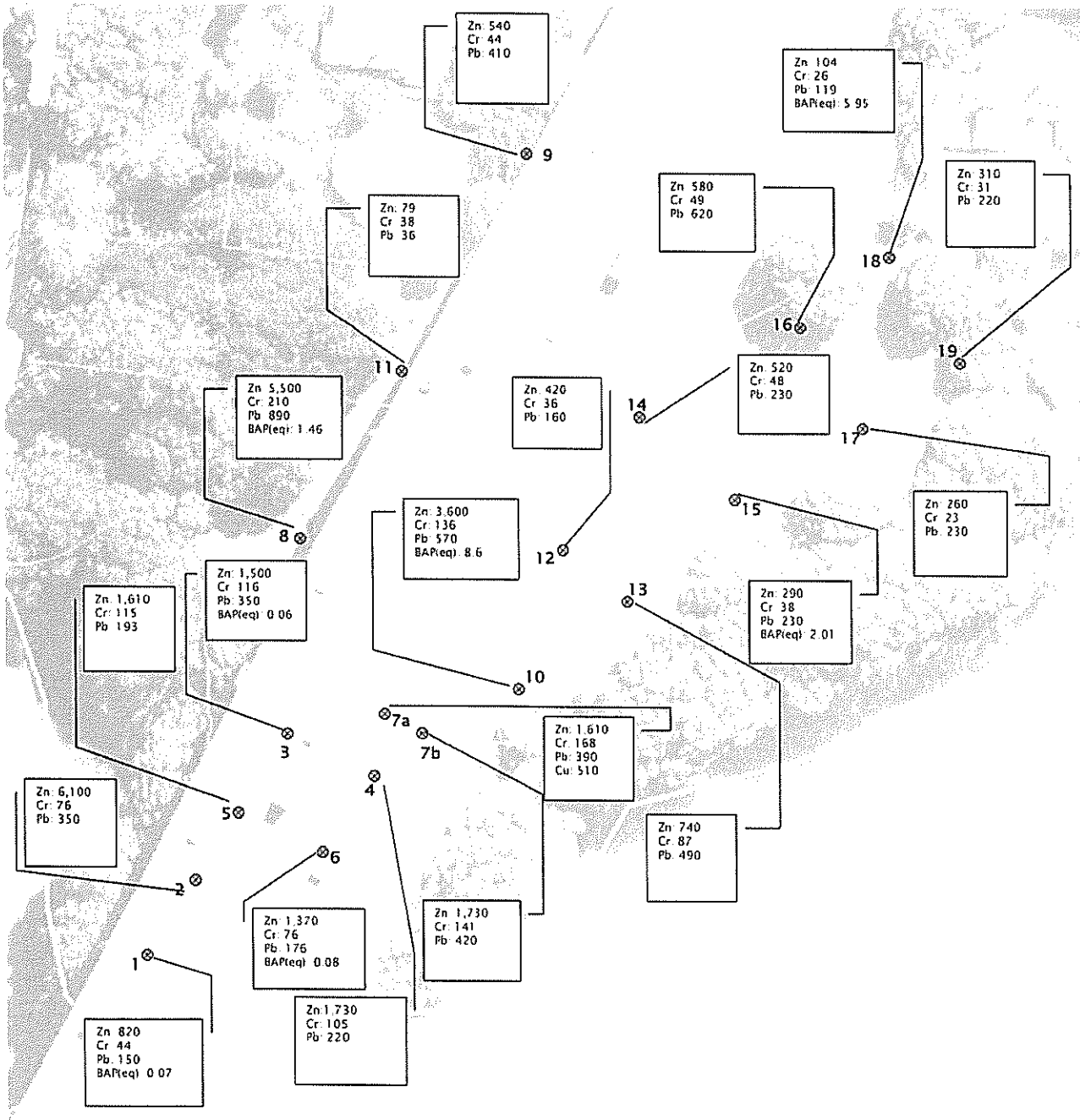


Auckland Harbour Bridge: Results from Soil Sampling
 Samples taken on 5 August 2010



Contaminant	Permitted Activity Soil Criteria (mg/kg)	
	Discharge	Human Health ³
Arsenic	100.0	30.6
Benzo (a) Pyrene (equivalent)	2.15	0.27
Cadmium	7.5	1.0
Chromium (total)	400.0	
Copper	325.0	
Total DDT ¹	12 or 0.7 ²	8.4 ⁴
Lead	250.0	
Mercury	0.75	
Nickel	105.0	
Zinc	400.0	

Auckland Harbour Bridge: Soil Sampling

Background

Contaminants derived from maintenance works undertaken on the Auckland Harbour Bridge (AHB) and traffic use activities may reside in the soils within the grassed public reserve adjacent to the north end of the AHB (Stokes Point, Northcote).

Methodology

The investigation broadly followed the Ministry for the Environment (MfE) Contaminated Land Management Guidelines. The land use activities suggested that should contaminants be present, the highest levels were likely to reside in the upper 0.1m of soil. Therefore, the investigation targeted these shallow soils. Further investigation may be required to determine the contaminant levels with depth, in order for decisions regarding remediation and consenting to be made.

The number of samples will be sufficient to provide a 95% level of confidence that a sampling program, based on a square grid, will detect a contaminant hotspot within 0.1m of the grassed surface in excess of 5% of the surface area of the investigated site. The number of samples and locations are listed below:

- South of the North Anchorage - approximately 750m². Six samples
- Maori trench - Two samples
- North of the North Anchorage - approximately 4,500m². Twelve samples located at the intersections of a 23m grid.

Contaminant Testing

The following testing is proposed:

- 7 heavy metal screen, including total recoverable copper, lead and zinc - contaminants derived from a number of possible sources including bridge maintenance works.
- Speciation of chromium compounds (to test for hexavalent chromium Cr(VI))
- PAH screen - contaminants derived from combustion of fossil fuels.
- BTEX screen - toluene and xylenes are the main components of aromatic naphthas used in paint solvents etc.

A total of 20 samples will be obtained. Some rationalisation of the testing program has been undertaken in order to limit expenditure at this stage, however the results may indicate that some of the tests should be undertaken on additional samples.

It is proposed to undertake the following initial testing:

- Heavy metal screen - 20 samples (including speciation of Chromium compounds to indicate levels of Cr(VI))
- TPH (C7-C36) / PAH / BTEX screen profile - 7 samples

Reporting and Results

Sampling was carried out in the afternoon of 5 August 2010. The weather was fine, with cloudy periods however heavy rain had preceded sampling for the previous few days and in the morning before sampling. The results of the soil sampling are presented in the 'Soil Sample Results and Summary Table' overleaf. The results are compared with the permitted activity criteria in the Auckland Regional Plan: Air, Land and Water as well as with the 'background' levels (for non-volcanic soils) set out in Technical Publication 153. The Canadian Environmental Quality Guidelines have been used to compare Cr (VI) levels.

Soil Sample Results and Summary Table

Sample ID	Description / notes	Heavy Metals ¹					BAP (eq)	2001 (Y/N)
		Pb	Zn	Cr	Cr(VI)	Cu		
ARC Guideline - Discharge (Schedule 10) Canadian Environmental Guidelines (for exposure to CrVI - residential)		250	400	400	< 0.4	325	0.27	() = increase since 2001
TPI53 Background levels (non volcanic)		65	80	55	-	45	-	
AHB 1 14:00	Tip of headland on Stokes Point reserve, sandy soils	150	820	44	< 0.4	101	0.07	Y (Zn, Cr, Pb)
AHB 2 14:04	South of north anchorage	210	6,100	76	< 0.4	27		Y (Zn)
AHB 3 14:06	South of north anchorage	350	1,500	116	< 0.4	52	0.06	Y (Pb)
AHB 4 14:07	South of north anchorage	220	1,730	105	< 0.4	47		N
AHB 5 14:09	South of north anchorage	193	1,610	115	< 0.4	36		Y (Zn, Cr, Pb)
AHB 6 14:11	South of north anchorage	176	1,370	76	< 0.4	26	0.08	
AHB 7a 14:22	Maori Trench - some garnet sand present in sample	390	1,610	168	< 0.4	510		
AHB 7b 14:25	Maori Trench - some garnet sand present in sample	420	1,730	141	< 0.4	57		
AHB 8 14:36	Changed location to capture overland flow through compound	890	5,500	210	< 0.4	220		
AHB 9 14:43	In front of closest residential property	410	540	44	< 0.4	161		
AHB 10 14:59	Adjacent to maintenance compound - hydrocarbon staining	570	3,600	136	< 0.4	67	8.60	
AHB 11 14:40	Adjacent to car park	36	79	38	< 0.4	18		
AHB 12 15:02	50mls only could be taken due to aggregate	160	420	36	< 0.4	23		
AHB 13 14:55	North of north anchorage - along cliff line	490	740	87	< 0.4	60		
AHB 14 15:04	In front of house - adjacent to car park	230	520	48	< 0.4	31		
AHB 15 14:52	North of north anchorage - along cliff line	230	290	38	< 0.4	36	2.01	
AHB 16 15:07	North of north anchorage	620	580	49	< 0.4	53		
AHB 17 14:50	North of north anchorage - along cliff line	230	260	23	< 0.4	33		
AHB 18 14:45	North of north anchorage - adjacent to car park	119	104	26	< 0.4	23	5.95	
AHB 19 14:48	North of north anchorage - under trees along cliff line	220	310	31	< 0.4	40		

¹ The heavy metal screen including arsenic, cadmium, chromium, copper, lead, nickel and zinc however none of the heavy metals not shown in the table were over guideline values.

Limitations

No Preliminary Site Investigation/Inspection was carried out because the results of sampling were intended to support an 'Assessment of Effects' into the discharges to land from bridge maintenance activities.

The full extent of the contamination is unknown as no samples were taken at depth. Samples were only taken at the soil surface (top 0.1m) as an indication of whether discharges from maintenance works were impacting soils.

No blasting had been carried out in the vicinity of sampling area in the previous 12 months. Given the nature of some of the key contaminants (e.g. hexavalent chromium Cr(VI) reduces to the more stable and less toxic form of Chromium III relatively quickly) the sampling results do not represent worst case scenario.

PTN: Results cannot be used to determine air discharge effects as Cr(VI) is reduced to Cr(III) at a significant rate in the atmosphere (reported in the range of 16 hours to about 5 days)