2024

Coastal Water Quality in Tāmaki Makaurau: Annual Data Summary

Auckland Council's online interactive Water Quality and River Ecology Data Explorer presents State of the Environment (SoE) monitoring data for rivers, lakes, groundwater and the coast. Coastal water quality can be compared across the region, by season, and over time[1].

This report provides a summary of **coastal water quality** monitoring results for **July 2019 to June 2024**.

Key findings

Freshwater inputs drive coastal water quality

- Sites in, or near the entrance of, narrow inlets or rivers in upper harbour and estuary sites experienced the strongest freshwater influence and were the most sensitive to land-derived water quality effects. Water quality was poorest at these sites and generally better at sites with decreasing freshwater influence. Water quality was good towards central and outer harbour sites, with best quality in exposed open coastal sites.

Nutrients are high in some locations

- Nutrient concentrations were higher in the upper Waitematā Harbour tidal creek sites, at Panmure Bridge in the Tāmaki Estuary, the Kaipara River Mouth, and in the Manukau Harbour. More targeted monitoring will be required to better understand ecological impacts of nutrients in our estuaries.

Cyclone Gabrielle affected Kaipara Harbour water quality

- Sampling in the Kaipara Harbour in February 2023 captured some of the effects of Cyclone Gabrielle on harbour water quality. This influenced salinity, temperature, dissolved oxygen and nitrogen at some sites; however effects of the cyclone were not as obvious in other harbours.

[1] This does not include the detailed statistical analysis that is required to assess trends in water quality over time and is reported in our five-yearly State of the Environment reports.

Our coastal water quality monitoring programme

Where	When	How	What
•31 water quality sites. •6 geographical areas including the region's 3 major harbours. •from the upper tidal creeks, over mid-estuaries to open coast.	•Monthly samples •standardised to the outgoing tide. •This report includes the most recent 5 years of data up to June 2024. •This reporting period was affected by COVID 19 lockdowns and extreme weather events leading to data gaps.	•Water quality measured directly at 0.3m depth using a hand held meter. •Bottles of surface water collected and sent for laboratory analysis. •In March 2023 the Waitematā Harbour run order was changed.	•18 parameters of water quality including physical factors, nutrients, and water clarity. •Focus on water quality for ecological health. •For recreational water quality see Safeswim: https://safeswim.org.nz

See the '[Water Quality and River Ecology Data Explorer Methodology]' report for more information on the water quality parameters we monitor, how we collect and analyse samples, how we analysed the data, and how to use the data explorer.

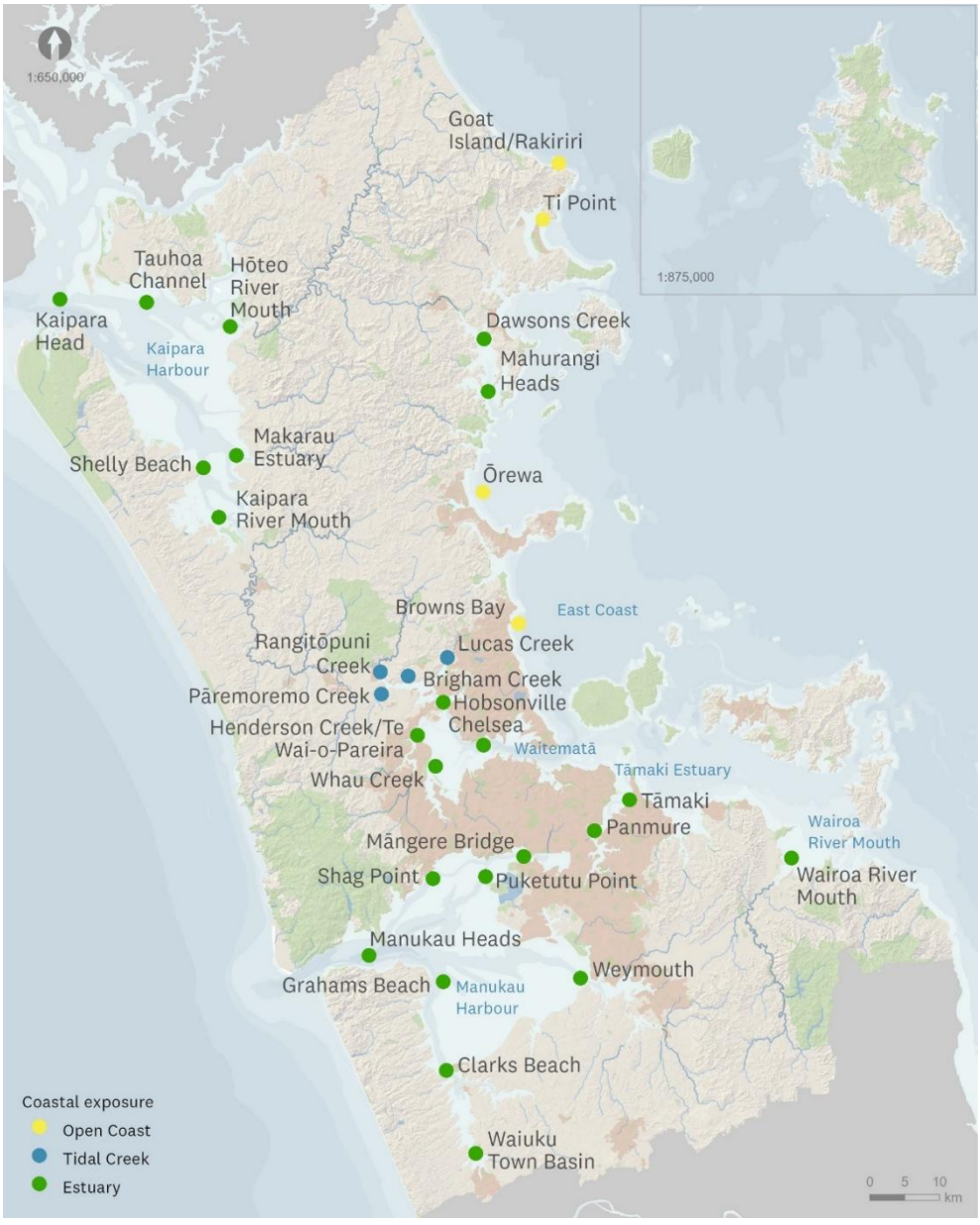

Figure 1: Coastal exposure type and location of sites monitored around the region from 2019 to 2024.

Summary by Exposure Type

Coastal water quality was driven by freshwater influences, which was well reflected when viewed by the exposure type grouping.

Open coast sites exhibited the lowest variability in physical parameters, with stable salinity, typical seasonal temperature ranges (13–23°C), and consistently healthy dissolved oxygen levels (6.5–8.7 mg/L). Nutrient concentrations remained low with minimal fluctuations. Water clarity was high, with low turbidity and chlorophyll *a* levels, indicating clear waters and low primary productivity. However, total suspended solids occasionally peaked above 20 mg/L (max 43 mg/L at Orewa), bringing upper quartile values in line with estuarine and tidal creek sites.

Water quality at the region's 27 estuary monitoring sites varied widely, reflecting diverse geomorphological and hydrodynamic conditions in the estuaries. Upper and mid-estuary sites (e.g., Henderson Creek, Hōteo River Mouth) experienced greater salinity fluctuations than outer estuary sites, closer to the coast (e.g., Chelsea, Grahams Beach, Kaipara Heads). Water temperature ranged from 11 to 24°C, following seasonal patterns. Dissolved oxygen generally remained healthy (>80% saturation, >6 mg/L), though some high-oxygen events occurred (see Manukau Harbour summary).

Nutrient concentrations varied significantly, with the lowest at Mahurangi Heads and the highest at Puketutu Point (close to a treated wastewater discharge), upper harbour sites, and river mouths. No clear seasonal nutrient patterns were identified. Water clarity also differed between sites. Mahurangi Heads had the clearest waters, similar to open coast sites. In comparison to this site, harbour mouths and central estuary sites had slightly higher turbidity and suspended solids. Total suspended solids exceeded 20 mg/L at times and turbidity exceeded 10 NTU, indicating periodically impacted water clarity in these estuarine waters.

Tidal creek sites exhibited the strongest salinity fluctuations, ranging from brackish (0.77–12 ppt) to seawater (~37 ppt). These sites also showed greater variability in all monitored parameters compared to other exposure types. Dissolved oxygen concentrations and pH were slightly lower than at non-tidal creek sites, with occasional measurements below 6 mg/L (min 5.3 mg/L at Brigham Creek), showing a higher susceptibility to low oxygen events compared with coastal and estuarine sites.

Nutrient concentrations varied widely, with the highest concentrations at Rangitōpuni and Brigham Creeks and slightly lower concentrations at Lucas and Pāremoremo Creeks. Median nutrient concentrations in the tidal creeks were comparable to most estuary sites, but upper quartiles of total nitrogen, ammoniacal nitrogen, and total oxidised nitrogen were up to three times higher. Seasonal patterns included peak total nitrogen in spring, lower ammoniacal nitrogen in summer, and elevated total oxidised nitrogen in winter and spring. Phosphorus concentrations at the tidal creek sites were similar to those at estuarine sites, with dissolved reactive phosphorus elevated in summer and autumn (except at Rangitōpuni Creek).

Water clarity parameters indicated turbid conditions, with high total suspended solids and turbidity compared with estuary sites. Chlorophyll *a* concentrations were similar to estuarine sites in the Manukau and Kaipara Harbours, but slightly higher in the central Waitematā Harbour. Seasonal patterns showed that chlorophyll *a* levels were highest in summer, lower in spring and autumn, and lowest in winter.

Summary by Area

East Coast

The East Coast sites displayed minimal freshwater influence and stable salinity from 2020 to 2024. Temperatures ranged seasonally from 11°C to 24°C, while dissolved oxygen (6.5-8.8 mg/L / 91–109%) and pH (7.9-8.4), remained within normal ranges. Nitrogen and phosphorus concentrations were the lowest in the region (e.g. median TN 0.1-0.12 mg/L, median TP 0.009–0.017 mg/L), with slight elevations in oxidized nitrogen at Dawsons Creek, Ti Point, and Goat Island compared with the other sites. Browns Bay showed higher dissolved reactive phosphorus in autumn and winter than other times of the year. Chlorophyll *a* levels were low (median approx. 0.0005 mg/L at most sites), with slightly higher values at Dawsons Creek (median = 0.0012

mg/L). Water clarity was high (e.g. median turbidity below 1 NTU at most sites), with occasional turbidity peaks at many sites in winter and suspended solids in spring. Effects of extreme weather events in early 2023 were not observed during our sampling run in this area.

Upper and Central Waitematā Harbour

Water quality in the Waitematā Harbour followed a gradient, with the upper harbour most affected by land use and freshwater inputs, while this impact was reduced towards the central harbour. Upper harbour sites showed greater fluctuations over time in salinity (<1-37 ppt), temperature (10-24°C), and pH (7.2-8.1), whereas central sites remained more stable (salinity 28-36 ppt, temperature 12-24°C, pH 7.9-8.2). Dissolved oxygen levels were generally healthy (above 70% saturation and 5 mg/L concentration). The lowest values occurred in tidal creeks (5.2 mg/L, 68 % saturation at Lucas Creek), indicating greater susceptibility to low oxygen events. Nitrogen levels were highest at Rangitōpuni and Brigham Creeks, with seasonal spikes, while phosphorus levels remained mostly stable except for occasional increases in spring. Water clarity followed similar patterns, with poorer conditions in the upper harbour and the clearest waters at Chelsea.

Tāmaki Estuary

The Tāmaki Estuary monitoring sites at Panmure Bridge (mid estuary) and Tāmaki (outer estuary) showed differences in water quality. Panmure Bridge experienced stronger freshwater influence, leading to slightly lower pH and higher nutrient concentrations, similar to upper Waitematā and Kaipara sites. Nitrogen peaked in winter, while phosphorus spiked in early 2023 due to heavy rainfall events. Water clarity and primary production indicators, including suspended solids, turbidity and chlorophyll a were also higher at Panmure than Tāmaki. Tāmaki showed greater dilution, with lower nutrient levels. Both sites had similar seasonal fluctuations in temperature (8-25°C) and dissolved oxygen patterns (89–105 % and 6.5–9.6 mg/L).

Wairoa River Mouth

Water quality at the Wairoa River Mouth was within expected ranges from 2020 to 2024. Temperature followed normal seasonal patterns (12–25°C), and salinity was brackish to marine (18–36 ppt), with occasional lower salinity due to freshwater inputs. pH was stable around 8.0, and dissolved oxygen levels showed typical seasonal variation with lowest values in summer (6.9–7.8 mg/L) and highest in winter (7.8–9.1 mg/L). Nutrient concentrations at Wairoa River Mouth were similar to central Waitematā and Tāmaki estuarine sites, with occasional winter nitrogen increases. Water clarity was high, with low turbidity (median 3.8 NTU) and suspended solids (median 7 mg/L). Primary production (chlorophyll a) was consistent with central Waitematā sites and showed no strong seasonal patterns.

Manukau Harbour

The Manukau Harbour showed highest salinity and lowest variability at the harbour mouth (33 ppt), increasing variability toward upper harbour areas and lowest salinity at Waiuku Town Basin (21 ppt). Water temperature was similar across sites, with a slightly wider range in the upper harbour (11–24°C). Nutrient levels were the highest in the region, likely due to discharges from the Māngere wastewater treatment plant and catchment activities. The highest nutrient concentrations were recorded at Puketutu Point and Māngere Bridge.
Supersaturation events for dissolved oxygen (>110%) occurred in the north-east of the harbour, peaking at Māngere Bridge (127%). These events coincided with algal blooms and nitrogen depletion in spring and summer. Similar trends were observed at Waiuku Town Basin and Weymouth but with a less pronounced nitrogen and oxygen response. Water clarity varied widely, with the highest turbidity (21–23 NTU) and suspended solids (60–64 mg/L) at upper and some mid-harbour sites, including Waiuku Town Basin, Māngere Bridge, Weymouth, and Clarks Beach. High chlorophyll *a* levels at most of these sites (max 0.037 mg/L at Māngere Bridge) suggest organic material influenced water clarity.

Kaipara Harbour

Auckland Council only monitors the southern part of Kaipara Harbour. Please contact Northland Regional Council for information on the northern part. Water quality varied between sheltered upper sites (Hōteo River Mouth, Kaipara River Mouth, Makarau Estuary) and exposed mid-to-outer sites

(Shelly Beach, Tauhoa Channel, Kaipara Heads). Upper sites showed greater fluctuations in salinity (12–36 ppt), pH (7.7-8.2), and temperature (12-25°C), while mid-to-outer sites were more stable (salinity 22–36 ppt, pH 8.1-8.4, temperature 13–22°C). Dissolved oxygen remained within normal ranges (saturation above 80% and below 110%, concentration 6.4–9.2 mg/L), but was lower in the upper harbour than outer harbour. Nutrient concentrations were highest at Kaipara River Mouth and Makarau Estuary, with ammoniacal nitrogen levels at Kaipara River Mouth among the highest in the region (median 0.031 mg/l). Water clarity was lower in upper sites, and Kaipara River Mouth showed the highest chlorophyll *a* (median 0.038 mg/L) and suspended solids concentrations (median 22 mg/L) in the region.

Cyclone Gabrielle (February 2023) impacted water quality, with sampling on February 17th capturing sudden temperature and salinity drops (showing increased freshwater input), and spikes in ammoniacal nitrogen at both Makarau Estuary and Hōteo River Mouth. Nitrogen increases which were uncharacteristic for the season were observed, but phosphorus and suspended solids showed minor changes. The event highlights the need for targeted storm event sampling to better understand water quality dynamics.

Find out more:

Visit the Data Explorer: https://environmentauckland.org.nz/Data/Dashboard/456

Read the methodology report: https://www.knowledgeauckland.org.nz/publications/water-quality-and-river-ecology-data-explorer-methodology-supplementary-report/

For more information and data, contact: EnvironmentalData@aucklandcouncil.govt.nz

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