



**December
2021**



Marine Sediment Contaminants

A summary of recent monitoring in the Whau Estuary

Overview

Contaminants such as copper, lead and zinc, can accumulate in the sediments of our harbours, estuaries, and beaches. These heavy metals originate from a range of different activities and land uses. They can come from vehicle tyre and brake wear, industrial discharges, and some building materials. When it rains these pollutants are washed into our stormwater networks and waterways, ending up in our marine environment. The build-up of these contaminants can affect ecological health, by reducing the number of animals and/or the diversity of animals living in the sediment. This can have harmful effects on the natural functioning of these ecosystems and result in degraded animal communities that are dominated by few species that are tolerant of higher contaminant levels.

Where we monitor

Auckland Council's 'Regional Sediment Contaminant Monitoring Programme' conducts regular monitoring at around 80 sites across the region, including three sites in the Whau Estuary and one near the estuary entrance. These sites cover the upper, middle and lower reaches of the estuary and are located in the intertidal sand/mud flats. The Whau catchment (the area where all rainfall, streams, and stormwater drain into the estuary) is intensively urbanised and has mixed



The Whau Estuary and catchment.

land uses, with large areas of industrial and residential use, along with pockets of open green space and vegetation.

What we monitor

Monitoring focuses on the key heavy metals associated with urban stormwater, copper (Cu),

lead (Pb) and zinc (Zn), along with arsenic (As) and mercury (Hg).

Concentrations are compared with conservative thresholds developed specifically for the Auckland region, known as the Environmental Response Criteria (ERC). The ERC uses a traffic light system to indicate the contaminant level and associated impact on ecological health, where green indicates a low level of contaminants, amber indicates moderately elevated levels, where adverse effects on ecology may be beginning to appear, and red indicates relatively high levels of contamination, where ecological degradation is likely to be occurring.

Metals	ERC (mg/kg)		
	Green	Amber	Red
Copper	<19	19 - 34	>34
Lead	<30	30 - 50	>50
Zinc	<124	124 - 150	>150
Arsenic	No ERC values		
Mercury	No ERC values		

Environmental Response Criteria (ERC) threshold levels for copper, lead and zinc.

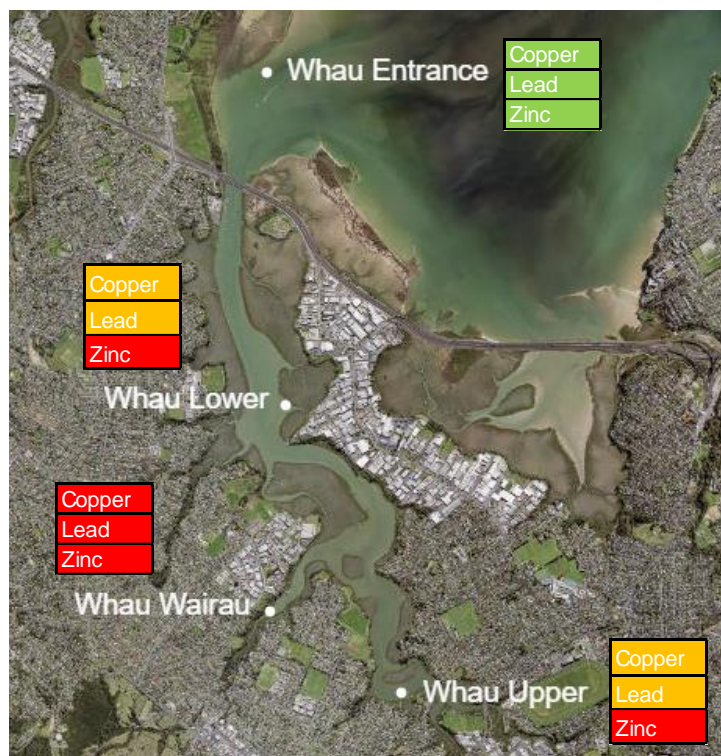
Marine ecology and sediment mud content are measured at all sites in conjunction with sediment contaminant monitoring. Muddy, low energy areas are prone to trapping and accumulating contaminants, and generally have higher metals' concentrations compared to sandier, more exposed sites.

What we've found

Results from 2019/2020 showed a spatial pattern consistent with previous monitoring in the Whau. Low levels of contamination (ERC-green status) were observed at Whau entrance, while sites in the upper reaches of the estuary are more impacted by both mud and contaminants. These sites have at least one metal (Zn) in the ERC-red status, while concentrations of Cu and Pb are at either high or moderate levels. Contamination is highest at the site Whau Wairau, in the upper reaches of the Wairau creek, where Cu, Pb, and Zn, are at levels where they will be impacting the ecological communities that live there. Low levels of contamination at the sandier Whau Entrance site

are likely a result of the site's exposure, receiving higher tidal energy and mixing, helping to remove and dilute pollutants as they enter the Waitematā.

The Whau and its catchment have a long history of industrial and urban use, and over time this has led to an accumulation of heavy metals in the estuarine sediment. This is similar to other intensively developed urban and industrial catchments in Tāmaki Makaurau, such as the Tāmaki Estuary and Māngere Inlet.



Monitoring sites and ERC rating for heavy metal (copper, lead, zinc) concentrations in the Whau in 2019/2020.

The ERC currently has no threshold levels for the metals' arsenic and mercury. However, when concentrations are compared against international guidelines, levels in the Whau remain relatively low (in the 'Green' category), except for one exceedance for mercury at Whau Lower.

Marine ecology monitoring (an assessment of ecological health based on the community of animals living in the sediment) showed grades that are 'marginal' for sites Whau Upper and Whau Entrance, and 'poor' for sites Whau Lower and Whau Wairau. Sites in the estuary are showing some improving trends over time. See the [marine ecology state and trends in Tāmaki Makaurau](#)

report for more detailed information on marine ecology at sites in the Whau.

Changes over time

Sites in the Whau have shown elevated levels of at least one heavy metal (most commonly Zn) since monitoring began in 1998. Overall, changes in metals' concentrations over time have been relatively small, such that contaminant status at most sites has remained largely stable.

More sensitive trend analysis (statistical analysis of the monitoring data to obtain the magnitude and direction of change over time) for data up to 2019 is reported in [marine sediment contaminant state and trends in Tāmaki Makaurau](#). This report shows that two sites in the Whau are exhibiting

long term trends, these are Whau Entrance, where the metals Cu, Pb, and Zn are shown to be increasing, and Whau Upper, where Pb levels are shown to be decreasing. Lead levels have been decreasing at a number of sites across Tāmaki Makaurau, since its large-scale removal from petrol in the mid 90's. The causes behind the increasing trends observed at Whau Entrance are difficult to determine, although may be attributed to an increase in fine sediment (i.e., mud) at this site. This increase in mud may be enough to raise the concentrations of metals, as metals are more likely to adhere to, and accumulate in fine sediment compared with coarser sand. Despite this, current concentrations at Whau Entrance remain at a level where minimal impact on ecology is expected.

Site	Status Cu Pb Zn only	Mud Content %	Total Recoverable metals, mg/kg <500 µm				
			Cu	Pb	Zn	As	Hg
Whau Lower	Zn	89.4	25.1	37.5	163.8	11.3	0.17
Whau Upper	Zn	37.0	27.9	42.7	257.3	9.7	0.127
Whau Wairau	Cu Pb Zn	72.6	41.4	53.4	254.1	12.8	0.142
Whau Entrance		22.44	6.1	10.6	50.2	3.87	0.052

Concentration (mg/kg) and ERC status for heavy metal (Cu, Pb, Zn) concentrations and mud content (% of sediment) at sites in the Whau Estuary in 2019/2020.

Find out more:

For information on what you should keep out of stormwater drains visit:

<https://www.aucklandcouncil.govt.nz/environment/looking-after-aucklands-water/stormwater/Pages/keep-out-of-stormwater-drain.aspx>

Mills, G N and Allen H. (2021). Marine sediment contaminant state and trends in Tāmaki Makaurau / Auckland 2004-2019. State of the environment reporting. Auckland Council technical report, TR2021/10. <https://knowledgeauckland.org.nz/media/2023/tr2021-10-marine-sediment-contaminant-state-and-trends-in-t%C4%81maki-makaurau-2004-to-2019.pdf>

Drylie, T P (2021). Marine ecology state and trends in Tāmaki Makaurau / Auckland to 2019. State of the environment reporting. Auckland Council technical report, TR2021/09.

<https://www.knowledgeauckland.org.nz/media/2018/tr2021-09-marine-ecology-state-and-trends-in-auckland-to-2019.pdf>

For more information or to request data email environmentaldata@aklc.govt.nz.

Technical reports are available on www.knowledgeauckland.org.nz