orchards on-site trial (facilitated by YVW).
- Education and assistance provided to other Councils developing their DMWP.
- Presentation of issues and outcomes of Manningham's DWMP at professional association conferences and seminars.

7.2. Strategies for the Future

STRATEGY	TARGETS	RESOURCE
Assess septic systems participating in the Park Orchards trial to ensure effective on-site containment and system operation.	December 2019	DWMP Project Team
Targeted inspection program for properties that are not on a sewerage backlog program (perform a 2nd assessment).	Ongoing	DWMP Project Team
Facilitate the repair / upgrade of systems identified as defective through a reminder and enforcement program. Particular focus on properties not programmed for sewerage services.	Continuing	DWMP Project Team
Continue to roll out a regular maintenance reminder program for all properties utilising a septic system with respect to annual service contract and 3 yearly desludge requirements.	Ongoing	DWMP Project Team
Continue to produce an annual *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
Participate in DELWP's Steering Committee in response to Victorian Auditor General's Office report into *Managing the Environmental Impacts of Domestic Wastewater*	Ongoing	DWMP Project Team
Update educational materials (septic system operation and maintenance) to better reflect current issues.	Ongoing	DWMP Project Team
Support YVW in forcing properties discharging off-site to connect to the available sewer.	Ongoing	DWMP Project Team
Continue to advocate for the inclusion of high risk properties onto YVW's Community Sewerage Program (properties discharging from site and within close proximity to sewerage infrastructure).	Ongoing	DWMP Project Team

Continue to participate in Yarra Valley Water's trail of on-site solutions for the Park Orchards Community Sewerage area in accordance with key objectives outlined in the Memorandum of Understanding April 2016.	Ongoing	DWMP Project Team
Perform water analysis on local creeks and rivers and monitor quality indicators.	Quarterly	DWMP Project Team
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.	Ongoing	DWMP Project Team
Liaise with Statutory Planning Department regarding System Types, Effluent Disposal Requirements and Planning Requirements.	Ongoing	DWMP Project Team

Table 5. *Strategies for the future*

Figure 11: *Flooded irrigation field and a deeply buried distribution pit (legacy system)*

8. 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 will continue to advocate for improved sewerage services in Manningham and 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.

APPENDIX ONE

Background Research

1. 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 123,000 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, the general topography of the area and open space, habitat and fauna links. 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).

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.

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. In April 2015, the number had reduced to 3,669 and in July 2019, 3,222 were still in operation. This equates to 1,430 properties connecting to the available sewer since 2011.

Within this number, there are approximately 12 different combinations that make up the various types of septic systems with approximately 56% of septic systems within the municipality discharging off-site into our local creeks and rivers. The 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.

Table 2.2 (page 6) provides an important overview of septic systems and change in use since 2011.

Current estimates for the provision of reticulated sewerage to Donvale is due for completion in late 2019 which will result in a large number of properties connecting and no longer operating septic systems.

The trial of onsite solutions (septic system upgrades) in Park Orchards is anticipated to conclude at the end of 2019 when a decision as to the best servicing solution will be made shortly thereafter.

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 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* 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 by type

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 following table:

CODE	TYPE OF SYSTEM	USEAGE	NO. IN USE APRIL 2015	JULY 2019
1. TP/AGL	Treatment Plant with Absorb / Transpiration Trenches	1990 onwards (still used)	170	136
2. TP/SI	Treatment Plant with Surface Irrigation	1997 onwards (still used)	110	91
3. TP/SSI	Treatment Plant with Sub Surface Irrigation	1997 onwards (still used)	398	464
	Ozikleen systems: OKAGL / OKSI / OKSSI	2006		
	Biolytix systems: BLTAGL / BLTSSI	2005		
4. SF/AGL	Sand Filter with Absorb / Transpiration Trenches	1990 onwards (still used)	360	329
5. SF/SI	Sand Filter with Surface Irrigation	Approx. 1997 - uncommon	5	4
6. SF/SSI	Sand Filter with Sub Surface Irrigation	1997 onwards (still used)	54	74
7. AW/AGL	All Waste to Absorb / Transpiration Trenches	1968 onwards (still used)	357	321
8. AW/WF	All Waste to Worm Farm contained on site		5	7
9. AW/RB	All Waste to Reed bed contained on site	1992 - not used often.	6	5
10. TP/DIS	Treatment Plant discharging off site*	1975 - Nov 1998	130	117
11. TWOAT	Toilet Waste Only to Absorption / Transpiration Trenches*	1996 WC Composting AW biolytic film - not used often. 1950's No longer used	811	672
12. SF/DIS	Sand Filter Discharging Off Site*	1970 to 1998.	1263	1,002
TOTAL			**3,649**	**3,222**

*Highlighted system types 10, 11 & 12 are types that discharge either treated effluent or untreated greywater to storm water.

Table 6: Waste water systems by type

MANNINGHAM

1.4. Installation Trends

The following data has been collected for the period 1994 through to 2019 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	2015 2019	Total
TP/AGL	5	4	5	15	17	18	8	79	18	16	9	**194**
TP/SI	2	2	7	24	30	25	18	68	5	0	0	**181**
TP/SSI	0	1	0	2	2	8	8	136	187	67	125	**536**
SF/AGL	26	33	39	34	34	28	14	73	47	34	34	**396**
SF/SI	0	0	0	0	1	1	0	2	4	0	0	**8**
SF/SSI	0	0	0	0	0	0	0	3	37	18	32	**90**
AW/AGL	9	3	7	4	5	4	3	51	44	25	8	**163**
Worm Farm	0	0	0	0	0	0	0	4	3	3	0	**10**
Reedbed	0	0	3	5	0	0	0	1	3	0	0	**12**
TP/DIS	20	21	20	5	0	1	0	3	3	0	0	**73**
TWOAT	0	0	0	1	0	1	0	27	178	0	0	**207**
SF/DIS	24	21	11	3	1	0	0	46	71	0	0	**177**
TOTAL	**86**	**85**	**92**	**93**	**90**	**86**	**51**	**493**	**600**	**163**	**208**	**2,047**

Table 7: Installation trends

All permits issued between 1994 and 2001 were obtained from permit books no longer 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 20 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-catchments

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 storm water 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 16km, with the final 10km 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 100mm 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 de-stabilised, 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.

Figure 12. *Mullum Mullum Creek Park Orchards*

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:

Toilet Waste Only Systems on reduce flush

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.

All Purpose Systems

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 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 macro-invertebrate 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 9km 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 25cm, 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 in-stream activities including straightening, de-snagging and toe destabilisation, 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 sub-catchment

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 storm water 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 storm water 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. 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. Changing Legislation

The Environment Protection Authority direction requires that all new properties must contain all wastewater within the boundaries of the property (EPA Bulletin No. 629).

The Environment Protection Act 1970 (EP Act) sets out the approval process for onsite wastewater systems with flow rates less than 5000 L/day, and Council can only issue a ‘permit to install/alter’ for system types that have been approved by EPA.

Previously the EPA provided approvals through a Certificate of Approval process. After a reform its administration of the onsite wastewater program, the EPA removed the requirement for individual treatment systems to hold a Certificate of Approval (CA), instead, now approving only ‘types’ of systems in line with Australian Standards 1546.1 to 1546.4. The four approved types are:

- AS/NZS 1546.1: 2008 – On-site domestic wastewater treatment units – Septic tanks
- AS/NZS 1546.2: 2008 – On-site domestic wastewater treatment units – Waterless composting toilets
- AS 1546.3: 2017 – On-site domestic wastewater treatment units – Secondary treatment systems*
- AS 1546.4: 2016 – On-site domestic wastewater treatment units – Domestic greywater treatment systems.

Treatment system brands and models must be certified by an accredited conformity assessment body (CAB) as conforming to the relevant AS. This accreditation is given by the Joint Accreditation System of Australia and New Zealand. EPA then collates these certificates of conformity and maintains a list of the valid certificate holders against each system type.

Council’s responsibility is then held with administering the responsibilities and permit conditions issued for the approved systems installed within its Municipality.

5. Modifications and Alterations to Properties

It is 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 private 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;
  - i. does not know the location of the septic system,
  - ii. does not realise he/she is living in an unsewered area, or
  - iii. uses a private building surveyor who is unaware that the property is in an unsewered area, or is unaware of the permit requirements in relation to altering a septic system.

6. Information Management

6.1. Inaccurate Records

In the past, there were several factors that influenced 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 TWO

Waterwatch

1. Waterwatch

The Manningham Waterwatch program is a citizen science initiative that supports local communities to monitor the health of our local waterways. In Manningham, a network of community volunteers have initiated a municipal wide water quality monitoring program. The program aims to connect local communities with waterway health and sustainable water management issues. Waterwatch monitoring has been done in Manningham for over 10 years across 20 different sites. Waterwatch volunteers repeat their monitoring over consecutive months and years, and as a result trends in waterway condition have been detected particularly in catchments where new sewer services have been made available to local residents.

1.1. Ruffey Creek

Waterwatch groups have been monitoring Ruffey Creek at 3 monitoring sites including Ruffey Lake, King Street and Dellfield Drive since 2007. Initially (prior to 2012), Waterwatch data identified that highly polluted stormwater was impacting the creek between King Street and Dellfield Drive. With the completion of the new Templestowe sewer service in 2012, the water quality of Ruffey Creek improved quickly at Dellfield Drive. This likely indicates a decline in household wastewater impacting on Ruffey Creek.

1.2. Andersons Creek

Waterwatch monitoring in Andersons Creek indicates that the creek is being impacted by highly polluted stormwater discharging from the majority of the stormwater drains. The continuous nature of the stormwater discharge, even outside of rainfall, and the associated milky white colour, strong sewer-like odour and foamy consistency suggests that the discharge is likely to have originated as household waste water. Measurements of Ortho-phosphorus, electrical conductivity and ammonium, particularly in the upper parts of the catchment, are measured as highly degraded and can regularly exceed the limits of the Waterwatch equipment. Waterwatch data indicates that the creek is at its most polluted at the top of the catchment and improves with ground water dilution as the creek flows through the Warrandyte State Park.

Figure 13: *Algal bloom, Andersons Creek*

MANNINGHAM

1.3. Mullum Mullum Creek

Waterwatch monitoring in Mullum Mullum Creek indicates that the water quality of the Creek deteriorates quickly after it enters the Manningham municipality. To determine what is impacting the creek Waterwatch volunteers established monitoring sites upstream and downstream of every stormwater discharge drain between Beckett and Park Roads. Monitoring results indicate that the water quality typically deteriorates after each stormwater drain. The rapid decline in water quality and the sharp increase of nutrient pollution indicates that household greywater from the 1,575 split greywater systems in the catchment is adversely impacting on the water quality of the creek. Continued Waterwatch monitoring of these sites will help assess the expected improvement to the water quality of Mullum Mullum when the new sewer service arrives in the coming years.

1.4. Jumping Creek

Jumping Creek provides a characteristic semi-rural catchment reference site against which Brushy, Ruffey, Andersons and Mullum Mullum Creeks can be compared. The water quality of Jumping Creek is rated as “Good” under the ANZECC water quality guidelines.

1.5. Brushy Creek

Waterwatch monitoring in Brushy Creek clearly indicates a reduction in nutrient pollution since the completion of the Wonga Park sewer service in 2012. Continued Waterwatch monitoring of Brushy Creek will confirm if this water quality trend will continue.

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

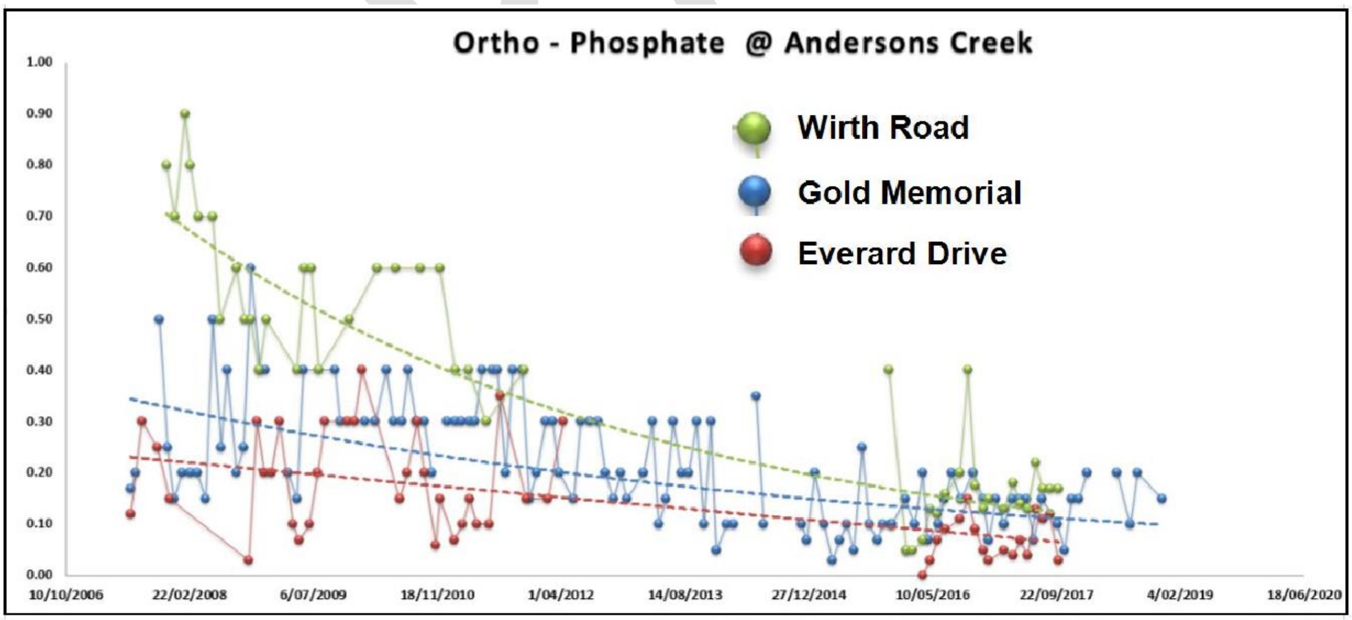


Figure 14. Andersons Creek Ortho-phosphate levels

2. Water sampling results

Water sampling has been conducted by the DWMP team 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.

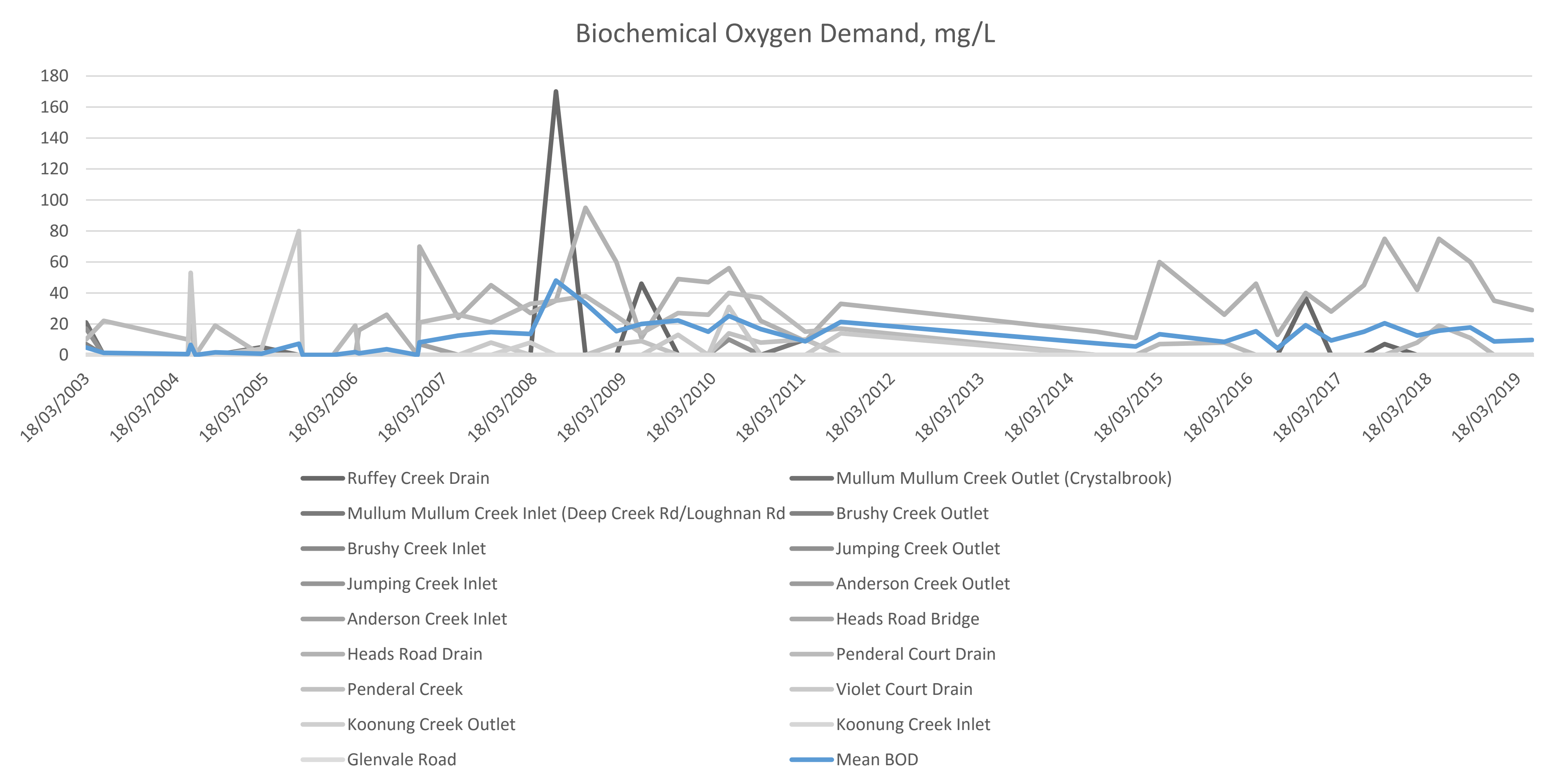
Although not conclusive, there appears to be an improvement in water quality results for the Penderal Court Drain and Creek and the Violet Court Drain compared to water sampling performed in previous years. The Penderal and Violet Court Drains are located in the Wonga Park backlog areas RA0005A & RA0005B where approximately 489 properties (88%) of properties have connected to sewer since 2013.

68 properties have not connected, 42 of which discharge to stormwater.

An improvement in the quality of the Ruffey Creek Drain has also been observed in recent years.

MANNINGHAM

Figure 15: BOD by date and location



MANNINGHAM

Figure 16: Suspended Solids by date and location

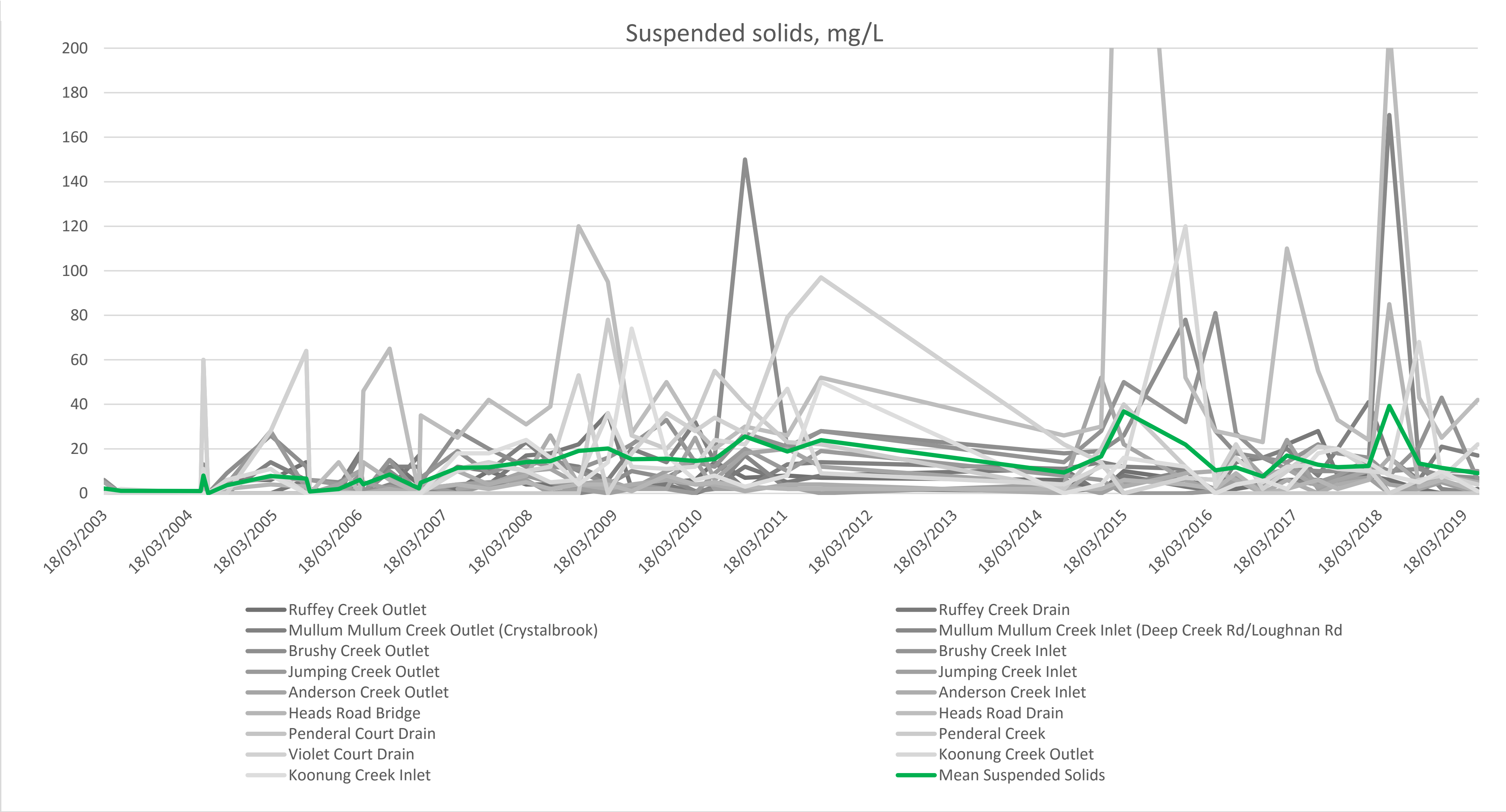
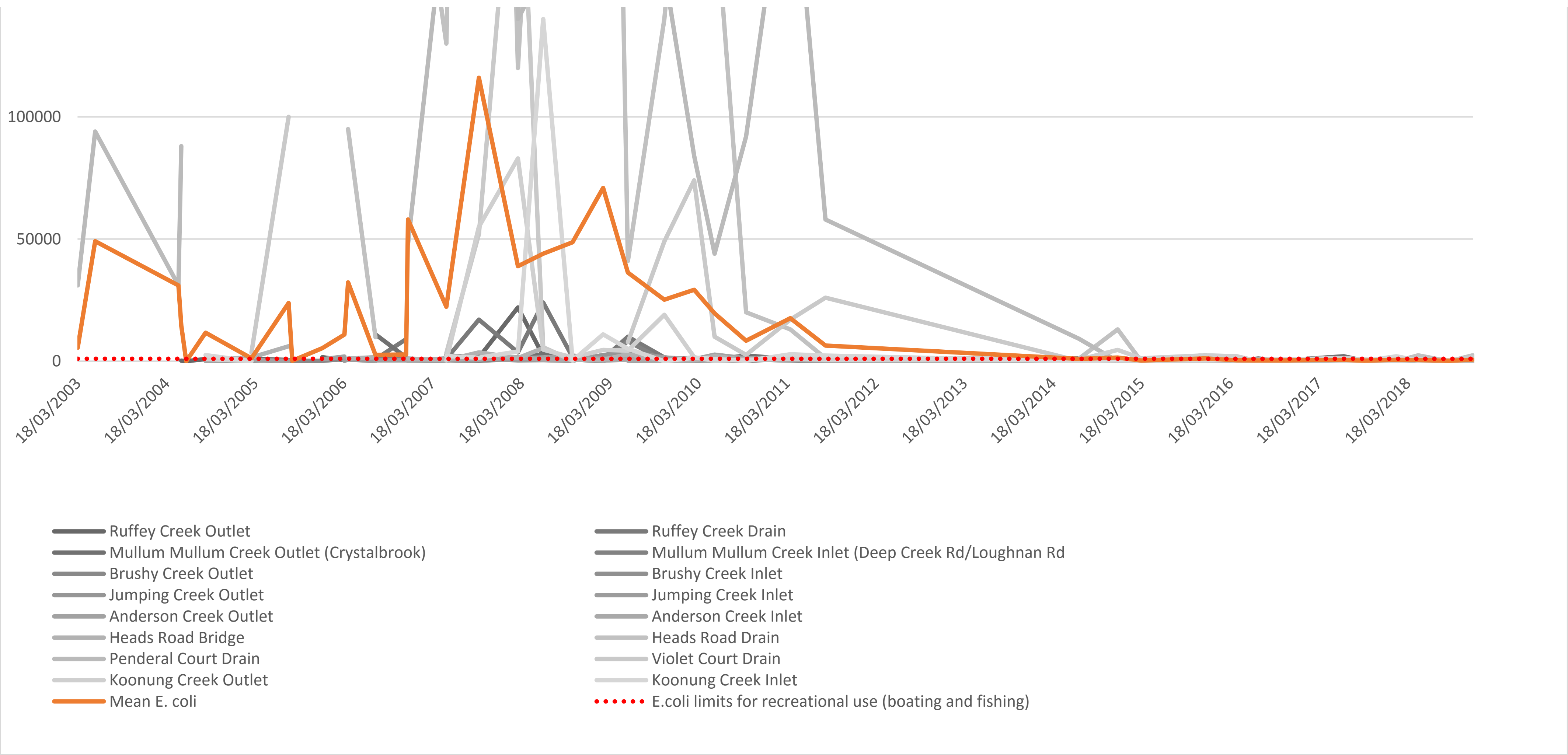


Figure 17: E.coli by date and location



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APPENDIX THREE

Onsite management or reticulated sewer

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1. Onsite management or reticulated sewer

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 $15,000 to $20,000 per system.

Ongoing maintenance costs (depending on the type of system) are approximately $380 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 $1,671.36 (in 2019/20).

YVW have reviewed and suspended the application of this charge for recently constructed areas, including Donvale. The future of the contribution charge will be reviewed as part of an overall review into the Community Sewerage Program funding approach and connections rates strategy.

Connection to sewer includes an annual service charge of $458.26 as of 1 July 2019 (charged quarterly). Sewerage disposal fees are charged at $1.1426 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 can be found on Yarra Valley Waters website under 'Fees and Charges https://www.yvw.com.au/help-advice/help-my-account/understand-my-bill/fees-and-charges

There may also be power costs to run a pump for those properties connected to a pressure sewer. Costs are approximately $40-$70 per year.

Owners are 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 and can be between $3,000 to $6,000 on average.

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 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

MANNINGHAM

APPENDIX FOUR

Operating and Maintaining Septic System

2. Operating and Maintaining Septic Systems

The following table outlines all the maintenance requirements for septic systems and links to the community local law.

Table 8: *Septic system operating requirements*

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

MANNINGHAM

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.
11. WC/AGL (split system)	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.

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