# Exploring Unseen Threats: Contaminant Trends and Impacts in Port Phillip and Westernport Bays Round One Results Summary Report August 2025

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https://www.marineandcoasts.vic.gov.au/grants/port-phillip-bay-fund

Front cover photographs and credits: Sheepwash Creek looking out to Port Phillip Bay (Credit: Daniel McMahon)

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**Acknowledgment of Country**

We respectfully acknowledge the Traditional Custodians of the unceded lands and waters on which we conduct this project; the Bunurong, Wadawurrung and Wurundjeri, Woi wurrung and Boon wurrung language groups of the eastern Kulin Nations. We pay our respect to their Ancestors and Elders, past and present and recognise their ongoing connection to lands, waters and culture.

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***Exploring Unseen Threats: Contaminant Trends and Impacts in Port Phillip and Westernport Bays*** is an innovative program bring together communities, government agencies and scientists to better understand the risks that everyday contaminants pose to the health of estuaries and bays.

Contaminants of concern are chemicals that can cause significant harm to aquatic ecosystems and human and environmental health due to their toxic, persistent, and bio-accumulative properties. These substances enter waterways from a wide range of sources, including households, industry, agriculture, urban runoff, and wastewater discharges.

Port Phillip and Westernport Bays and their estuaries hold immense ecological, social, and economic value. However, they face growing threats from population growth, urbanisation, pollution, and climate change. Estuaries, which connect freshwater ecosystems with the bay, act as the main conduits transporting contaminants from catchments to coastal waters. As urbanisation and climate pressures intensify, these fragile systems come under increased stress. Understanding water quality in estuaries and the bays is therefore of critical importance to local, state and federal agencies, given the direct links between environmental health and the economic, social, environmental and cultural values they support.

The widespread use of chemicals in everyday life is contributing to water pollution and ecosystem stress. Thousands of different chemicals are in use today, many of which can accumulate in the environment and affect aquatic communities even at very low concentrations. Key groups of contaminants of concern include, but are not limited to:

- **Pesticides:** compounds designed control, prevent, eliminate, suppress, or repel pests, including insecticides (insect control), herbicides (weed management), fungicides (for fungus control), rodenticides (rodent control), growth regulators, miticides (mite control), and molluscicides (control snails and slugs). While effective in both urban and agricultural environments, even small amounts can harm sensitive aquatic species such as fish and amphibians and may accumulate in the food chain.
- **Pharmaceuticals:** Drugs used in human and animal medicine, such as antibiotics, antidepressants, pain relief medications and hormones. These can persistent in waterways, disrupting the behaviour, reproduction, and survival of non-target organisms.
- **Personal Care Products (PCP):** Ingredients in cosmetics, soaps, sunscreens, and cleaning products. PCPs can enter aquatic systems, where they accumulate and affect marine life. For example, microplastics can be ingested by fish and other organisms, allowing them to enter the food chain.

Despite the potential risks, there is little comprehensive information about the types and levels of contaminants in our estuary and bay surface waters, or about their ecological impacts. Identifying contaminants and hotspots is essential for guiding effective management and setting priorities for action.

The ***Exploring Unseen Threats*** project, funded by the Department of Energy, Environment and Climate Action (DEECA) through the Port Phillip Bay Fund and Melbourne Water/RMIT University through the Aquatic Pollution prevention partnership (A3P), seeks to address this knowledge gap. The program combines the scientific expertise of RMIT University's Aquatic Environmental Stress Research Group (AQUEST) and the Aquatic Pollution Prevention Partnership (A3P), the National Measurement Institute (NMI), and Melbourne Water's Research and Modelling Team, together with the support of volunteer organisations including the Port Phillip EcoCentre, Estuary Watch, the Werribee Riverkeeper Association, and local citizen volunteers to investigate the occurrence and potential impacts of contaminants used in everyday processes within our estuaries and bays,.

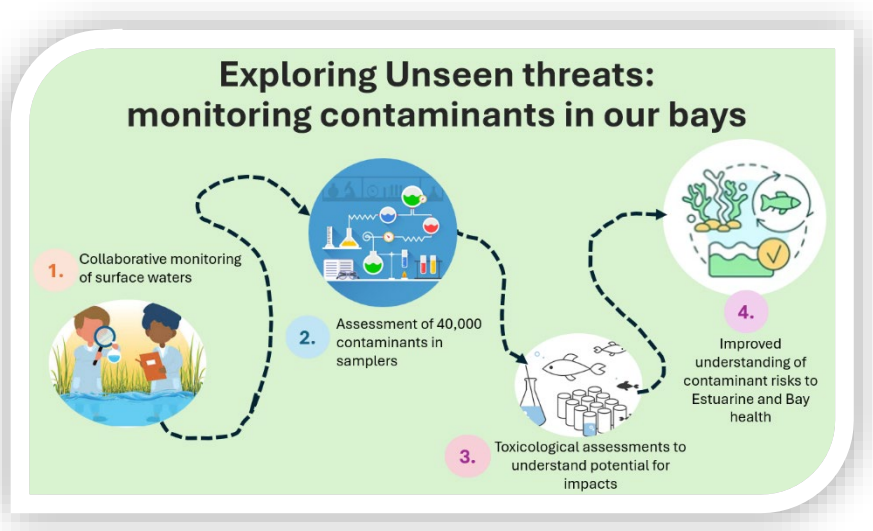
Over the next three years, the project will:

- Monitor contaminants across estuaries and bays
- Generate essential data on contaminant types and concentrations
- Assess potential impacts on ecosystem health and
- Engage the community in hands-on monitoring and learning opportunities.

By working with citizen scientists, the project builds local knowledge and awareness of estuary and bay health, while also generating critical data to support evidence-based decision-making. This information will guide strategies to protect and restore estuaries and bays, safeguarding the environmental, social, and economic values they provide.

This report presents:

- A brief project outline
- A summary of volunteer engagement and participation
- Project progress to date
- Contaminants detected and where they are found across 34 estuaries in Round One (Dec 2024–Jan 2025)
- How results will inform future monitoring
- Insights into the unseen threats facing Port Phillip and Westernport bays and their estuaries.



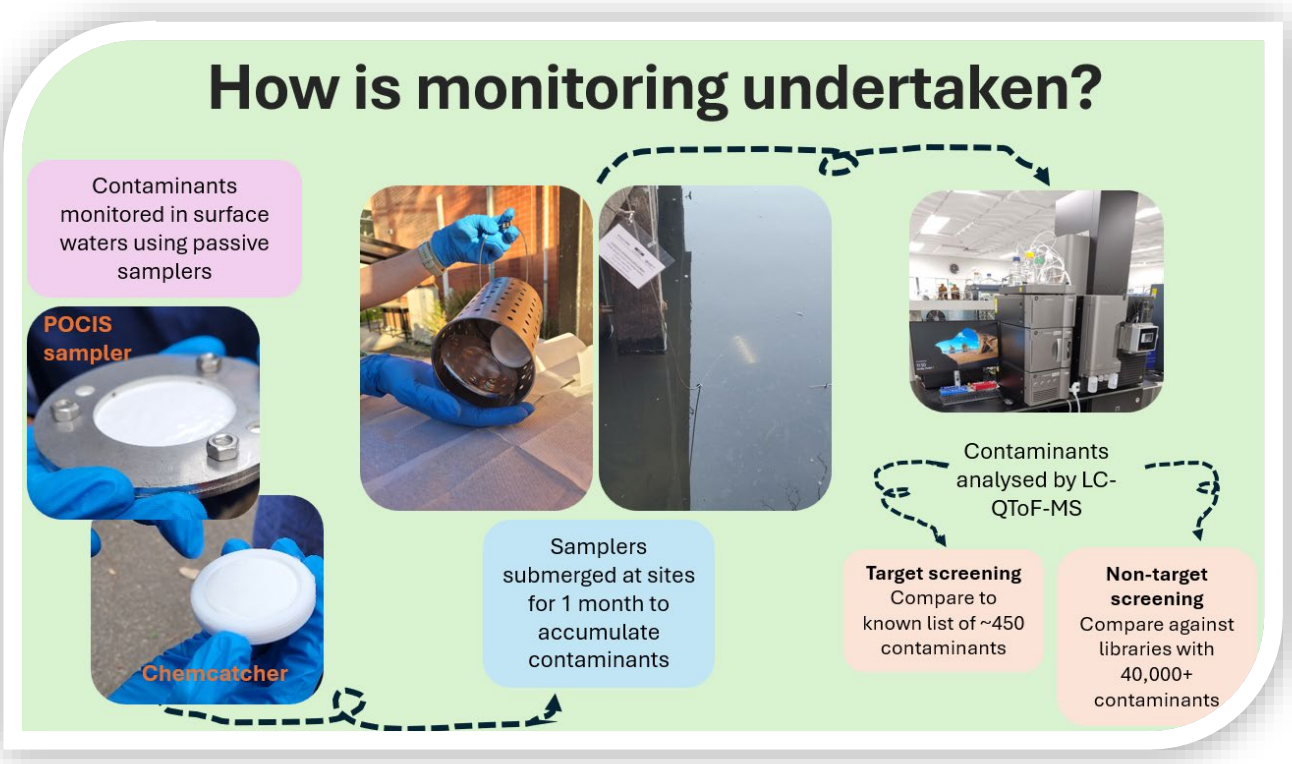

*The Exploring Unseen Threats Program*

# HOW IS MONITORING UNDERTAKEN?

The monitoring program aims to assess contaminants in the surface waters of our estuaries and bays. To achieve this, we are utilising specialist sampling equipment known as passive samplers, along with a unique chemical analytical method capable of detecting up to 40,000 different contaminants.

Passive samplers are environmental monitoring devices that employ a collection medium, such as filter paper or powder, to accumulate chemical pollutants from water over extended periods. This method contrasts with grab sampling, which involves collecting a water sample at a single point in time. Passive samplers are submerged underwater for several weeks to months, during which they absorb chemical contaminants. After this deployment period, they are retrieved and analysed to identify the contaminants they have accumulated, providing valuable insights into the presence of various pollutants in our estuaries and bays.

For this project, we are using two types of passive samplers: POCIS (Polar Organic Chemical Integrative Sampler) and Chemcatcher. The Chemcatcher consists of a thin, paper-like membrane, whereas the POCIS sampler uses powder held between two porous filter papers. Each sampler captures different contaminants based on the chemical properties of its medium. By deploying both types, we aim to collect comprehensive data on the types and relative levels of a broad range of contaminants present in the water.




*The Sampling Process*

# 2024-25 PROJECT REACH

Our first year has been an exciting journey of science, community, and discovery. Together, we've completed two rounds of sampling across Port Phillip Bay and Western Port, starting to build a picture of the unseen contaminants in these vital waterways.

### Round 1 sampling

The project launched in December 2024, with samplers deployed at 34 estuary sites—18 in Port Phillip and 16 in Western Port. After 4 weeks in the water, they were retrieved in January 2025, marking the very first step in uncovering contaminant trends across our bays (Figure 1).


*Figure 1: Sampling sites for Round 1.*

### Round 2 sampling

In June 2025, samplers were deployed at 20 estuary sites -16 in Port Phillip and 4 in Western Port. In addition, samplers were deployed at 3 bay sites (Figure 2). These were retrieved in July and are currently awaiting analysis (Figure 2).


*Figure 2: Sampling sites for Round 2.*

**Volunteer Participation**

At the heart of this project is community involvement, and the response has been inspiring. More than 60 people registered their interest to contribute, with many taking part in training and fieldwork.

***In Round 1***, the AQUEST team at RMIT led the first deployments, but the community was already stepping in. Eight volunteers joined us at four sites to help retrieve samplers. Training sessions, delivered both online and in-person, were well attended, with 36 volunteers joining live and others engaging online afterwards.

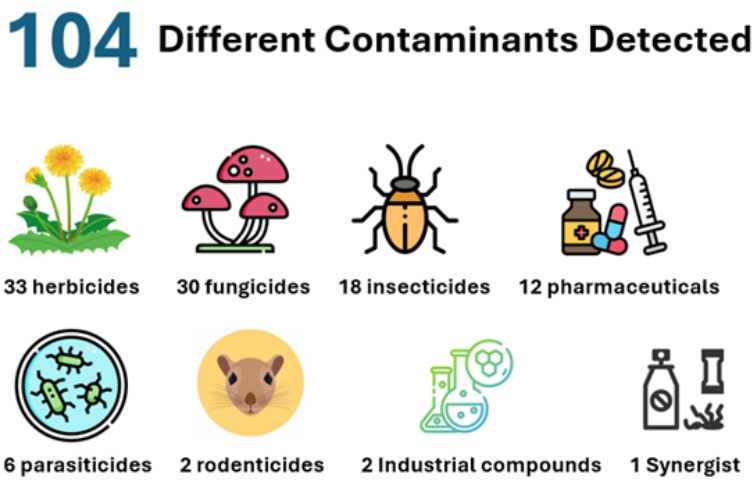
By ***Round 2***, volunteers had become central to the program. Equipped with their new skills, 30 participants took on the responsibility of deploying and retrieving samplers at 15 estuary sites. The remaining sites were managed by AQUEST staff and, in the case of bay sites, by Melbourne Water staff to ensure access and safety requirements were met.

This shift from staff-led sampling in Round 1 to volunteer-led work in Round 2 highlights one of the most powerful outcomes of the project so far: local people are not only contributing to research but are also building the skills and confidence to take action in caring for their estuaries and bays.

*Retrieving samplers at Skeleton Creek estuary July 2025*

# ROUND 1 RESULTS

These results cover **Round One sampling only**. Processing each set of samples takes several months in the laboratory, and with Round Two samples only recently retrieved, the analysis for that round is still underway.

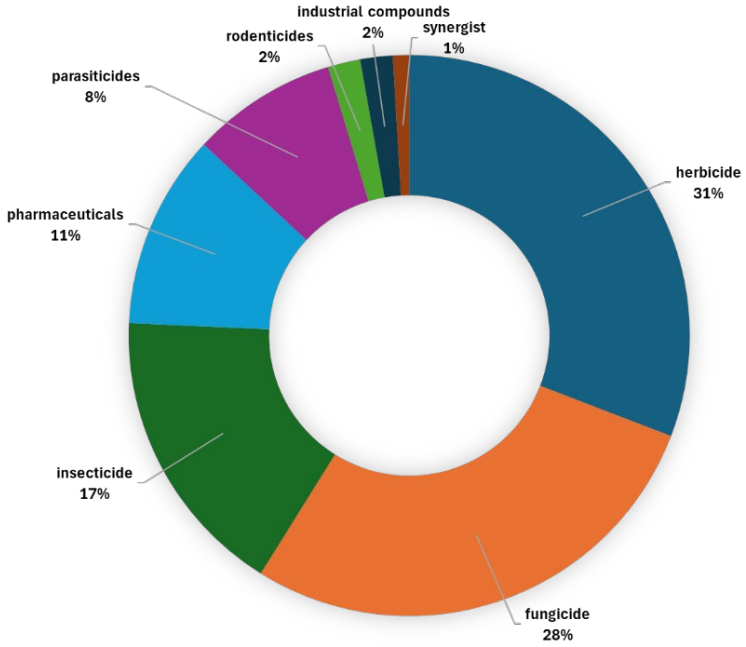



From the targeted screen of **450 contaminants**, a total of **104 different chemicals** were detected. These included a wide variety of compounds such as pesticides, pharmaceuticals, industrial chemicals, and chemical additives.

Both types of samplers used in the study picked up similar numbers of contaminants, although the specific chemicals detected varied between them.

When we look at the frequency of detections across sites, clear patterns emerge. The most commonly detected contaminants were **fungicides and herbicides**, which dominated the top results (Figure 3). The ten most frequently detected chemicals, all belonging to these groups, were:

- **Tebuconazole** – a fungicide commonly used on cereals, fruits, vegetables and turf.
- **Carbendazim** – a fungicide used to control fungal diseases in pulses and timber products.
- **Simazine** – a herbicide often used to control weeds in agricultural and urban areas such as in orchards and along roadsides.
- **Propiconazole** – another fungicide, widely applied on turf, timber products, cereals, and fruit crops.
- **Diuron** – a herbicide used in agriculture and also for weed control in non-crop areas.




- **Azoxystrobin** – a fungicide used on cereals, vines, and many horticultural crops.

- **Metolachlor** – a herbicide applied to agricultural crops such as maize and pastures, and in urban and industrial settings such as home gardens and roadsides.
- **Atrazine** – one of the most widely used herbicides worldwide, used in agriculture and forestry.
- **Flutriafol** – a fungicide used in cereals and other broadacre crops.
- **Propazine** – a herbicide not registered for use in Australia, likely a legacy item.

Each of these were present in at least **30% of the sampled sites**. Figure 4 shows the full range of detection frequencies, from the most common chemicals, found at 65% of sites, to those detected less frequently, at as low as 1% of sites (see inset in Figure 4).

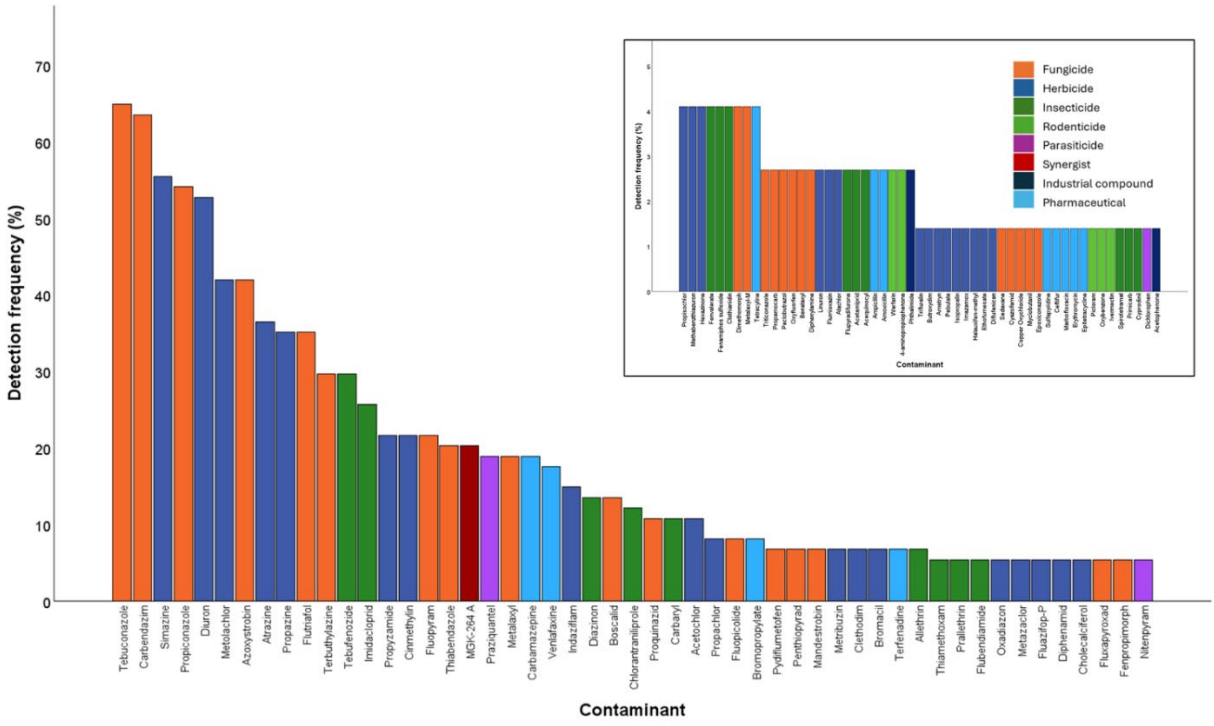



*Figure 4: Pesticides detected in samples during Round 1 monitoring (Dec 2024- Jan 2025).*

It is important to note that the targeted screening method is focused mainly on pesticides. The list has been built over time, with a strong focus on herbicides, fungicides, and insecticides, and to a lesser extent pharmaceuticals. Because of this design, pesticides are more likely to appear in our results than other types of contaminants. This does not necessarily mean that pesticides are the only contaminants present, or even the most significant, it simply reflects the way our target screen has been set up.

To address this limitation, we are undertaking a much broader untargeted screen of 40,000 contaminants. Unlike the targeted screen, this approach is not biased towards any one group of chemicals. Instead, it casts a wide net, giving us the chance to detect new or unexpected contaminants that may be entering our waterways. These could include ingredients from everyday products, such as sunscreen chemicals, cleaning products, or industrial compounds. This type of testing is more complex and time-consuming, but the payoff is substantial: any regularly occurring contaminants identified through this broader scan will be added to our target list. Over time, this will make our monitoring program more balanced, comprehensive, and representative of the true mix of chemicals potentially affecting our estuaries and bays.

Another important finding is that contaminants rarely occur in isolation. At individual sites, mixtures of chemicals were detected, ranging from 6 to 33 different contaminants (Figure 5). Seven sites contained more than 25 chemicals; these sites were typically located in catchments dominated by industry or intensive agriculture. In contrast, three sites with catchments that had minimal human impact contained fewer than 8 contaminants (Figure 5). This highlights how land use and human activity in surrounding catchments strongly influence the number and diversity of contaminants entering our estuaries and bays.

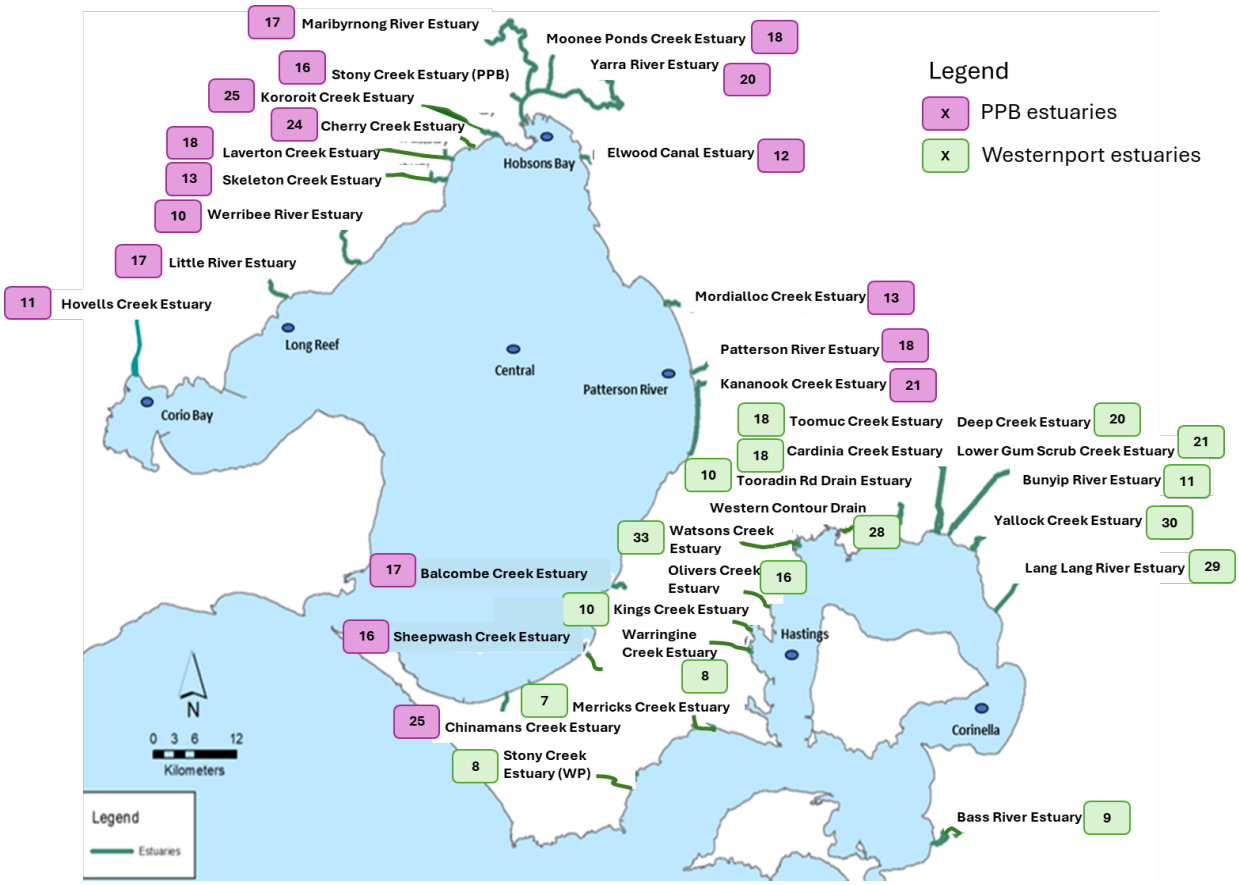



*Figure 5: Number of contaminants detected by estuary in Round One (Dec 2024- Jan 2025).*

**Key Insights from Round One**

- **104 different contaminants** were detected from the initial screen of 450.
- **Herbicides and fungicides dominated** the results, with 10 chemicals found in at least 30% of sites.
- **Contaminants often occur in mixtures**, with some sites containing over 25 chemicals.
- **Land use matters**: sites in industrial and agricultural catchments had more contaminants than sites with minimal human impact.
- A broader **40,000-contaminant screen** is the next step, which will expand monitoring beyond the current pesticide-focused approach.
- Results provide an indication of the **presence of contaminants** rather than concentrations

# NEXT STEPS

With two rounds of sampling now complete, the project is well underway. These early stages are providing valuable insights, but much more lies ahead. Over the next three years (2024–2027), we will continue with three rounds of sampling each year, alongside workshops and training activities to share knowledge, build skills, and discuss findings with the community and stakeholders.

## So what's next?

**Conduct the broad screen for 40,000 contaminants on round one samples.**

The immediate priority is the broader contaminant screening of Round 1 samples. While these samples have already been analysed for our target list of 450 contaminants, a much larger screen against the library of 40,000 contaminants is still to come. This type of analysis is rarely undertaken and has involved some technical hurdles, but the information it will provide will be invaluable. Results from the broad screen will guide future monitoring, allowing any new and regularly occurring contaminants in Port Phillip Bay or Western Port to be added to the standard list, ensuring that subsequent sampling rounds are more targeted and effective.

**Round two sample analysis**

Processing of Round 2 samples is also progressing. Initial preparation has been carried out at the RMIT AQUEST laboratory in Bundoora, and once the broad screen is complete and the updated target list finalised, these samples will be analysed at the National Measurement Institute. A small number of samples were compromised in the field, either being exposed to air or tampered with, but these have been prepared for analysis, and any impacts on the results will become clear once testing is completed.

**Volunteer Feedback and In-person Training**

Volunteers remain central to the success of the project, and their feedback will be sought to ensure that involvement is as straightforward and rewarding as possible. Insights into what is working well, and where improvements can be made, will help refine how future rounds are organised and supported. To further strengthen participation, in-person training sessions will be offered ahead of the third sampling round in October 2025. These sessions will provide opportunities for new volunteers to join, as well as a chance for those who missed earlier training to get involved.

**Round 3 sampling (Year 1)**

The third sampling round, scheduled for late October to late November 2025, will follow a similar process to Round 2. Volunteers will once again coordinate deployments and retrieval, supported by AQUEST and Melbourne Water staff where specialist access or safety considerations are required. This round will also include the collection of water samples during retrieval, which will be used in the project's first toxicological tests, marking an important next step in understanding ecological impacts.

**Stakeholder workshop and Education Resources**

Looking further ahead, the project will hold its first stakeholder workshop at the Port Phillip EcoCentre in late 2026. This event will bring together volunteers, community groups, agencies, and researchers to share

findings, discuss what they mean, and consider what actions are needed to protect estuaries and bays. Alongside these activities, educational resources such as fact sheets will continue to be developed and expanded to ensure results are shared widely in clear and accessible ways.

## GET INVOVLED

To everyone who has already joined the project - thank you! Your enthusiasm, commitment, and curiosity are what drive this work forward. Every sample collected, every workshop attended, and every conversation shared adds to a growing community that is helping to safeguard the health of Port Phillip and Westernport Bays.

And the journey is only just beginning. If you haven't joined us yet, now is the perfect time. By getting involved, you'll be part of an exciting citizen science effort that is uncovering the hidden impacts of contaminants on our estuaries and bays. You don't need to be a scientist to make a difference - just a willingness to learn, get involved, and care for the places we all value.

There are many ways to participate. You can follow our progress on linkedin/aquest-rmit to stay up to date with the latest news and discoveries. You can register as a volunteer to receive updates, join workshops, and connect with others who share your passion for healthy waterways. Or, if you're ready to roll up your sleeves, you can take part in fieldwork by helping us deploy and retrieve samplers. (For safety and consistency, training is required before joining fieldwork—but don't worry, we'll provide everything you need.)

All the details, including volunteer registration, training resources, and project updates, can be found on our webpage: www.rmit.edu.au/aquest/ppb-unseen-threats

**By getting involved, you'll be helping to uncover the unseen threats to Port Phillip Bay and Western Port, while learning new skills and contributing to the protection of these vital ecosystems.**

# A big thank you for participating in our Exploring Unseen Threats contaminant monitoring project!