Real-time monitoring, pollutant loads and dynamics in Port Phillip and Western Port catchments

The Research Project

Background

The health of Port Phillip and Western Port Bays depends upon the management of pollutant loads carried by stormwater runoff within the catchments draining into the Bays. Estimating these pollutant loads and understanding the dynamics of pollutant generation, transport and transformation processes are critical to inform management actions and meet statutory reduction targets. Given significant and growing investment in stormwater treatment across the Greater Melbourne area, and the fragile health of the Bay ecosystems, an accurate characterisation of pollutant load dynamics is vital, but challenging to achieve.

Data collection is resource intensive, pollutant transport can be highly skewed to large and infrequent storm events, spatial variation is significant across the estimated 11,000 km² area of the catchments, and pollutant transformations can occur moving downstream. These complex dynamics require a carefully targeted monitoring program that delivers sufficient and accurate data, within finite available resources.

The project will involve conducting water quality monitoring and detailed process studies at multiple sites across the Port Phillip and Western Port catchments. It will also involve working closely with Melbourne Water and regular reporting of findings.

The student will join the Urban Water research group within Monash University’s Civil Engineering Department, working with and alongside other research students and staff working in areas that include Water Sensitive Urban Design, Green Infrastructure, stormwater harvesting, water quality and public health, as well as exposure to the diverse research undertaken within the broader Department. Facilities include the award-winning Living Laboratory and the Environmental and Public Health Microbiology Lab.

The project will be commencing in mid-2020.

Research questions

- What are the key sources of contaminants within the catchment, and key processes that govern their transport and potential transformation?
- How do contaminant concentrations and loads vary temporally and spatially?
- What are the optimal monitoring program requirements to estimate pollutant loads with minimum uncertainty, yet within the confines of available resources? Use of the data for input to models such as Source and MUSIC is also an important consideration.
- How can we quantify the impact of Best Management Practices (such as riparian revegetation, vegetated filter strips, constructed wetlands, biofiltration, rainwater tanks, porous pavement etc.) or other pollution reduction measures on load reduction?

Methods

A literature review will be undertaken to canvass the available literature and determine critical knowledge gaps for the focus of the PhD study. The project will involve significant field work collecting water quality data during both baseflow conditions and wet weather events, and autosamplers will be used for sample collection. Field work will include calibration and maintenance of sampling
equipment, sample collection and delivery for laboratory analysis, and the collection of additional data for detailed process-based studies. Laboratory-based work will also be conducted for the analysis of certain pollutant samples (such as pathogens). Statistical and data analysis will also be a key component of the project.

**Expected outcomes**

By completion of the project you will gain a strong understanding of

- How to design and conduct a robust water quality monitoring program that delivers data that has a high degree of accuracy and precision, and is targeted to meet the program objectives
- The key drivers and sources contributing to pollutant loads within the Port Phillip and Western Port catchments
- The physical, chemical and biological processes that occur within a catchment and its waterways that influence water quality
- Spatial and temporal heterogeneity in pollutant loads and processes
- Statistical and data analytical tools used in the assessment of water quality data and the associated uncertainty

The student will also gain skills in research report and journal paper writing, and opportunities to present their work to peers, Melbourne Water and at conferences.

**Candidate Requirements**

Up to 2 PhD positions are available.

Applications are sought from students with a H1 (first class or equivalent) honours Bachelor degree or Masters degree in a range of relevant discipline areas including Environmental, Civil or Chemical Engineering, Chemistry or Environmental Science. Applicants will also need to meet the University’s minimum English language proficiency requirements for admission to the PhD program ([https://www.monash.edu/graduate-research/faqs-and-resources/content/chapter-two/2-2](https://www.monash.edu/graduate-research/faqs-and-resources/content/chapter-two/2-2)).

Applicants should have a strong interest in environmental science, water quality, waterway health and pollutant processes, and enthusiasm for field-based work.

**Remuneration**

Three year tenure full-time - $29,000 tax-free with the opportunity for up to $10,000 tax-free top up funding, and the possibility to earn up to $10,000 (taxed income) with tutoring work.

**Application Process**

Please include your curriculum vitae (CV) and official academic transcripts and degree certificate or testamur from the awarding institution. A covering letter outlining your interest and suitability for the project is recommended.

Proof of citizenship and proof of meeting the English language proficiency requirements will be required at a later stage in the application process.

**More Information**
Please contact Dr Emily Payne (emily.payne@monash.edu) or Assoc Prof David McCarthy (david.mccarthy@monash.edu) for further information.

**Closing date for applications:**

Applications close 20\textsuperscript{th} April 2020.