W4 Monitoring Water Quality: Review and refining our long-term water quality monitoring network to support waterway management under a changing climate.

Objective(s)

This project will review the suitability of the water quality network to meet Melbourne Water's current and expected future needs and optimise future data collection through site selection and integration of a range of sampling methods and measurement frequency.

Why this research is important

The waterways long-term ambient water quality monitoring network (the network) has been operating since the 1970s to detect long-term trends across the Greater Melbourne region. The network currently monitors physicochemical parameters at 134 sites and draws on a long historical dataset.

Since establishment, the design and uses of the network have changed in many ways, as have many contextual factors (such as urbanization, agricultural practices and climate). Reviews of the network have confirmed the value of network for management of the waterways in the region but also identified opportunities to significantly increase the benefits to Melbourne Water and stakeholders. These recommendations include undertaking a review of the network's ability to deliver on key goals and develop proposed improvements to redesign the network, which is the purpose of this research project.

Contribution to Key Research Areas

- Water Quality:
  Developing improved water quality indicators and monitoring methods to better understand the impacts of pollutants on waterway health.

Approach

This research will be delivered through a PhD project by Vaughn Grey (to September 2025) and then in Vaughn's ongoing Melbourne Water role as Senior Scientist Catchments & Waterways, Service Futures. It will require a review of international best practices, detailed interrogation of the existing datasets, the collection and analysis of additional waterways WQ samples and/or further modelling where required. Within the overarching intent to design an efficient and effective monitoring program, the network review will describe the advantages and disadvantages of any options that may emerge to alter the cost of delivering the program in the future. More specifically, the project will:

- Develop methods to accurately use data collected from the network
- Understand the role of individual monitoring sites
- Develop methods to allow catchment-wide understanding of water quality
- Investigate the development of HWS performance objectives for environmental water quality

Key outputs

- Assessment of how water temperature has changed across the region over the past 30 years (period 1992 - 2021)
- Methods to accurately detect trends and site means of stream water temperature with long-term data
- A method for estimating daily streamflow at all stream reaches across the network
- A geostatistical model for predicting water quality at all stream reaches across the network
- A method to optimize the sampling network to meet multiple needs, including spatial coverage

Expected benefits

- Identification of management actions to address historical and anticipated future warming of stream temperatures
- Robust methods for interpretation of the data collected from the long-term water quality monitoring network, allowing certainty in interpretation and provision of reliable "water quality products" to key stakeholders
- The ability to predict water quality at sites that are not part of the network
- Optimization of the network through the provision on information on the relative importance of individual monitoring sites and identification of additional monitoring locations most likely to provide valuable information
- Knowledge to inform the development of a MERI / adaptive framework for the network and environmental water quality performance objectives for the next HWS

For more information

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