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Report to Environment Committee
from Gary Stephenson, Surface Water Quality Scientist

Porirua Stream Water and Sediment Quality

1. Purpose

To report on the results of a targeted investigation of Porirua Stream water and sediment quality.

2. Background

Regular water quality monitoring in Porirua Stream has shown that it consistently complied with the water quality guidelines for the protection of aquatic ecosystems. However, these findings are at variance with the Macroinvertebrate Community Index (MCI) scores recorded over the same period. These scores consistently indicated *possible* moderate or severe pollution in the lower Porirua Stream. To try and resolve the issue of these conflicting results a targeted investigation of water and sediment contamination in the Porirua Stream was commissioned, focussing on heavy metals and organic compounds. The investigation was carried out by Montgomery Watson New Zealand Limited.

3. Methods

Nine sampling sites were selected, four of them located on the main-stem of the Porirua Stream, one on each of the Mitchell and Takapu Streams, and three sites at selected stormwater inflows to the main-stem. Sampling included one dry weather and two wet weather runs. Water samples were tested for pH, electrical conductivity, total suspended solids, metals and semi-volatile organic compounds. Sediment samples were tested for metals and semi-volatile organic compounds.

Results for water were compared with water quality guidelines recommended by the USEPA. Results for sediments were assessed using interim sediment quality guidelines recommended in the 1998 ANZECC Draft.

4. **Results**

Water

The two large stormwater outlets draining the southern and western parts of Porirua City carried the highest heavy metal concentrations. Within the Porirua Stream, heavy metal concentrations were low during dry weather. During wet weather metal concentrations were elevated, particularly in the case of chromium, lead, and zinc, which exceeded USEPA guidelines at several stream sites. Chromium and zinc also exceeded the guidelines in the middle reaches of the stream during a moderate rainfall event. This result is particularly significant because it indicates that rainfall events with a return period of less than one month *may* lead to the occurrence of potentially toxic metal concentrations within the stream.

No organic substances were detected in stream water at any time during the investigation. However, during the larger of the two rainfall events monitored some organic substances were detected in stormwater derived from the southern and western parts of Porirua City.

Sediments

Sediment concentrations of heavy metals increased with distance downstream reaching a maximum below the intensive commercial/industrial zone in Tawa/Linden, then declined in the estuarine reach adjacent to Porirua City. Concentrations of zinc and lead downstream of Linden indicated a *moderate probability* of toxic effects on sediment biota.

The majority of the 72 organic compounds tested were not detected in Porirua Stream sediments. For those that were detected the concentrations were at levels that indicated a low probability of causing toxic effects. Their distributions were similar to that described for heavy metals, with maximum levels occurring in the reaches immediately downstream of Linden. The notable exception to this was the organochlorine pesticide DDT and its breakdown products DDE and DDD. The results for four sediment sampling sites showed concentrations which indicated a moderate probability for toxic effects to occur. The highest concentrations of DDT were recorded in the rural catchment of Takapu Stream, upstream of significant urban influences. DDT adsorbs strongly to sediment, bio-accumulates, and has a high toxicity to many species.

Sediment concentrations of phenolic compounds were also recorded at higher concentrations at the upstream sites, and particularly at the Takapu Stream site, than elsewhere. The source of the phenol contamination is unknown. Sediment and water quality guidelines are not available for these substances and the potential risk to stream life is unknown.

5. Discussion

Despite the elevated DDT levels recorded in Takapu Stream sediments there is no indication of significant toxic effects on stream life. By contrast, the macroinvertebrate fauna of the Porirua Stream at Linden suggests possible moderate to severe pollution. This investigation has found contaminant levels in the water column during wet weather events which, in the cases of chromium, lead, and zinc, exceed the relevant water quality guidelines for the protection of aquatic ecosystems. The investigation has also found elevated levels of lead and zinc in stream sediments, particularly downstream of Linden. However, the bio-availability of these metals and the degree of toxicity exerted on the stream life of Porirua Stream has not been determined. The importance of this factor relative to other possible (*but as yet unstudied*) influences which could have contributed to the decline in the macroinvertebrate fauna is therefore uncertain.

The investigation has confirmed the Porirua Stream as one of the sources of the heavy metal accumulation in sediments of the Porirua Harbour reported by previous researchers. One group found heavy metal pollution in Porirua Harbour appeared to be restricted to lead, zinc, and, to a lesser extent, copper, and occurred in the Porirua Inlet adjacent to Porirua City and the Porirua Stream mouth. Another group reported levels of lead, zinc, and five polycyclic aromatic hydrocarbons above the critical levels in sediments off the Porirua Stream mouth, while DDT exceeded the critical levels off Mungavin Point. Shellfish tissue samples from the Porirua City area were tested for heavy metals and did not exceed the guidelines for human consumption.

6. Further Action

Instruments to continuously measure a number of physico-chemical factors (dissolved oxygen, temperature, pH, and turbidity) known to influence stream macroinvertebrates will be installed at the WRC telemetry site at Porirua City in 2001/02. The information from these will be used to try and determine what contribution diurnal variability in these factors may be having on the composition and abundance of the fauna.

The WRC will endeavour to identify possible point sources of the heavy metals and organic compounds reported in the Porirua Stream and visit these premises to ensure that any discharges to the stormwater system and/or the stream are curtailed.

The findings of this report relating to the levels and nature of contaminants in the Porirua City stormwater system will contribute to the data being accumulated by the stormwater investigation currently being undertaken by the Council.

7. Communications

Copies of the consultant's report will be made available to the Wellington City Council and the Porirua City Council.

8. Recommendation

That the report be received and noted.

Report prepared by:

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