



## The Nexus of Stormwater and Septics

**Mr Matt Pilcher<sup>1</sup>, Ms Lynze Cheung<sup>2</sup>**

*<sup>1</sup>Yarra Ranges Council, Lilydale, Australia, <sup>2</sup>Monash University, Australia*

### Overview

Yarra Ranges Council (Council) in partnership with Melbourne Water and Monash University is investigating the risks and impacts to beneficial uses of waterways from septic tank systems (STS); including greywater and blackwater discharges that may enter the stormwater network. The impact and extent of septic discharge conveyed to waterways via stormwater drainage is an under researched yet long standing issue. Pathogen and nutrient pollution from STS could be transported through stormwater networks into waterways and WSUD features, posing risks to ecological and recreational values, plus potential WSUD maintenance issues.

The study area included Warburton, Launching Place and Yarra Junction. Detailed spatial mapping of catchment characteristics was undertaken accompanying local knowledge and ground-truthing in prioritising monitoring sites. Monash University conducted monitoring for microbial and chemical indicators of STS discharges. A leading-edge Microbial Source Tracking (MST) technique was used to determine the bacterial community fingerprints from regionally specific faecal contamination sources (sinks).

Current results are positive for waterway and human health based on National Health and Medical Research Council (NHMRC) 2008 and State Environment Protection Policy (SEPP) guidelines. However, some sites had high *E. coli* and Enterococci levels (>150MPN/100mL), possibly associated to recent rainfall events and holiday periods.

The findings suggest STS discharge into informal stormwater drainage as dry-weather flows were effectively treated before reaching waterways. However, a few sites indicated potential STS contamination through formal drainage. Upcoming MST will inform contamination source.

### Objectives

- To assess the interaction between septic systems and stormwater
- To determine if leakage from STS is polluting stormwater and minor tributaries
- Understand the septic pollution risk profile across townships along the Yarra River in relation to key water quality elements (ecosystem health, recreation areas, drinking water)

### Method

Spatial mapping and site assessments identified:

- Engineered catchments (using drainage network)
- Number and age of property (to inform septic age)
- Distance to stormwater drain or waterway
- Directly Connected Imperviousness (DCI %)
- Number of septic outlets connected into formal or informal drainage

Eight sampling sites were identified through risk mapping; four sites were within stormwater drains, four within minor tributaries and one a control site. Dry weather sampling was conducted bi-monthly with testing adhering to national and international standard methods for water quality, including:

- TN,TP, TSS & heavy metals
- Chemical analysis
- microbial (E. coli, total coliforms, Enterococcus & human bacteroidales and
- DNA sequencing, quantitative Polymerase Chain Reaction (qPCR) and high throughput MST techniques (see Appendix)

#### Results

The site assessments revealed majority (80%) of septic discharge and greywater outlets were directly connected to informal drainage, within the analysed catchments. Results indicated all sites were within tolerances of recreational and stormwater water quality (NHMRC, 2008a&b). Faecal indicator organisms (FIO) (E. coli, Enterococci and total coliforms) results revealed most sites were below recreational guideline levels. The overall trends for nutrient data was below SEPP guidelines for TN, TP and TSS. However, some site specific variation was noted; the results for January identified three sites (including a stormwater outfall near swimming hole) with very high readings for E. coli, Enterococcus and pollutant loads (including heavy metals). It is likely these results were influenced by a combination of peak holiday period with increased township occupation and high rainfall 24 hours prior to sampling.

#### Conclusions

Current findings suggest that leakage from STS could be sufficiently treated through informal drainage, precluding rainfall events. Imminent MST and DNA sequencing results will specify the nexus between human contamination from septic systems and formal stormwater drainage. The multiple lines of evidence approach, through various testing techniques will clarify the distinction of whether the contamination was human or otherwise; this informs robust management decisions including:

- health risk management
- WSUD installations
- prioritisation of future sewerage connections
- STS upgrades

#### References:

NHMRC 2008a, Guidelines for managing risks in recreational water, Australian Government

NHMRC 2008b, Australian Guidelines for Water Recycling: Managing Health and Environmental Risks – Phase 2, Australian Government