ENVIRONMENTAL CSI OF THE OKEOVER STREAM IN CHRISTCHURCH

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Background: The Okeover stream was originally spring-fed but now primarily receives aquifer water used to cool buildings at the University of Canterbury. The lowered water table and displaced stream source results from nearby urbanisation. While its perennial reach was the focus of restoration efforts since 1998, it is classified as a highly disturbed ecosystem. The upper ephemeral section located off-campus relies on >60 variable stormwater discharge conduits for flow. Water quality and in-stream fine sediments are believed to inhibit biota recovery in this ecosystem. We quantified key metal contributions to the Okeover and its current chemical signature to prioritise recovery options.

Methods: Baseflow water quality and sediment chemistry along a five-point ~300m transect (Figure 1) were determined following accredited sampling and analytical procedures. Results were compared to stormwater contributions at point T5.

Results: Baseflow water quality revealed Copper (Cu) concentrations, primarily in dissolved forms, consistently and 2-3 fold above the lowest (i.e. 80%) ANZECC guidelines for the protection of aquatic species. Stormwater quality investigations showed metal concentrations well above the 80% guidelines, which typically reached 0.053 g Cu/m^3, 0.521 g Zn/m^3 for and 0.073 g Pb/m^3. Annual metal load estimations (Table 1) show baseflow contributions in par with stormflow inputs at sampling point T5 and increasing baseflow contributions along the transect, which likely impairs the stream's ecological integrity. Furthermore, in-stream fine organic sediments had metal concentrations exceeding the ANZECC trigger values for Zn (ISQG-high), Cu and Pb (ISQG-low) indicating deposited metals as ecotoxicological threats.

Conclusions: Elevated Cu concentrations in baseflows were attributed to contamination from deteriorating air-conditioning pipes. Alarmingly high metal-sediment levels were likely the legacy of diffuse stormwater inputs and probably inhibit successful ecological recovery. This hydro-ecosystem is being continuously monitored though real-time data logging for suspended solids transport and is the subject on on-going detailed studies that aim to enhance the integrity and robustness of this campus waterway.

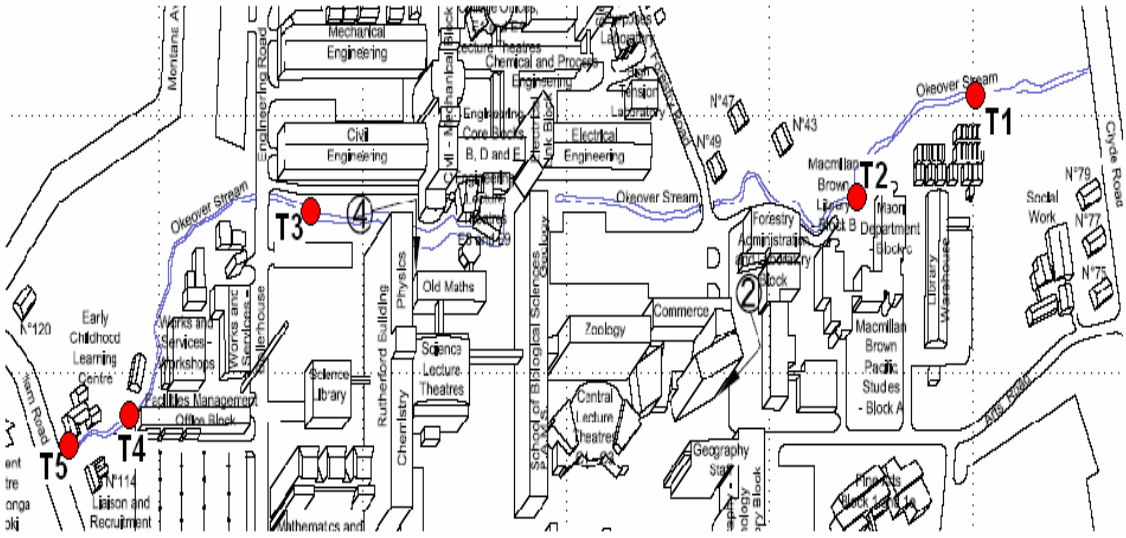

Figure 1: Location of sampling points (T1 – T5) along the Okeover stream passing through the University of Canterbury

Table 1: Annual loads for total metals during base- and storm flow

Location	Annual Load – Base flow [kg]			Annual Load – Storm flow [kg]		
	Zn	Cu	Pb	Zn	Cu	Pb
T1	15.9	7.2	0.60			
T2	10.4	4.4	0.47			
T3	1.6	1.2	0.03			
T4	0.9	5.2	0.02			
T5	3.9	0.3	0.24	4.79	0.49	1.31

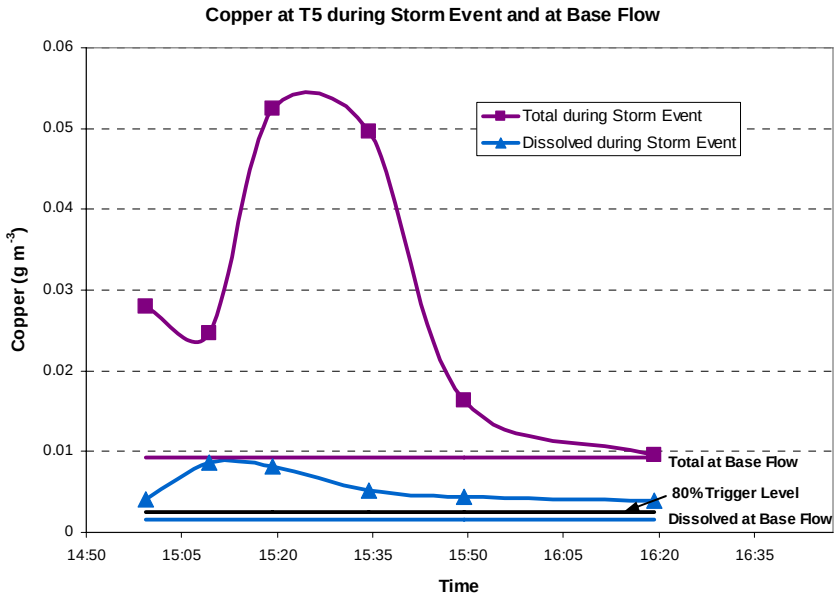

Figure 2: Copper concentrations during storm event and at baseflows compared to the ANZECC 80% trigger level.