

8 Soil metal loads

8.1 Soil loads

As explained in Section 2, soil washing from urban catchments carries a natural load of zinc, copper and lead. This load is included in the total catchment stormwater loads given in Section 4 but is not included in the road run-off loads which assume that metals originate only from vehicles and the road surface (Richardson Road is on a ridgeline so receives very little run-on from adjoining land surfaces).

The catchment total suspended solids loads (Section 5) include the loads generated on roads (Section 6). These loads are compared in Table 13 with difference assumed for the purposes of this study to be soil.

Table 13. Loads (t a) of total suspended solids in stormwater from the three study catchments and in road run-off reaching the stormwater network and of soil (by difference).

	Central Business District	Mission Bay	Mt Wellington
Total catchment	9.33	28.0	8.57
Road run-off	2.06	1.42	0.43
Soil	7.27	26.6	8.14

The natural metal loads in soil carried past the stormwater monitoring point were determined by combining the estimated soil loads with the measured concentrations of the metals in the catchment sub-surface soils. Sub-surface soils are likely to be reasonably free of contamination by metals from urban activities.

8.2 Metal concentrations in catchments soils

Samples of soil were collected from Myer's Park in the CBD, and from sites close to and distant from, buildings in the Mission Bay and Mt Wellington catchments. At each site soil was collected from two depths, 0-20mm and 20-60mm, in the soil profile. Samples were digested in hot acid and analysed by the same procedures used previously in the stormwater monitoring programme for particulate metals. The results for the samples likely to be most representative of "natural" soils, i.e. the sub-surface samples distant from buildings, are given in Table 14. Note that medians rather than means are used to derive representative natural concentrations. Medians reduce the influence of the few abnormally high concentrations possibly caused by unrecognised contaminating activities. The rounded concentrations in Table 14 are assumed to be the natural concentrations in the soils of the study catchments.

Table 14. Metal concentrations (mg kg⁻¹ in sub-surface (20-60mm depth) soils of the study catchments.

Catchment	Zinc	Copper	Lead
CBD	77	20	47
Rounded values for CBD soils	80	20	50
Mission Bay	32	10	19
	54	14	30
	68	28	16
	79	24	39
	103	32	65
	25	6	43
	113	22	45
Medians for Mission Bay soils	68	22	39
Rounded values for Mission Bay soils	70	20	40
Mt Wellington	54	20	23
	96	28	30
	106	35	25
	177	71	43
	354	145	146
	241	52	64
	126	45	25
Medians for Mt Wellington soils	126	45	30
Rounded values for Mt Wellington soils	130	50	30

Although it is possible that the sub-soils of the Mt Wellington catchment have been contaminated by urban activities, the proximity of Mt Wellington volcanic soils is a more likely explanation for the generally higher zinc and copper concentrations in the sub-soils in this catchment than are found in the soils of the other two catchments. Volcanic soils of the Auckland region are known to have higher natural concentrations of zinc and copper (but not lead) than have soils derived from sedimentary rocks (ARC, 2001).

8.3 Natural metal loads in the study catchments

Table 15 combines the soil loads from Table 13 with the rounded concentrations in Table 14 to give the natural soil metal loads for each catchment.

Table 15. Natural metals loads in soil washing into the stormwater network from the study catchments

Catchment	Catchment area	Total Zinc	Total Copper	Total Lead
	ha	kg a⁻¹	kg a⁻¹	kg a⁻¹
Central Business District	30.1	0.58	0.15	0.36
Mission Bay	45.2	1.86	0.53	1.06
Mt Wellington	34.0	1.06	0.41	0.24