

Key results for the Porirua Harbour Marine Sediment Quality Investigation

Particle size analysis

Sediments of the sites in the Onepoto Arm had a higher proportion of mud (63–98%) than the sediments of the sites in the Pauatahanui Arm (31–71%).

Total organic carbon (TOC)

The sediment of the site off Browns Bay in the Pauatahanui Arm had a slightly lower TOC content than the sediments of the other sites (Fig. 1). Variability in TOC content was low at three of the four sites. However, at the site off Duck Creek in the Pauatahanui Arm TOC content was quite variable and may mean that trend detection will not be as sensitive at this site as it will be at the others, at least for the organic contaminants.

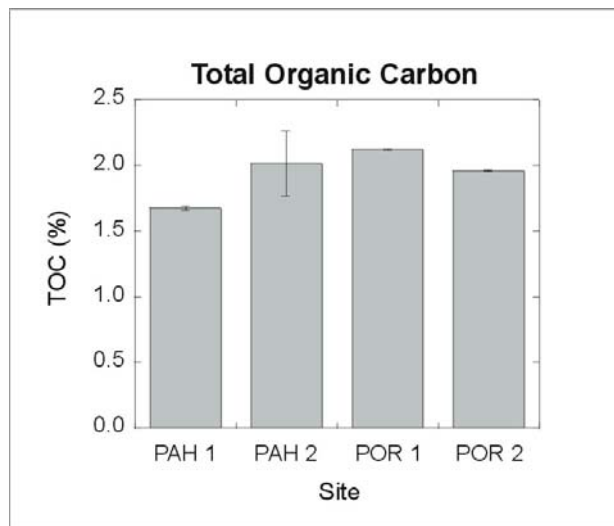


Figure 1: Total organic carbon content of the sediments monitored in the Porirua Harbour

Heavy metals

The concentrations of the nine metals tested, with the exception of cadmium, were higher in the sediments of the sites in the Onepoto Arm than in the sediments of the sites in the Pauatahanui Arm (Figs. 2, 3 and 4). The mud fraction metals data showed low variability, which means that monitoring will be able to detect relatively small changes in concentration over time.

The concentrations of copper and lead in the sediments of both sites in the Onepoto Arm exceeded the Auckland Regional Council’s Environmental Response Criteria (ARC ERC) amber “trigger level”, while the concentrations of zinc exceeded the ARC ERC red “trigger level”. The

concentration of zinc in the sediment of the southern site in the Onepoto Arm also exceeded the ANZECC (2000) ISQG-Low “trigger level”.

The concentrations of copper, lead, and zinc in the sediments of the sites in the Pauatahanui Arm were all below ARC ERC and ANZECC (2000) ISQG “trigger levels”, although the concentration of copper in the sediment of the site off Browns Bay was very close to the ARC ERC amber “trigger level”.

The concentrations of arsenic, cadmium, chromium, mercury, nickel, and silver in the sediments of the sites in both arms of the harbour were all below ANZECC (2000) ISQG “trigger levels”. However, mercury approached the ISQG-Low “trigger level” in the sediments of both sites in the Onepoto Arm.

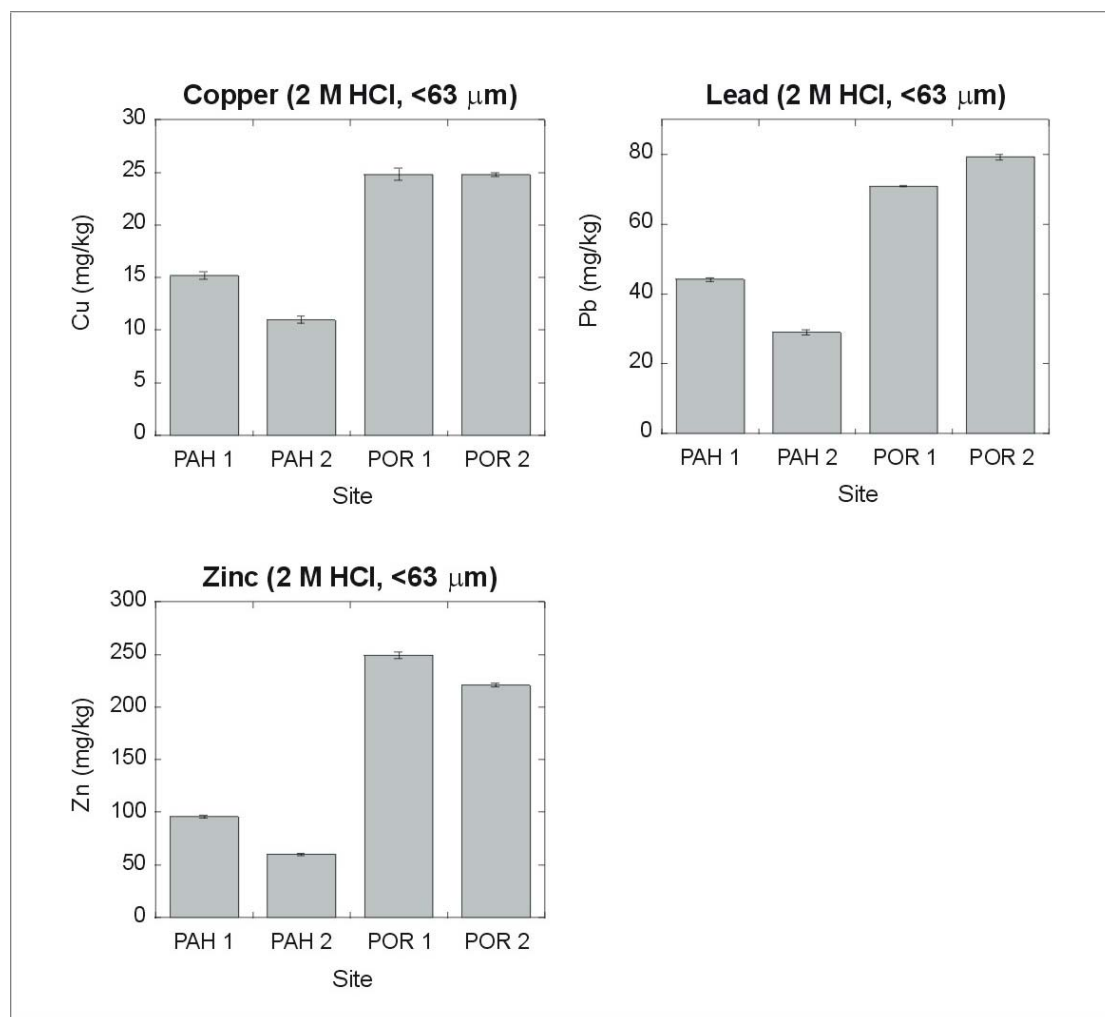


Figure 2: Concentrations of copper, lead, and zinc in the mud fraction of the sediments monitored in the Porirua Harbour

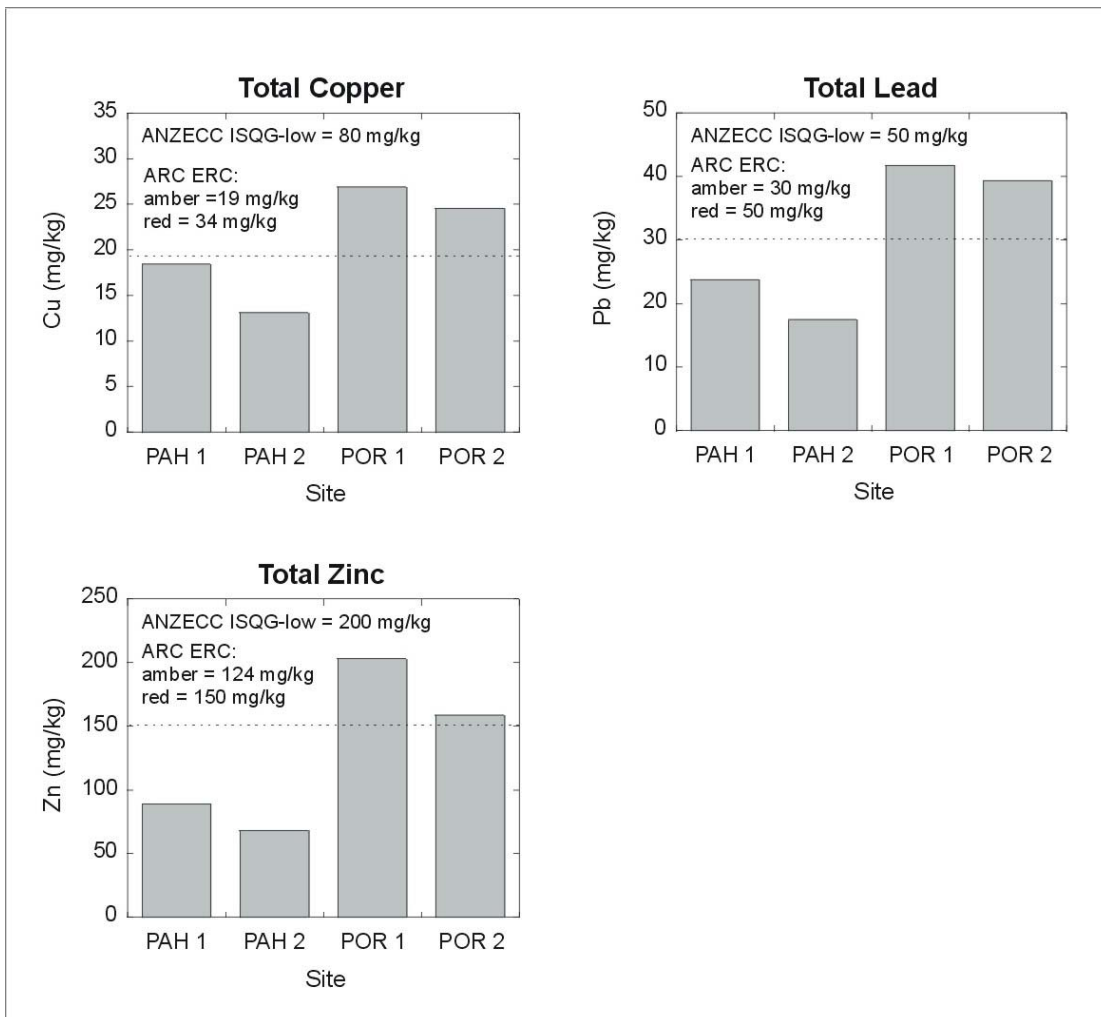


Figure 3: Concentrations of total copper, lead, and zinc in the sediments monitored in the Porirua Harbour

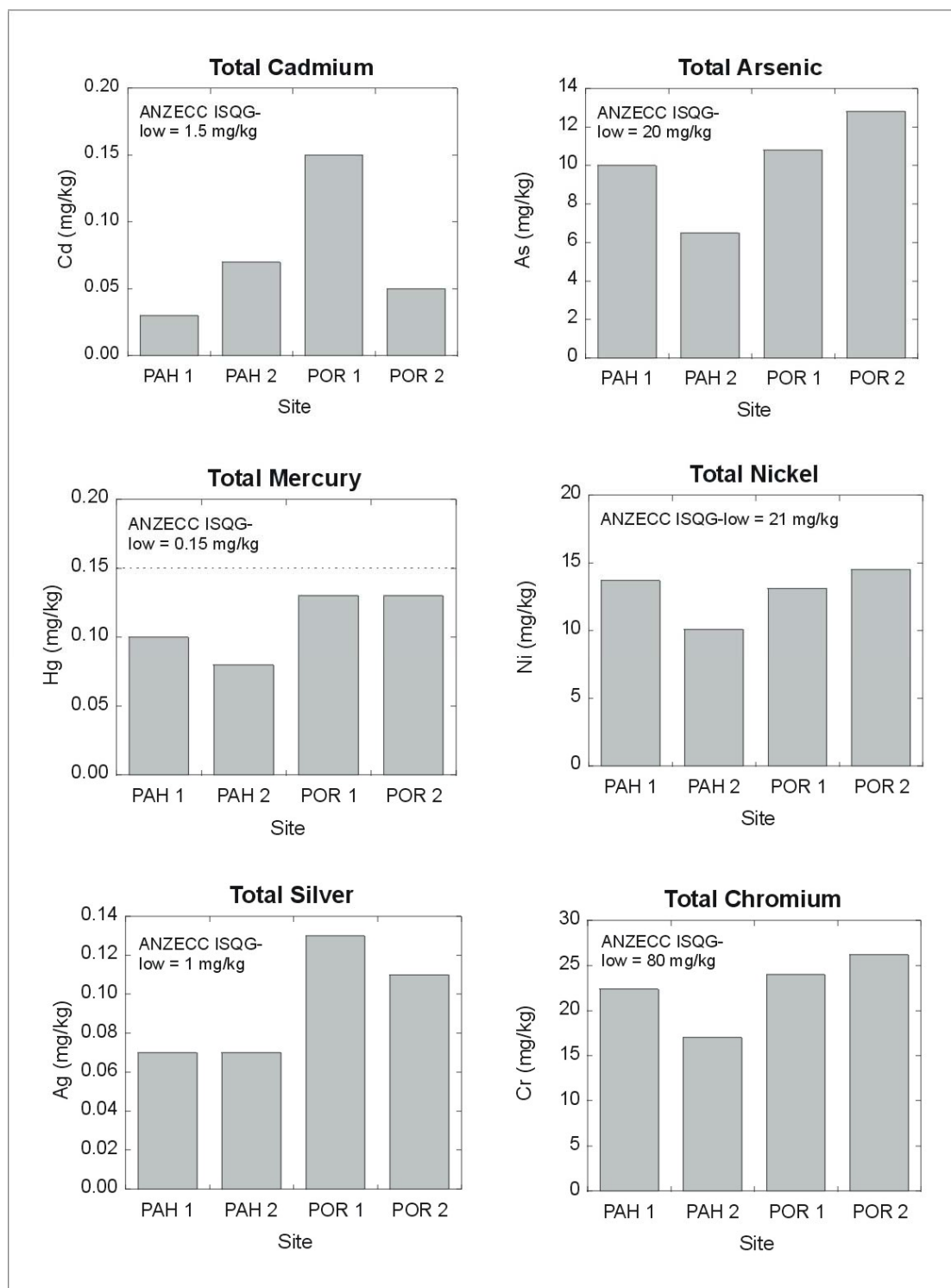


Figure 4: Concentrations of total cadmium, arsenic, mercury, nickel, silver, and chromium in the sediments monitored in the Porirua Harbour

Polycyclic aromatic hydrocarbons (PAHs)

Total PAH and high molecular weight PAH concentrations were both higher in the sediments of the sites in the Onepoto Arm than in the sediments of the sites in the Pauatahanui Arm (Fig. 5). In sediment quality guidelines the concentrations are expressed as “normalised to 1% TOC” – the concentration equivalent to that which

would be present in sediment of 1% TOC, to allow better comparison of potential toxicity between sediments with different TOC levels. “Normalised” total PAH and HMW PAH concentrations were well below ARC ERC and ANZECC (2000) ISQG “trigger levels” in the sediments of all sites in both arms of the harbour.

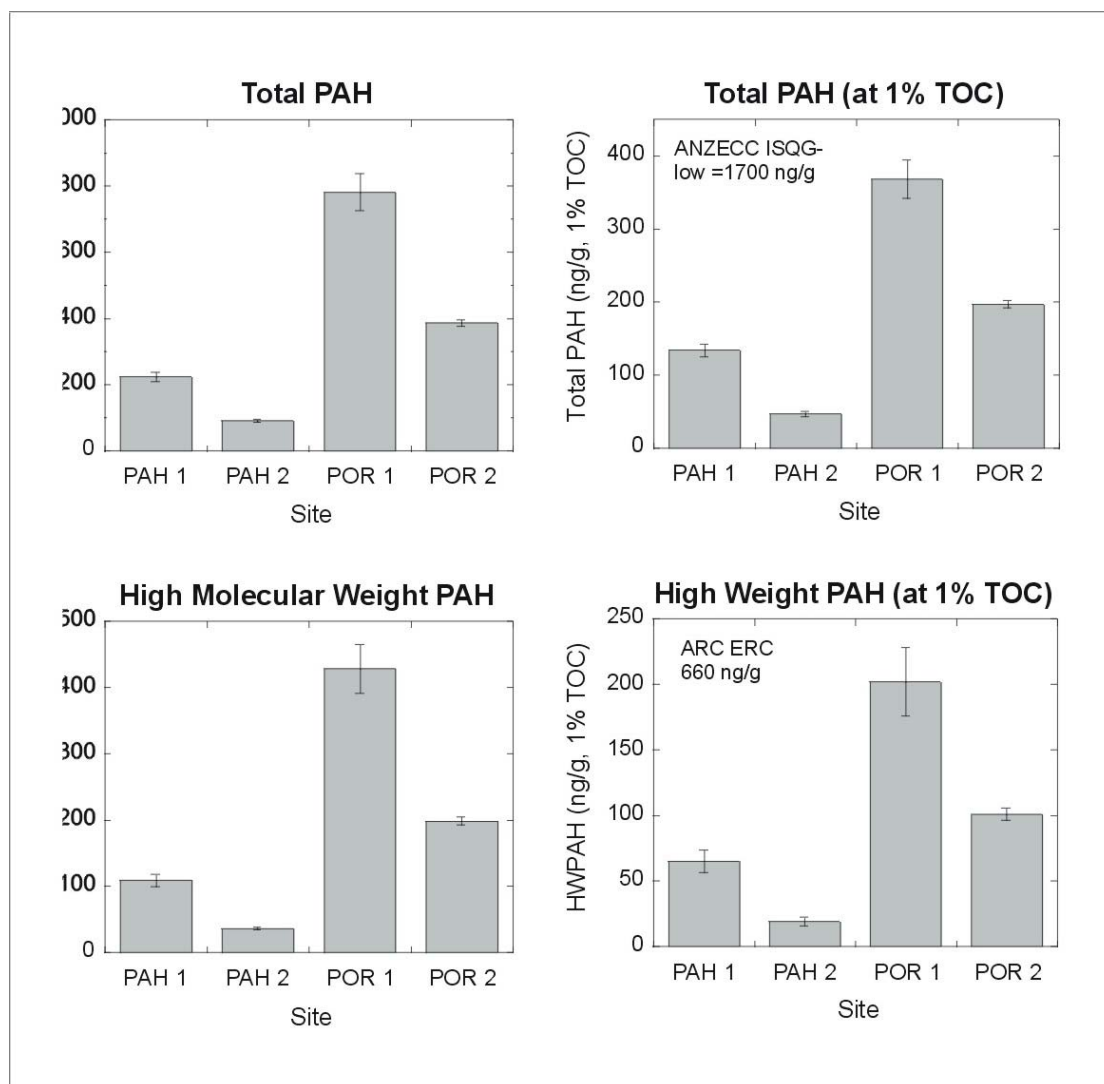


Figure 5: Concentrations of PAH in the sediments monitored in the Porirua Harbour. Concentrations are in nanograms/gram in the < 0.5 mm fraction

Organochlorine pesticides

Of the 23 organochlorine pesticides analysed, only DDT and its derivatives were consistently detected in the sediments. Total DDT concentrations were similar at all the sites, these being above the ARC ERC red “trigger level”, and well above the ANZECC (2000) ISQG-Low “trigger level” (Fig. 6). DDE is the main contributor to the totals, particularly in the Pauatahanui Arm, which is consistent with an aerobically weathered DDT source, e.g., agricultural soils (Fig. 7). Higher proportions of DDD and DDT in the Onepoto Arm sediments possibly reflect less weathered sources, such as urban stormwater and in-situ anaerobic transformation of DDT to DDD.

Dieldrin was detected in the sediments of the site off Duck Creek in the Pauatahanui Arm, and of both sites in the Onepoto Arm, at concentrations above the ANZECC (2000) ISQG-Low “trigger level”, but this is set extremely low (0.02 nanograms/gram at 1% TOC). The ARC ERC-red “trigger level” for dieldrin is 0.72 nanograms/gram at 1% TOC and the Porirua Harbour sediments had dieldrin concentrations that were all well below this level.

Hexachlorobenzene (HCB) was detected in the sediments of the site off Browns Bay in the Pauatahanui Arm and of the southern site in the Onepoto Arm at concentrations close to its detection limit of 0.3 nanograms/gram. There is no “trigger level” for HCB in the ANZECC (2000) interim sediment quality guidelines.

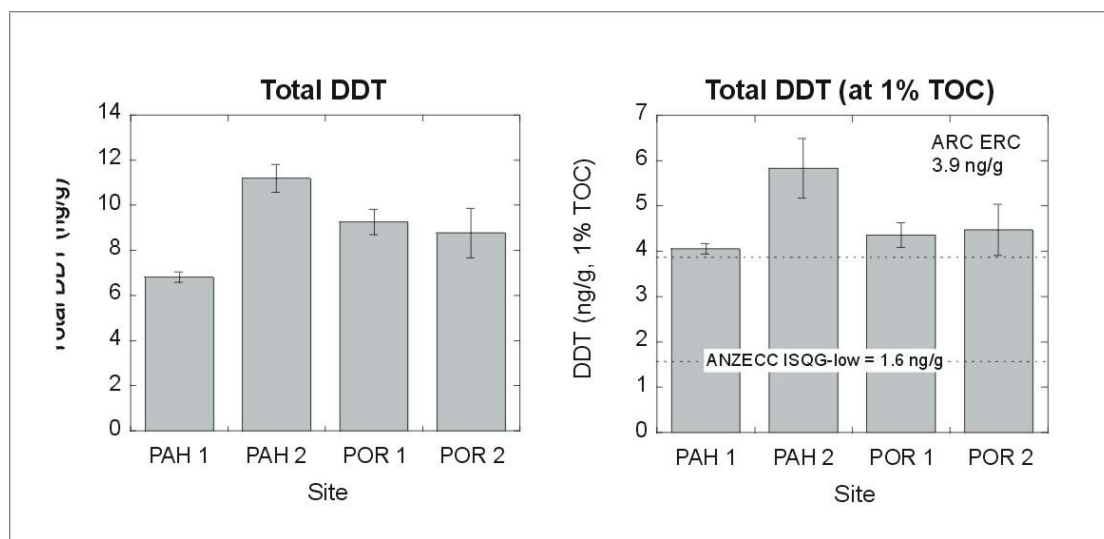


Figure 6: Concentrations of DDT in the sediments monitored in the Porirua Harbour

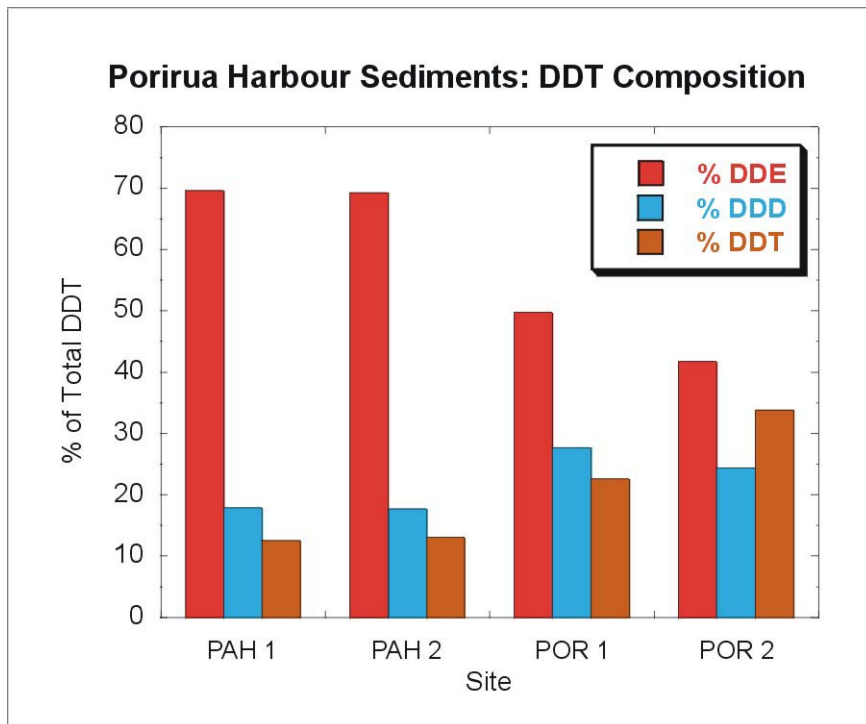


Figure 7: DDT composition in the sediments of the LTB monitoring sites in the Porirua Harbour

Organotin compounds

All of the four organotin compounds analysed were below detection limits in the sediments of both sites in the Onepoto Arm. In the Pauatahanui Arm, dibutyltin (DBT) was detected in the sediments of both sites and tributyltin (TBT) in the sediments of the site off Duck Creek. The TBT concentration was below the ANZECC (2000) ISQG-Low “trigger level”.

In the preceding section the measured concentrations of contaminants have been compared against both the Auckland Regional Council Environmental Response Criteria (ARC ERC) for estuarine environments (ARC 2002) and the interim sediment quality guidelines (ISQG) of ANZECC (2000). These are not “pass” or “fail” values, but the concentrations which experimental and/or field evidence suggests are likely to result in impacts on aquatic life. They signal the need for further investigation to confirm whether or not impacts on aquatic life are occurring.