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TE RAUHITANGA TAIAO

Marine Sediment Monitoring Programme – 2003 Results

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Marine Sediment Monitoring Programme – 2003 Results

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1.0 Executive Summary

The Auckland Regional Council (ARC) operates a long-term marine sediment monitoring programme in the Auckland Region. On each survey occasion surface sediment (0-20mm depth) is collected from each of 27 sites by the ARC and delivered to NIWA for analysis. There have been four surveys conducted, in 1998, 1999, 2000 and 2003. This report presents the results of the 2003 survey.

The concentrations of metals, zinc (Zn), copper (Cu), lead (Pb), were measured by cold dilute 2M hydrochloric acid extraction on the silt <63μm fraction and also by hot strong acid digestion on the <500μm fraction. Total organic carbon (TOC), organochlorine compounds (OCs), polychlorinated biphenyl compounds (PCBs) and particle size distributions were determined on the <500μm fraction.

The results from the 2003 survey are compared with those for the three previous surveys. Accumulation rates for metals estimated from the 2001 survey are used to compare predicted estimates to actual concentrations at sites sampled in 2003. The rate of increase in concentrations of some metals is increasing. Rates of increase of metals are higher than predicted at several sites. Few sites show a decline in contamination.

Organochlorine pesticides and polychlorinated biphenyl compounds were measured for the first time in the 2003 survey. There were twenty six samples at 12 sites containing detectable PCBs and these were, as expected, located in the most urbanised sites. The sites in the Whau and Tamaki estuaries were conspicuous for their high concentrations. The Wairau Arm of the Whau estuary appears to have been exposed to PCBs to a generally greater extent than the other sites. No sites exceeded the ERC Red values for PCBs. Forty seven of the eighty one samples contained OC pesticide concentrations above the method detection limit. DDT and its degradation products, DDE and DDD, were the most frequently detected. Meola was the only site to exceed the ERC Red value for Total DDT. Dieldrin was the next most common. Sites in Motions, Anns Creek and Mangere exceeded the ERC Red value for dieldrin. The greatest number of OC pesticides detected at one site was five and that was at the Henderson site.

2.0 Introduction

Since 1998, the Auckland Regional Council (ARC) has monitored the concentrations of urban-derived chemicals in sediments at 27 sites in the coastal zone of the Auckland region. There have been three previous surveys in 1998, 1999, 2001 (Williamson et al. 1998; Mills et al. 2000; Hawken et al. 2002; Timperley and Mathieson, 2002).

For the 2003 survey described in this report, samples were collected by the ARC and delivered to NIWA for analysis. Three replicates from each site (a total of 81 samples) were analysed for zinc (Zn), copper (Cu), lead (Pb), total organic carbon (TOC), organochlorine pesticides (OCs), polychlorinated biphenyl compounds (PCBs) and particle size distribution. In the previous surveys samples were analysed for polycyclic aromatic hydrocarbons (PAHs) but these compounds were not measured in the 2003 survey, partly because their concentrations did not changed markedly over the 1998 to 2001 period (Mills et al. 2000; Hawken et al. 2002) and partly because of the intention to measure OCs and PCBs in the 2003 samples. This is the first time that these chlorinated compounds have been determined in the monitoring programme.

This report presents the results for the samples collected in 2003 and compares these results with those for the samples collected in 1998, 1999, and 2001. The rates at which the concentrations of metals are changing over time were previously reported for the period 1998 to 2001 in a review of the monitoring programme (Timperley and Mathieson, 2001). Although further consideration of these rates was not part of the 2003 monitoring programme, it seemed appropriate to revise these rates to include the 2003 results and to present them in this report.

3.0 Analytical procedures

The sample preparation and analytical procedures used for the 2003 samples were the same as those used for the previous surveys (Williamson et al. 1998) except that inductively coupled plasma-mass spectroscopy (ICP-MS) was used to measure metals in the 2003 survey rather than atomic absorption spectrophotometry as used for the previous surveys. The detection limits for the sediment metal concentrations determined by ICP-MS were Cu = 0.01 mg kg^{-1}, Zn = 0.02 mg kg^{-1} and Pb = 0.002 mg kg^{-1} when measured in cold dilute HCl extracts, and Cu = 2 mg kg^{-1}, Zn = 4 mg kg^{-1} and Pb = 0.4 mg kg^{-1} when measured in hot acid digests. The other method change survey was the measurement of TOC for the 2003 survey in place of loss-on-ignition (LOI) as used for the previous surveys.

The concentrations of OCs were measured by gas chromatography-electron capture detector (GC-ECD) and PCB concentrations were determined by gas chromatography-mass spectrometry (GC-MS) in extracts of the total (<500 μm) sediment fractions. Particle size distributions were determined with a Galai WCIS l00 particle size analyser. TOC was measured by an Elemental Combustion Analyser with a detection limit of 0.05g $100g^{-1}$ dry weight. More details of these new procedures and quality assurance are given in Appendix 1.

4.0 Results

4.1 Concentration units

Concentrations of metals, organochlorine pesticides (OCs) and polychlorinated byphenyls (PCBs) are all given in mg kg^{-1}. Total Organic Carbon concentrations (TOC) are given in g $100g^{-1}$ dry weight (equivalent to %) and Loss on Ignition is given in %.

4.2 Metals and Differences across sites

The results for Zn, Cu, and Pb from the 1998, 1999, 2001 and 2003 surveys are presented in Figures 1 to 6. The sites are ranked according the 2003 concentrations. Quality assurance (QA) data are shown in Appendix 1. All metal results are given in tabulated form in Appendix 2.

Zinc

The sites with the highest silt concentrations (< 63µm) of zinc were those in the upper reaches of the Whau and Tamaki estuaries which is not surprising considering the intensity or urban development in these catchments. At three of these sites, Tamaki, Pakuranga Upper and Whau Upper, the zinc concentrations have increased markedly since 2001. Whau Upper remains the most contaminated site as it was in 2001.

The Motions and Meola sites, another two estuaries receiving stormwater from Auckland City, are the next lowest in zinc concentration. The next site down in the ranking, Ann's Creek had a much higher concentration in 2003 then it had in 2001. Considering the activities in the catchment of Ann's Creek, the 2003 concentration is possibly closer to expectations than the 2001 concentration.

The total concentrations of zinc show a similar although not identical pattern of rankings to that shown by the silt concentrations. The differences are due to a combination of effects related to the different metal concentrations on sediment particles of different sizes (usually but not always, small particles have higher concentration than do large particles) and to the different proportions of particles of different sizes at each site. The four top ranked sites exceeded the ANZECC ISQG-Low for zinc.

It is also apparent that the trends over time are more consistent for the silt concentrations than they are for the total concentrations. This is mainly because the effects of particle size on the sediment zinc concentration explained above, are more pronounced for total concentrations.

Copper

The seven sites with the highest zinc concentrations also had the highest copper concentrations. Both metals originate from vehicles and building materials so both increase in estuarine sediments in proportion to the extent of urban development in the contributing catchments. The average ratio of zinc to copper in the silt fraction of estuarine sediments is about 8. None of the sites exceeded the ANZECC ISQG-Low for copper. Other comments made above for zinc apply also to copper.

Lead

The rankings for lead in silt are a little different from those for zinc and copper. Te Tokaroa swaps with Ann's Creek in the top most contaminated seven sites. The higher ranking for Te Tokaroa for lead may be due to its proximity to Motions and Meola Creeks which also increased their ranking for lead relative to their rankings for zinc and copper. The five top ranked sites for lead exceeded the ANZECC ISQG-Low.

Figure 1.

Zn concentrations (mg kg^{-1}) in the silt fractions (<63μm) extracted with cold 2M HCl of samples from 1998, 1999, 2001 and 2003. Values are means ± standard error.

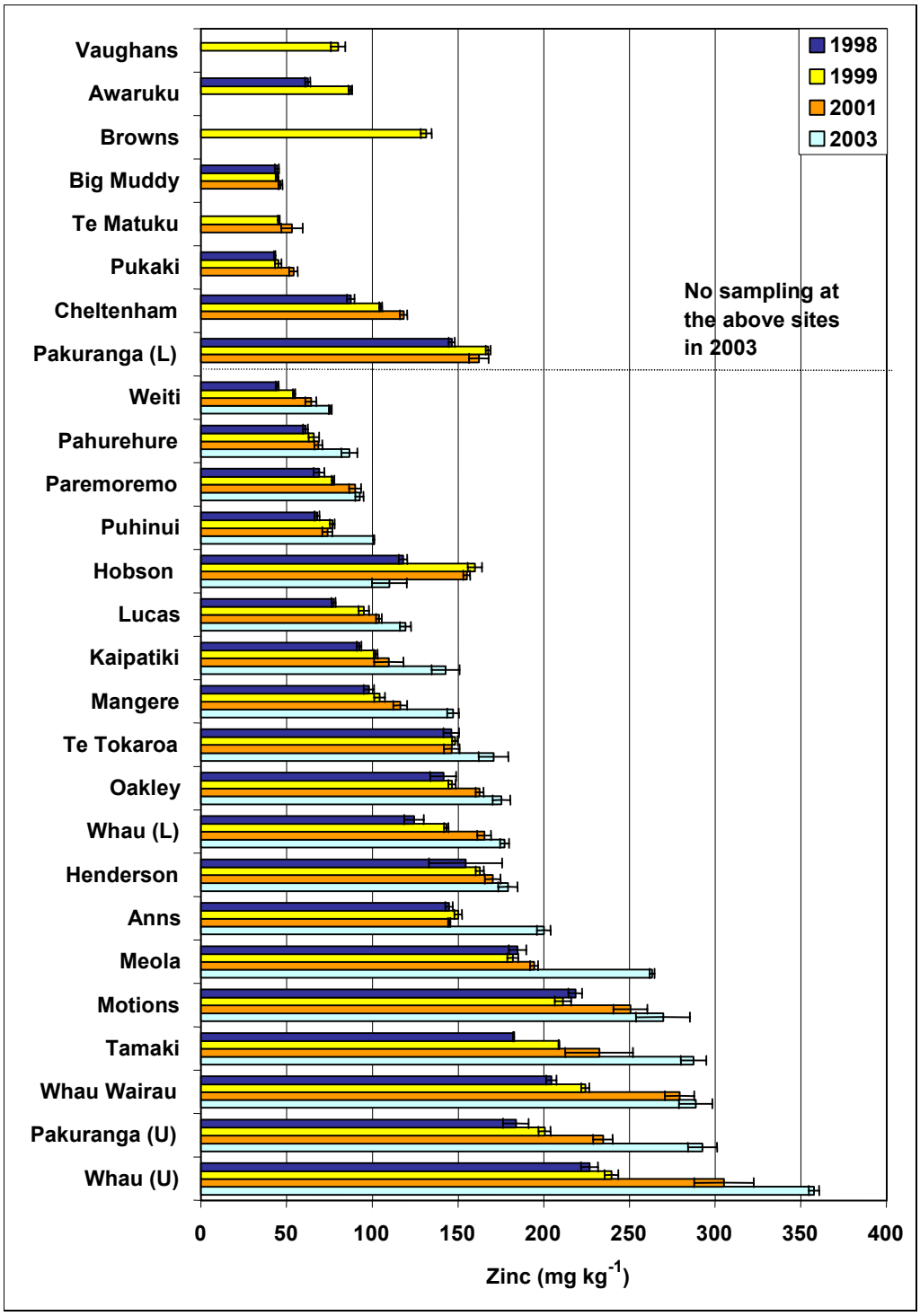


Figure 2.

Zn concentrations (mg kg^{-1}) in total sediment (<500 μm) digested with hot concentrated acids in samples from 1998, 1999, 2001 and 2003. The ANZECC ISQG-low is 200 mg/kg. Environmental response criteria (ERC) Green (<124 mg kg^{-1}), Amber (124-150 mg kg^{-1}) and Red (>150 mg kg^{-1}).

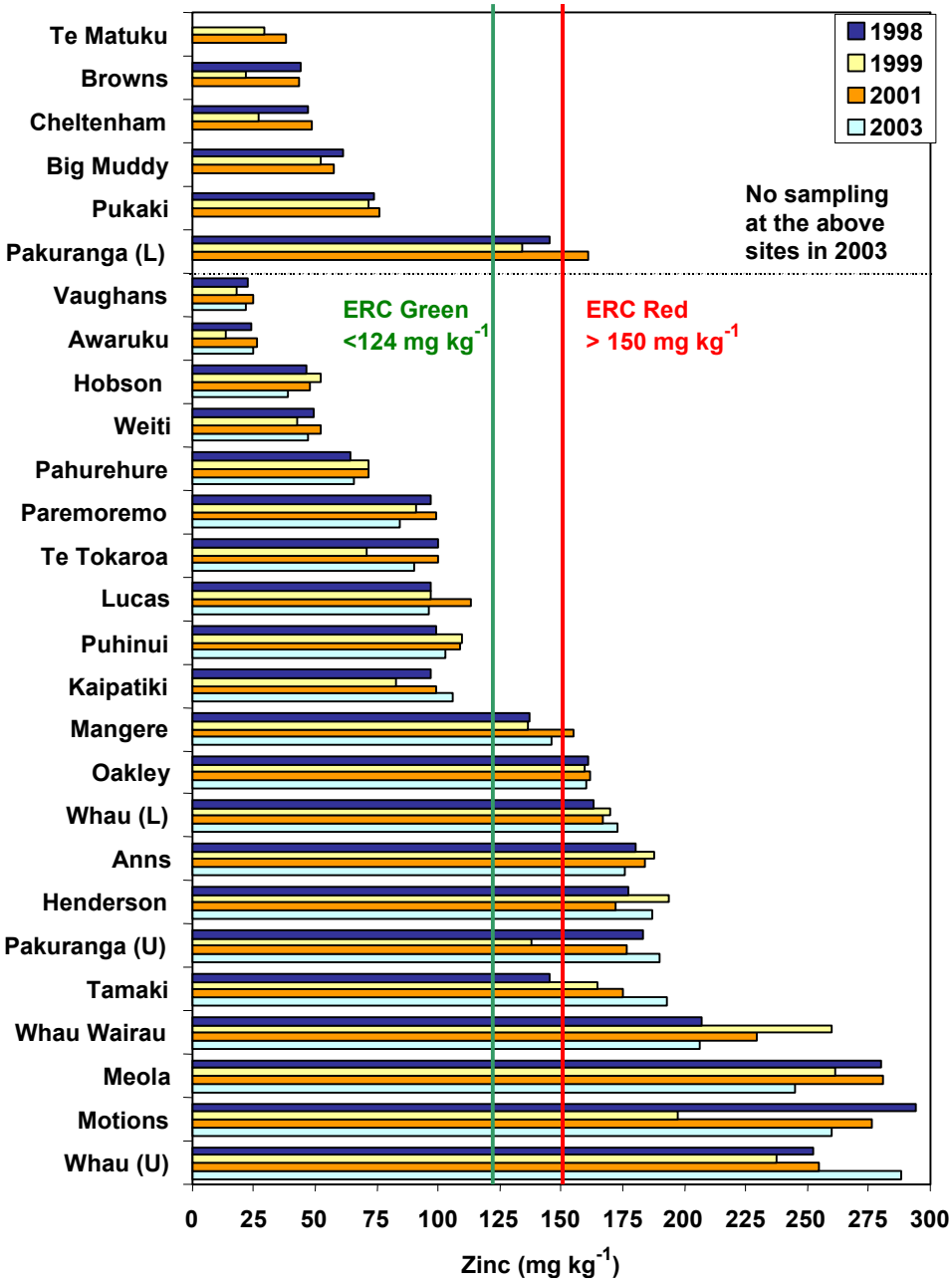


Figure 3.

Cu concentrations (mg kg) in the silt fractions (<63μm) extracted with cold 2M HCl of samples from 1998, 1999, 2001 and 2003. Values are means ± standard error.

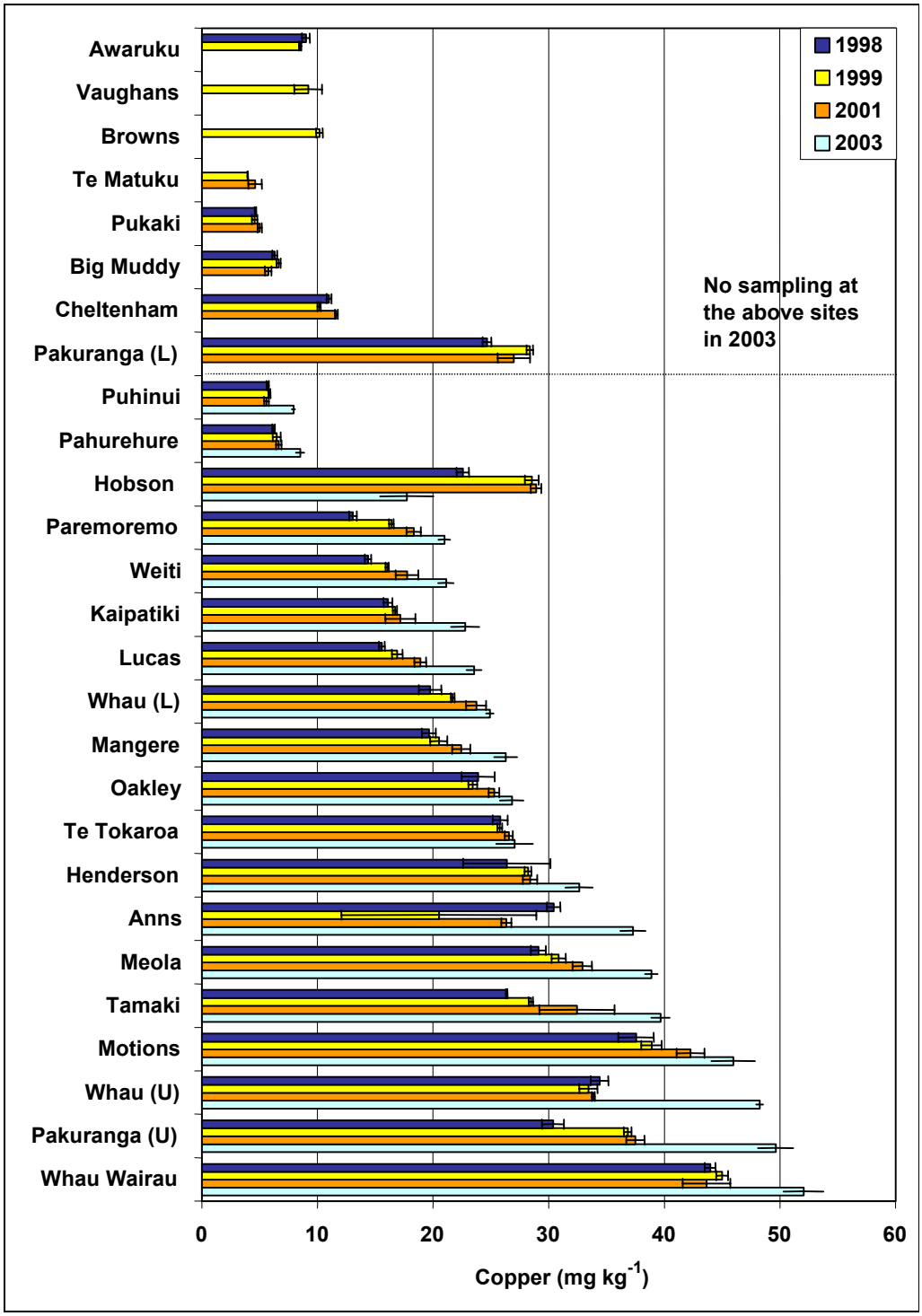


Figure 4.

Cu concentrations (mg kg-1) in total sediment (<500 µm) digested with hot concentrated acids in samples from 1998, 1999, 2001 and 2003. The ANZECC ISQG-low is 65 mg/kg. Environmental response criteria (ERC) Green (<19 mg kg-1), Amber (19-34 mg kg-1) and Red (>34 mg kg-1)

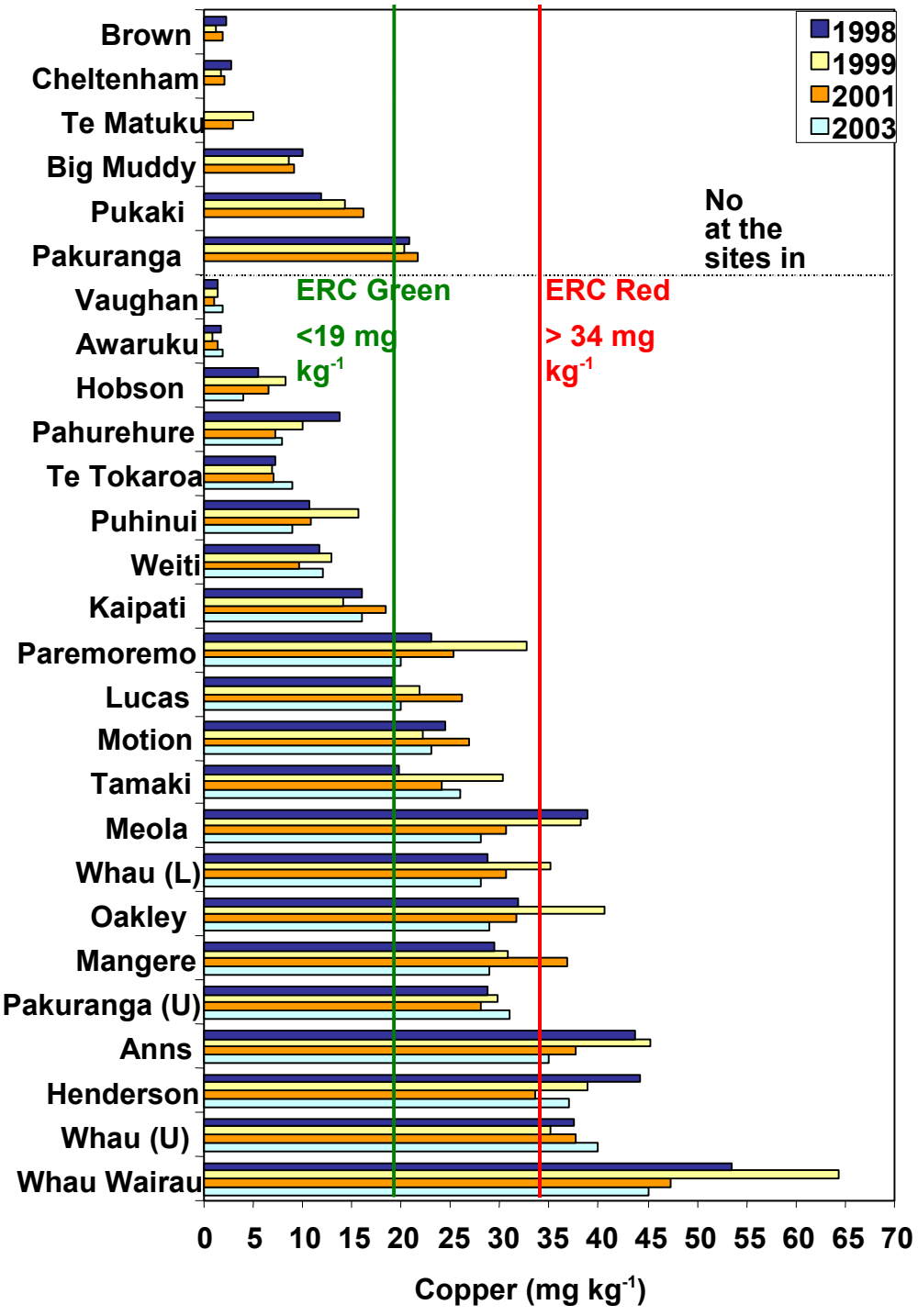


Figure 5.

Pb concentrations (mg kg) in the silt fractions (<63μm) extracted with cold 2M HCl of samples from 1998, 1999, 2001 and 2003. Values are means ± standard error.

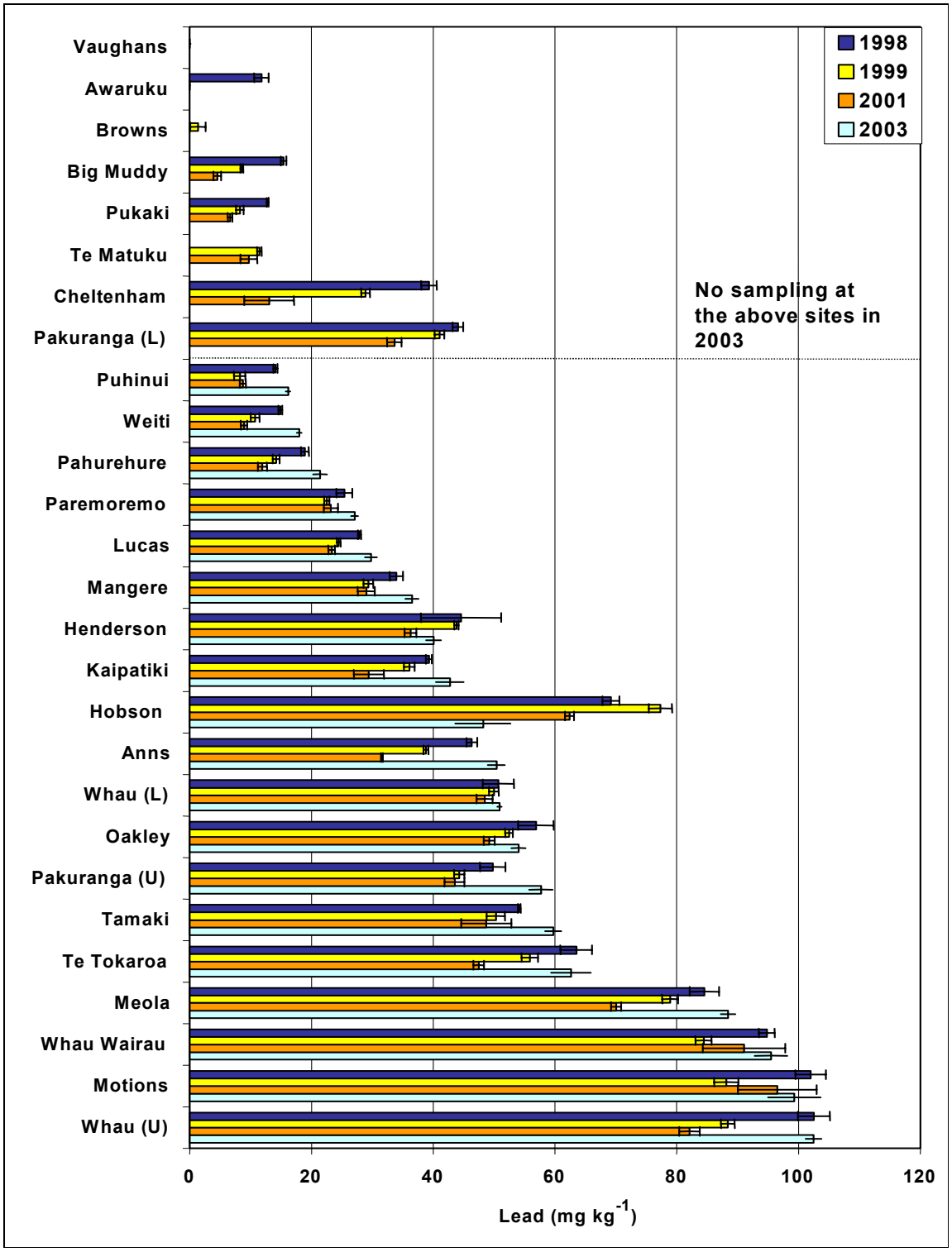
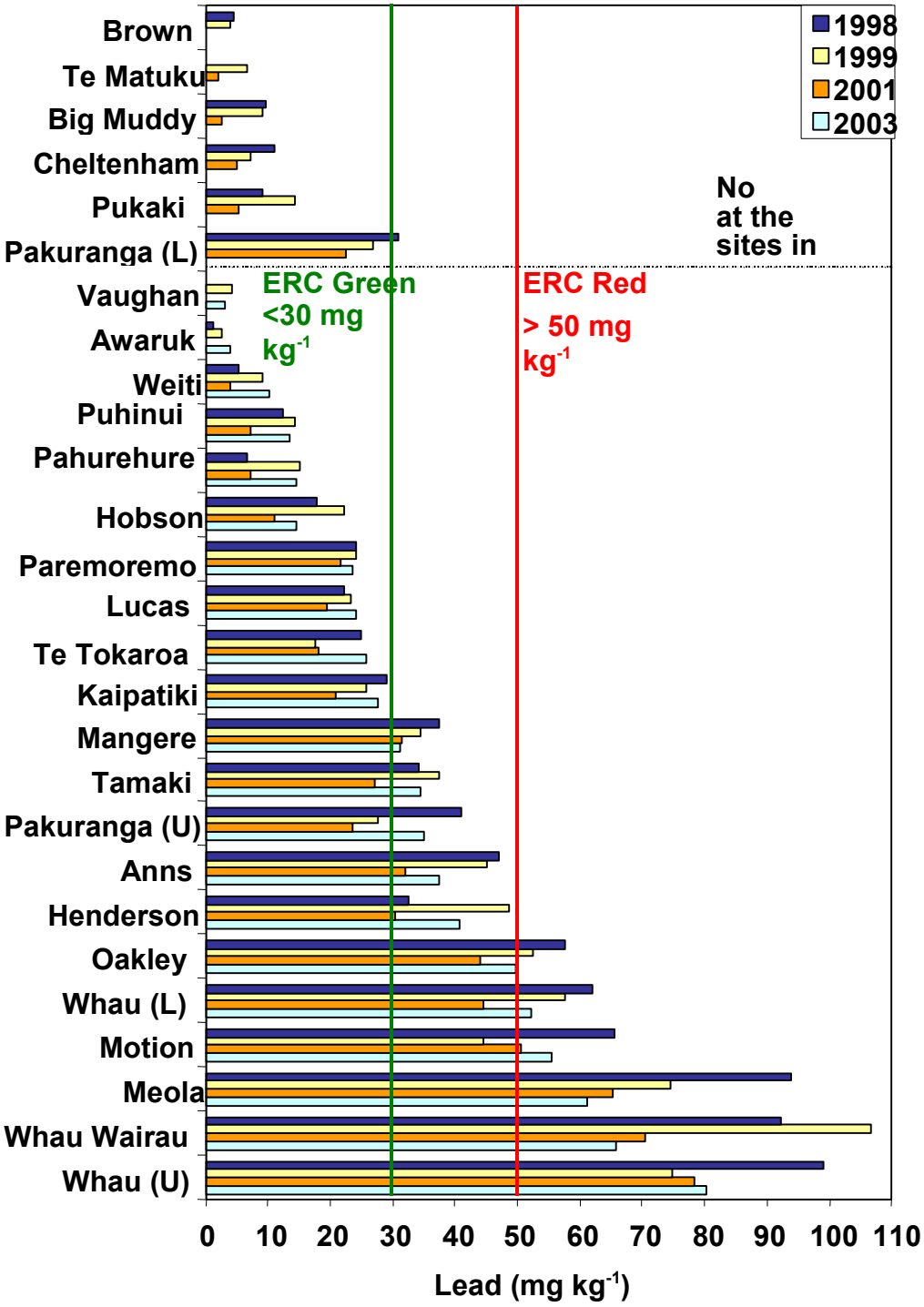


Figure 6.

Pb concentrations (mg kg^{-1}) in total sediment (<500 μm) digested with hot concentrated acids in samples from 1998, 1999, 2001 and 2003. The ANZECC ISQG-low is 50 mg/kg. Environmental response criteria (ERC) Green (<30 mg kg^{-1}), Amber (30-50 mg kg^{-1}) and Red (>50 mg kg^{-1}).



4.3 Total organic carbon

Loss-on-ignition (LOI) was measured in the samples collected in 1998, 1999 and 2001 as an indicator of organic matter. Instrumental procedures for measuring total organic carbon (TOC) came available just before the 2001 survey but it was decided to continue with the LOI measurement for the survey. LOI does not provide a completely reliable measure of TOC because, as well as organic matter, other substances that are volatile at 450 °C such as bound water not volatile at 105 °C, are included in the measurement.

A reliable procedure for measuring total organic carbon (TOC) is now available and this procedure was used for the samples from the 2003 survey. This a major step forward for the monitoring programme because organic contaminant concentrations (PAHs and OCs) can now be normalised to the TOC concentration for comparison with sediment quality guidelines.

Figure 7 shows the results obtained in 2003. These data show that TOC can be measured with a reasonable precision. The 2003 results for TOC are compared with the LOI results for the previous surveys in Figure 8. Overall, the TOC:LOI ratio is 3½:1 but there is considerable scatter about this line because of the variable amounts of other substances contributing to LOI in the different samples.

Figure 7.

Total Organic Carbon in total sediment (<500 μm) in 2003 samples. Values are means ± standard error of means.

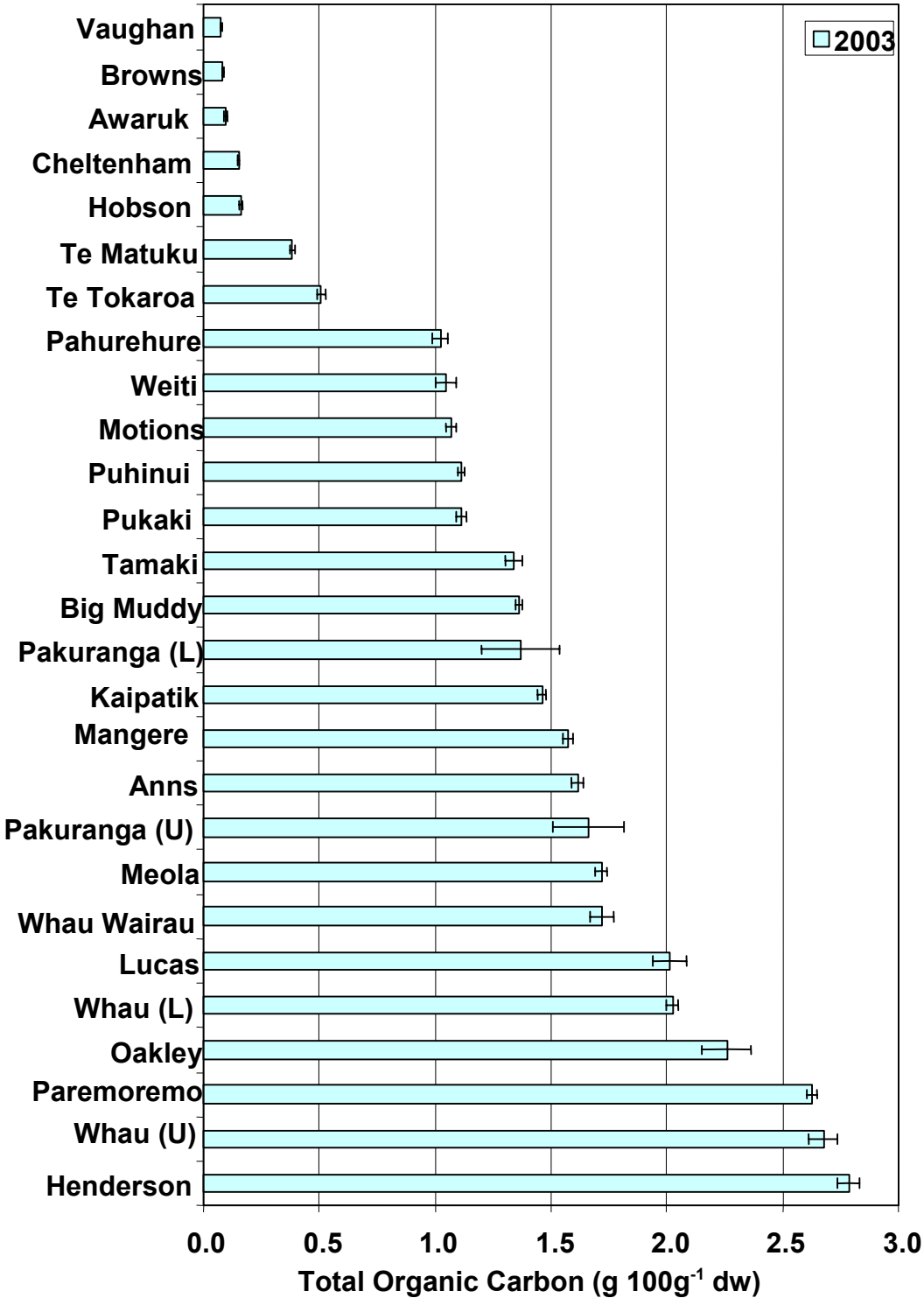
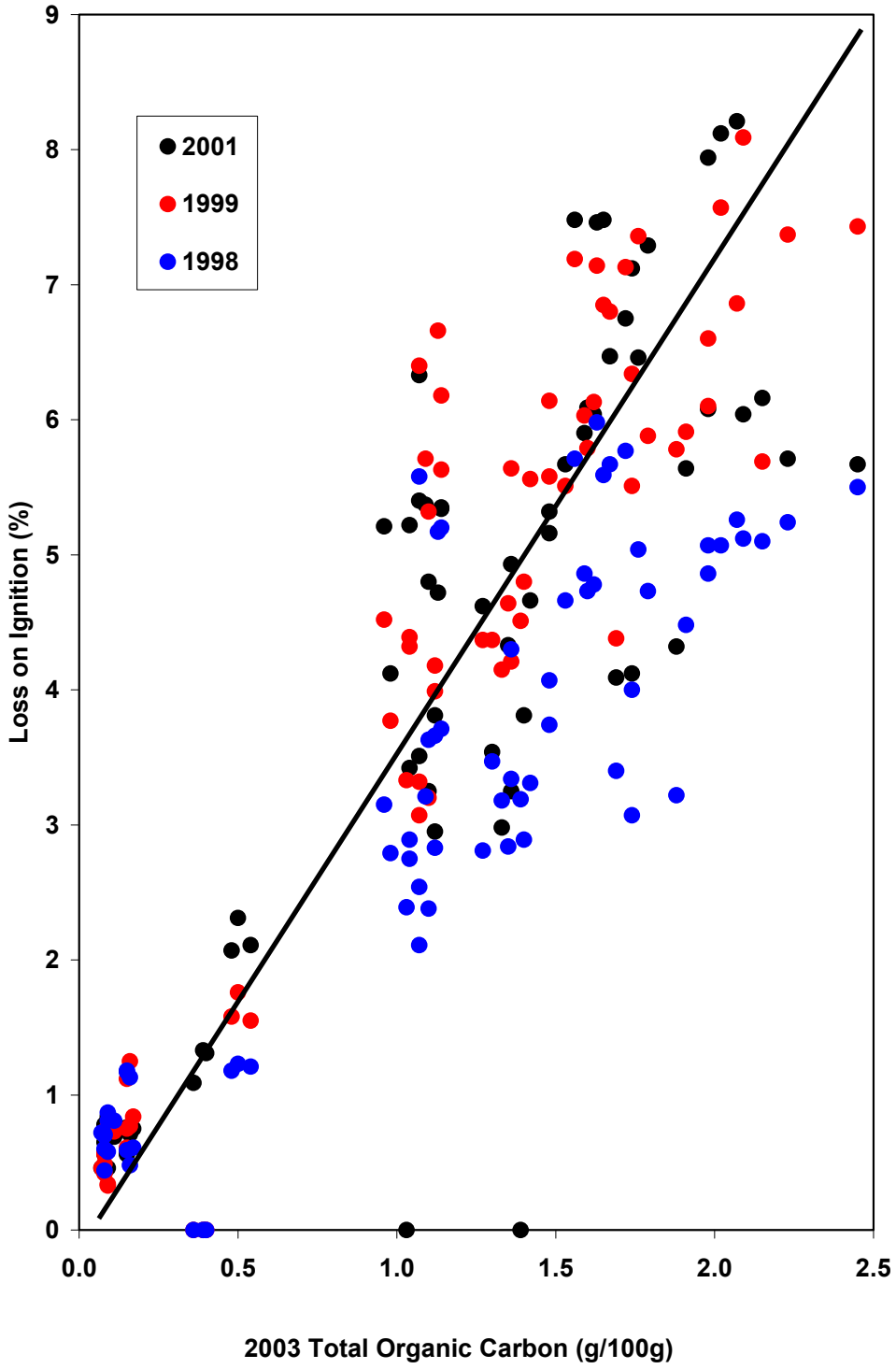


Figure 8.
The relationship between Total Organic Carbon measured in 2003 and Loss on Ignition measured in 1998, 1999 and 2001



4.4 Organochlorine compounds: Pesticides and PCBs.

Organochlorine pesticides were present at above the method detection limit in 47 of the 81 samples analysed. Table 1 lists the results for the 47 samples. DDT and its degradation products, DDE and DDD, were the most frequently detected. Dieldrin was the next most common. The greatest number of OC pesticides, five, was detected at the Henderson site.

Table 2 lists the results for PCBs. Twenty six samples at 12 sites contained detectable PCBs and these were, as expected, the most urbanised sites. The sites in the Whau and Tamaki estuaries were conspicuous for their high concentrations. The Wairau Arm of the Whau estuary appears to have been exposed to PCBs to a generally greater extent than the other sites.

Figure 9 shows concentrations of dieldrin normalised to Total Organic Carbon. Three sites (at Motions, Anns Creek and Mangere) exceed the ERC Red value for dieldrin. For sites where Total DDT and Total PCBs have been detected, the minimum detection limits for some of the constituents were halved and included in the total summation. Where no pesticides have been detected, it is assumed the <MDL value is zero. This approach is adopted because a number of sites with low TOC levels (e.g. Cheltenham Beach, Browns Bay and Hobson Bay) were exceeding the ERC Red values if the halved MDLs were added and normalised to such low TOC levels. Figures 10 and 11 show the average concentrations (± standard error of means) of Total DDT and Total PCBs respectively, normalised to Total Organic Carbon. Meola is the only site to exceed the ERC Red value for Total DDT. No sites exceeded the ERC Red values for PCBs.

Figure 9.

Concentration of Dieldrin (mg kg-1) normalised to Total Organic Carbon (TOC) (g 100g-1) measured in 2003. Values are an average ± standard error of means. ERC values as indicated.

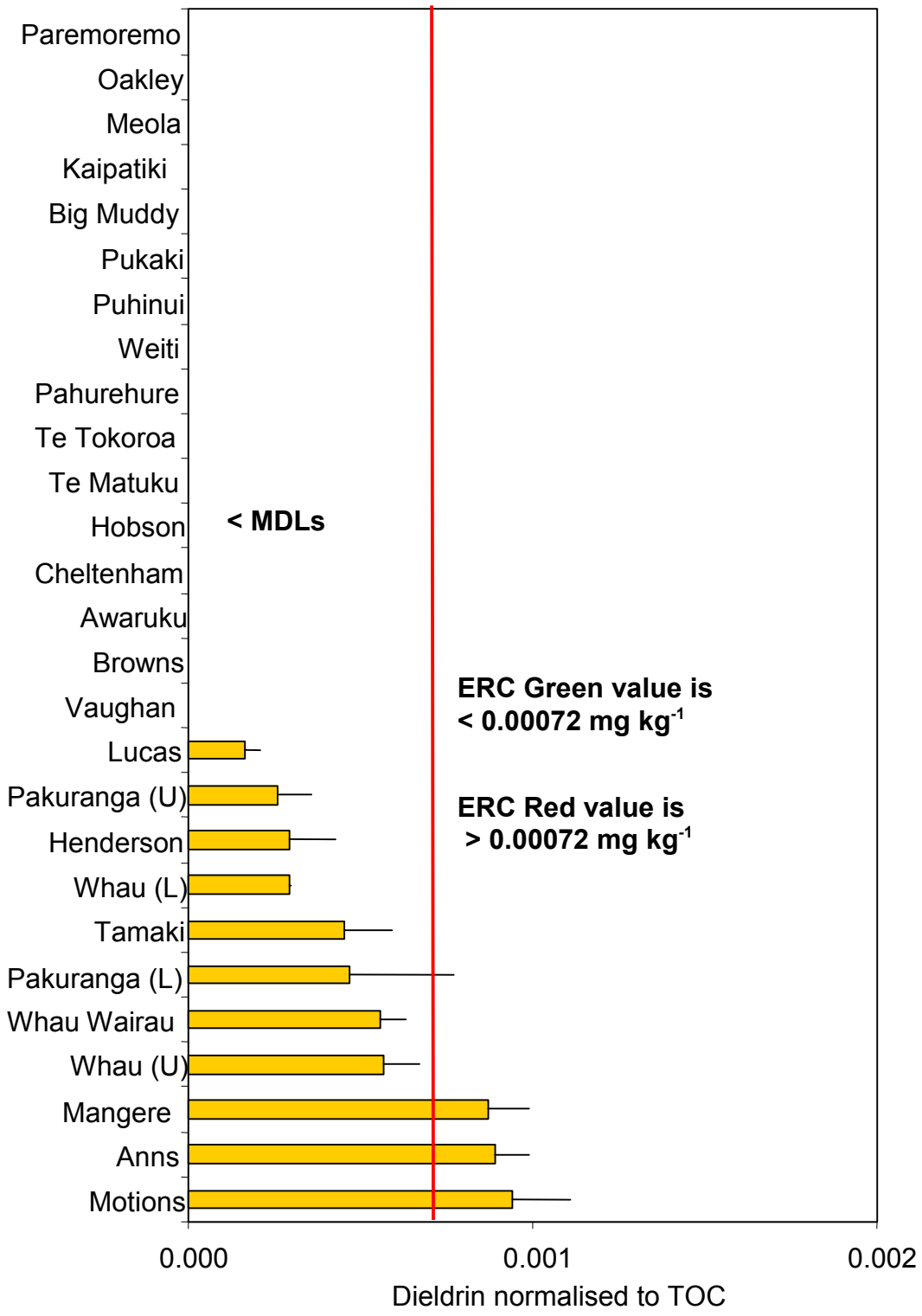


Figure 10.

Concentration of Total DDT (mg kg^{-1}) normalised to Total Organic Carbon (TOC) (g 100g^{-1}) measured in 2003. Values are an average ± standard error of means. ERC values as indicated.

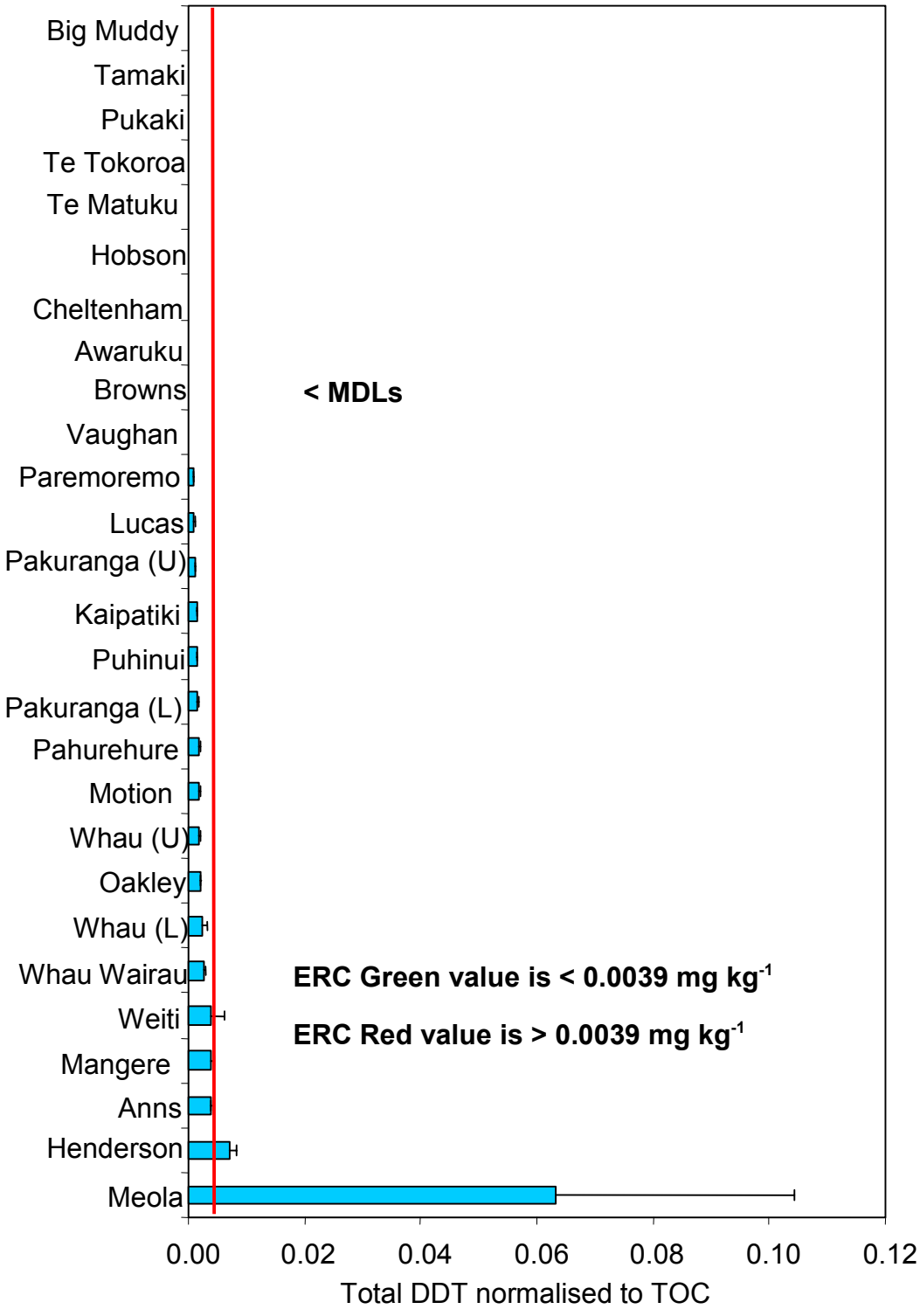


Figure 11.

Concentration of Total PCBs (mg kg-1) normalised to Total Organic Carbon (TOC) (g 100g-1) measured in 2003. Values are an average ± standard error of means. ERC values as indicated.

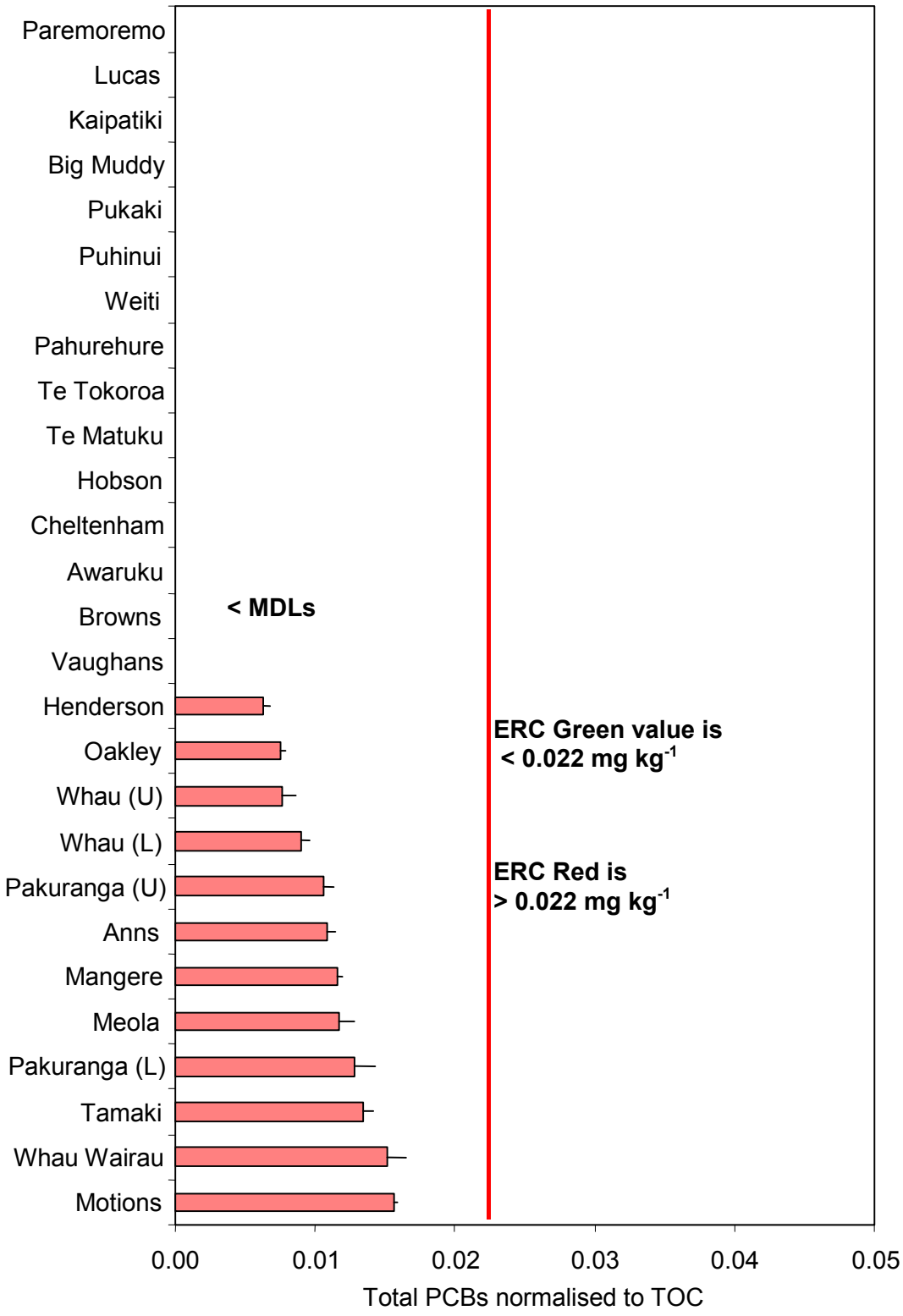


Table 1.

Organochlorine pesticide concentrations (mg kg⁻) in the total (<500 μm) sediment collected in 2003. Samples not shown contained no detectable OC pesticides. Site Code is the ARC site id/year/replicate no.

Site name	Site Code	No. of OCs detected	Hexachloro-benzene	Gamma-BHC (Lindane)	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate	2,4'-DDD	2,4'-DDT	4,4'-DDE	4,4'-DDD	4,4'-DDT	Methoxychlor
Weiti	01/03/01	3				0.0019	0.0016	0.0006						
Weiti	01/03/02	4				0.0026	0.0021					0.0005	0.0072	
Weiti	01/03/03	3				0.0028	0.0017	0.0007						
Kaipatiki	02/03/01	1									0.0012			
Kaipatiki	02/03/03	1									0.0007			
Lucas	03/03/01	2						0.0006			0.0009			
Lucas	03/03/02	4		0.0005	0.0005			0.0007			0.0008			
Paremoremo	04/03/01	4				0.0015	0.002	0.0026			0.0013			
Paremoremo	04/03/02	4				0.0012	0.0011	0.0011			0.0008			
Paremoremo	04/03/03	4				0.0021	0.002	0.0012			0.0014			
Henderson	05/03/01	5		0.0006	0.0015						0.0132	0.0057	0.006	
Henderson	05/03/02	5			0.0007				0.0007		0.0068	0.0031	0.0055	
Henderson	05/03/03	4							0.0006		0.0065	0.0028	0.0057	
Whau (U)	06/03/01	5	0.0013		0.001						0.0012	0.0009	0.0028	
Whau (U)	06/03/02	4			0.0018			0.0025			0.0021	0.0017		
Whau (U)	06/03/03	4			0.0017			0.0024			0.002	0.0014		
Whau (L)	07/03/01	3			0.0006						0.0008	0.0009		
Whau (L)	07/03/02	4			0.0006						0.0007	0.0011	0.0051	
Whau (L)	07/03/03	4			0.0006						0.0008	0.0011	0.0022	
Whau Wairau	08/03/01	3			0.001						0.002	0.0016		
Whau Wairau	08/03/02	3			0.0007						0.0012	0.0011		
Whau Wairau	08/03/03	3			0.0012						0.0021	0.0021		
Oakley	09/03/01	2									0.0017	0.0019		
Oakley	09/03/02	2									0.0019	0.0018		
Oakley	09/03/03	3							0.0009		0.0017	0.0017		
Meola	10/03/01	3									0.0013	0.0043	0.0032	
Meola	10/03/02	4								0.0207	0.0022	0.0215	0.2	

Table 1. (Contin.)

Organochlorine pesticide concentrations (mg kg^{-1}) in the total (<500 µm) sediment collected in 2003. Samples not shown contained no detectable OC pesticides. Site Code is the ARC site id/year/replicate no.

Site name	Site Code	No. of OCs detected	Hexachloro-benzene	Gamma-BHC (Lindane)	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate	2,4'-DDD	2,4'-DDT	4,4'-DDE	4,4'-DDD	4,4'-DDT	Methoxychlor
Meola	10/03/03	4								0.0019	0.0018	0.0121	0.054	
Motions	12/03/01	3			0.0007							0.001	0.0008	
Motions	12/03/02	1			0.0013									
Motions	12/03/03	1			0.001									
Tamaki	14/03/01	1			0.0007									
Tamaki	14/03/03	1			0.0009									
Pakuranga (U)	15/03/02	3			0.0008						0.0006	0.0009		
Pakuranga (L)	16/03/01	1			0.0012									
Pakuranga (L)	16/03/02	1											0.0015	
Pakuranga (L)	16/03/03	1						0.0007						
Anns	18/03/01	4			0.0013						0.0033	0.0012	0.0011	
Anns	18/03/02	4			0.0013						0.0034	0.0012	0.0013	
Anns	18/03/03	3			0.0017						0.0039	0.0011		
Mangere	19/03/01	3			0.001						0.0026	0.001		
Mangere	19/03/02	3			0.0016						0.0041	0.0016		
Mangere	19/03/03	4			0.0015						0.0036	0.0012	0.0012	
Puhinui	21/03/03	1									0.0005			
Pahurehure	22/03/01	2									0.0006	0.0006		
Pahurehure	22/03/02	1									0.0005			
Awaruku	26/03/01	3					0.0007						0.0005	0.0005

Table 2.

Polychlorinated biphenyl (PCBs) concentrations (mg kg^{-1}) in total fractions (<500 μm) from samples collected in 2003. Samples not shown had no detectable PCBs. Site Code is the ARC site id/year/replicate no.

Site Name	Site Code	PCB-101 (Penta)	PCB-110 (Penta)	PCB-149 (Hexa)	PCB-118 (Penta)	PCB-153 (Hexa)	PCB-138 (Hexa)	PCB-180 (Hepta)	PCB-170 (Hepta)	PCB-206 (Nona)	Total PCB detected
Henderson	05/03/01	0.001	0.001		0.001	0.002	0.001				0.006
Whau (U)	06/03/01					0.001					0.001
Whau (U)	06/03/02	0.001	0.001	0.002	0.001	0.002	0.003	0.001			0.011
Whau (U)	06/03/03	0.001		0.001		0.002	0.002				0.006
Whau (L)	07/03/01	0.001		0.001		0.002	0.002				0.006
Whau (L)	07/03/02					0.001					0.001
Whau (L)	07/03/03					0.001					0.001
Whau Wairau	08/03/01	0.002	0.001	0.002	0.001	0.003	0.002	0.001			0.012
Whau Wairau	08/03/02	0.001	0.001	0.002	0.001	0.002	0.002				0.009
Whau Wairau	08/03/03	0.002	0.002	0.002	0.002	0.004	0.004	0.002			0.018
Oakley	09/03/01					0.001					0.001
Oakley	09/03/02					0.001					0.001
Meola	10/03/01					0.001					0.001
Meola	10/03/02	0.001	0.001	0.001	0.001	0.002	0.001				0.007
Meola	10/03/03	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.001		0.010
Motions	12/03/02					0.001					0.001
Tamaki	14/03/01					0.001					0.001
Tamaki	14/03/02	0.001				0.001					0.002
Tamaki	14/03/03					0.002	0.001	0.001		0.001	0.005
Pakuranga (U)	15/03/01					0.002	0.001				0.003
Pakuranga (U)	15/03/02					0.001					0.001
Pakuranga (L)	16/03/02		0.001			0.001	0.001				0.003
Anns	18/03/03				0.001	0.002	0.001				0.004

Table 2. (contin)

Polychlorinated biphenyl (PCBs) concentrations (mg kg) in total fractions (<500 μm) from samples collected in 2003. Samples not shown had no detectable PCBs. Site Code is the ARC site id/year/replicate no cont'd

Site Name	Site Code	PCB-101 (Penta)	PCB-110 (Penta)	PCB-149 (Hexa)	PCB-118 (Penta)	PCB-153 (Hexa)	PCB-138 (Hexa)	PCB-180 (Hepta)	PCB-170 (Hepta)	PCB-206 (Nona)	Total PCB detected
Mangere	19/03/01					0.001	0.001				0.002
Mangere	19/03/02					0.002	0.002				0.004
Mangere	19/03/03	0.001			0.001	0.001					0.003

4.5 Particle size distributions

Tables 3 and 4 show the particles size distributions in the samples in terms of surface area and volume respectively. Surface area is relevant to the surface adsorption capacity of the sediments for chemical contaminants whereas volume is proportional to the mass and weight of the sediment fractions.

Table 3.

Percentage contributions to surface area based on Udden-Wentworth particle size fractions. Values (%) are means. Sites listed in order of decreasing fine sand contribution.

Site	clay	very fine silt	fine silt	medium silt	coarse silt	very fine sand	fine sand	medium sand
	0µm-	3.9-	7.8-	15.6-	31.3-	62.5-	125-	250-300
Weiti	17.6	8.4	6.5	5.2	9.0	30.3	23.0	0.1
Kaipatiki Creek	23.1	7.7	6.6	5.4	9.9	20.4	26.4	0.4
Lucas	33.6	14.4	11.6	8.7	10.5	12.9	8.3	0.0
Paremoremo	35.5	16.8	16.5	12.8	11.5	6.3	0.5	0.0
Henderson	33.2	11.4	9.5	7.0	7.9	19.4	11.4	0.0
Whau (U)	26.7	12.3	8.9	6.0	9.8	21.7	14.5	0.0
Whau (L)	34.3	15.1	13.6	10.8	14.2	10.6	1.5	0.0
Whau (Wairau)	20.9	9.7	8.9	6.4	12.7	26.5	14.8	0.0
Oakley	36.9	15.3	11.9	8.2	8.1	14.9	4.9	0.0
Meola	14.6	6.3	6.2	4.2	8.0	30.2	30.6	0.0
Te Tokaroa	0.9	2.1	2.6	2.5	6.7	36.7	46.9	1.8
Motions	6.3	2.6	2.9	2.6	8.5	36.2	40.5	0.4
Hobson Bay	0.2	0.5	0.7	1.1	8.2	42.9	44.4	2.1
Tamaki	25.4	10.2	7.2	5.4	8.0	22.1	21.7	0.0
Pakuranga (U)	21.3	9.0	6.7	5.2	11.3	23.5	22.9	0.0
Pakuranga (L)	17.5	7.2	5.9	5.0	12.3	27.5	24.5	0.1
Big Muddy	9.8	5.5	7.4	9.9	23.8	31.7	11.6	0.3
Anns	33.6	21.6	19.1	14.3	8.3	2.8	0.2	0.0
Mangere	30.3	19.0	17.6	16.9	12.6	3.7	0.0	0.0
Pukaki	20.6	12.2	13.9	16.4	22.6	10.5	3.8	0.0
Puhinui	22.9	12.9	13.5	15.1	19.1	11.7	4.6	0.0
Pahurehure	10.8	5.3	7.5	6.0	8.6	26.2	34.7	0.9
Te Matuku	0.4	1.1	1.5	1.5	6.7	27.6	57.3	4.0
Cheltenham	0.9	0.4	0.5	0.8	5.6	45.9	44.9	1.0
Browns Bay	0.1	0.3	0.3	0.4	1.5	15.1	73.1	9.2
Awaruku	0.1	0.3	0.4	0.5	2.8	32.9	61.7	1.2
Vaughans	0.1	0.2	0.2	0.3	1.7	19.5	73.7	4.2

Table 4.

Percentage contributions to sediment volume based on Udden-Wentworth particle size fractions. Values (%) are means. Sites listed in order of decreasing fine sand contribution.

Site	clay	very fine silt	fine silt	medium silt	coarse silt	very fine sand	fine sand	medium sand
	0µm-	3.9-	7.8-	15.6-	31.3-	62.5-	125-	250-300
Weiti	0.6	0.7	1.0	1.6	6.4	40.3	49.3	0.2
Kaipatiki Creek	0.6	0.6	1.0	1.6	6.5	26.3	62.0	1.4
Lucas	2.0	2.4	3.9	5.6	14.6	34.1	37.5	0.0
Paremoremo	4.0	5.3	10.5	15.4	29.5	30.9	4.4	0.0
Henderson	1.4	1.5	2.5	3.6	8.8	42.5	39.8	0.0
Whau (U)	1.1	1.3	2.0	2.5	9.3	39.4	44.4	0.0
Whau (L)	3.1	3.9	7.0	10.8	30.8	37.3	7.2	0.0
Whau (Wairau)	0.7	1.0	1.8	2.5	11.0	43.0	40.0	0.0
Oakley	2.9	3.3	4.9	6.3	13.5	47.7	21.3	0.0
Meola	0.3	0.4	0.8	1.1	4.8	35.1	57.4	0.1
Te Tokaroa	0.0	0.1	0.2	0.5	2.8	29.8	62.4	4.2
Motions	0.1	0.1	0.3	0.5	4.0	33.1	60.8	0.9
Hobson Bay	0.0	0.0	0.1	0.2	3.4	32.5	59.1	4.7
Tamaki	0.9	1.0	1.3	2.0	6.2	34.8	53.9	0.0
Pakuranga (U)	0.8	0.9	1.2	1.8	8.2	31.8	55.3	0.1
Pakuranga (L)	0.5	0.5	0.9	1.5	8.3	34.3	53.4	0.4
Big Muddy	0.3	0.5	1.3	3.6	18.6	43.8	30.9	1.0
Anns	5.7	9.1	16.5	23.5	26.7	16.5	2.0	0.0
Mangere	4.5	7.1	12.7	23.6	34.5	17.6	0.0	0.0
Pukaki	1.4	2.2	5.1	11.9	32.9	28.9	17.6	0.0
Puhinui	1.5	2.3	4.8	10.6	27.4	31.4	22.1	0.0
Pahurehure	0.3	0.4	1.2	1.8	4.9	28.7	60.6	2.0
Te Matuku	0.0	0.0	0.1	0.2	2.4	19.1	70.1	8.0
Cheltenham	0.0	0.0	0.0	0.1	2.4	36.5	58.8	2.1
Browns Bay	0.0	0.0	0.0	0.0	0.4	8.8	74.9	15.6
Awaruku	0.0	0.0	0.0	0.1	1.0	24.7	71.6	2.6
Vaughans	0.0	0.0	0.0	0.0	0.6	12.8	79.1	7.5

4.6 Trends over time for metal concentrations

Trends in metal concentrations at the 27 sites in the programme over the period 1998 to 2001 have been described previously (Timperley and Mathieson, 2002). These trends have been revised to include the 2003 results and are presented in Figures 12 to 14 for Zn, Cu and Pb, respectively. Note, however, that 8 sites were not sampled in 2003. These were Vaughans, Awaruku, Browns, Big Muddy Te Matuku, Pukaki, Cheltenham, and Pakuranga (L). The trend plots for these sites for the period 1998 to 2001 are included here for completeness.

Zinc concentrations are continuing to increase at all sites except Hobson Bay. The increases are most marked at those sites identified as settling zones which are generally those sites closest to urban areas with the highest exposure to contaminants (Timperley and Mathieson, 2002). At ten sites the average rate of increase in zinc concentration over the 1998 to 2003 period has increased compared to the rate over the 1998 to 2001 period. These sites are (from largest increase to smallest) Meola, Ann's, Pakuranga (U), Tamaki, Te Tokaroa, Puhinui, Kaipatiki, Mangere, Pahurehure and Whau (U). For Meola and Ann's Creek the increases in concentration between 2001 and 2003 were 56 and 63 mg kg^{-1} respectively. The increase at Anns Creek might be more apparent than real because of the high variability in Zn concentrations at this site in 2001 (Timperley and Mathieson, 2002). Zinc concentrations have apparently decreased at the Hobson Bay site.

The concentrations of copper have continued to increase at all sites except Te Tokaroa and Pakuranga (L) at which the concentrations have stabilised and Hobson Bay where the initially increasing trend seems to have reversed. The average rate of increase in copper concentrations at fifteen of the sites has increased since the 2001 survey. These fifteen sites (from largest increase to smallest) were Whau (U), Anns, Whau Wairau, Pakuranga (U), Kaipatiki, Meola, Tamaki, Henderson, Lucas, Puhinui, Mangere, Pahurehure, Weiti, Motions and Oakley.

The results for the period 1998 to 2001 showed a general regional picture of decreasing trends in lead concentrations but the 2003 results have changed this picture for most of the sites. Only one site, Hobson Bay, continues to show a declining trend. At all other sites, the 2003 results were similar to the 1998 results. As a consequence the overall trends at these sites are now flat or increasing. This rather dramatic and unexpected change does not have an obvious explanation but clearly, the assumed steady decrease in lead contamination in marine sediments as a result of removing lead from petrol and the restrictions on lead-based paints, is now in question.

Over the period of the previous three surveys in 1998, 1999, 2001, lead concentrations decreased at most sites. However, the rate of decrease has slowed at all sites except for Hobson Bay for which the concentrations are apparently decreasing faster. The highest increases from previous estimates were at Whau (U), Anns, Meola, Te Tokaroa, Kaipatiki and Pakuranga (U).

Figure 12.

Zinc concentrations (mg kg^{-1}) in the <63µm sediment fractions

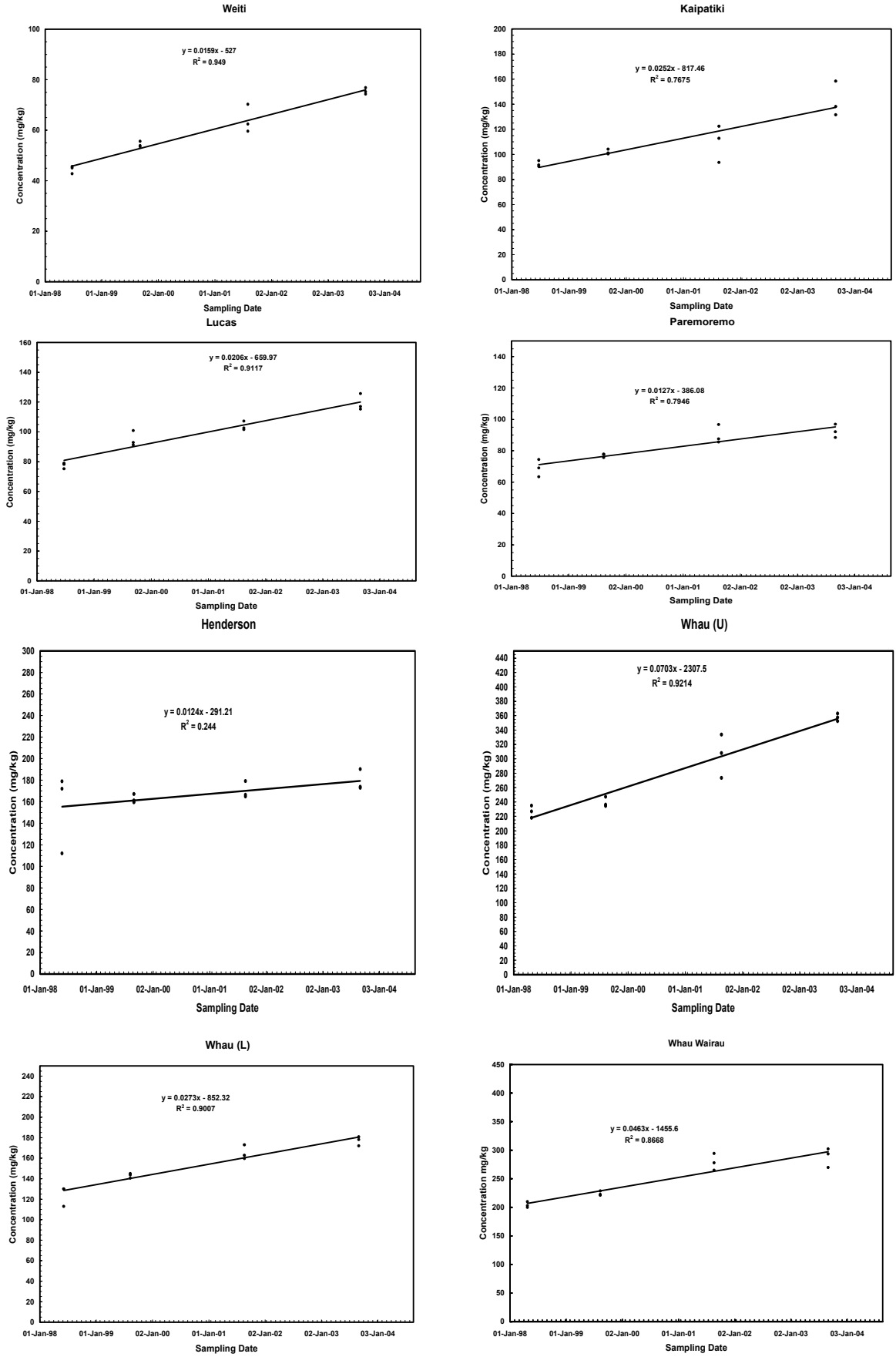


Figure 12 (contin.).

Zinc concentrations (mg kg^{-1}) in the <63µm sediment fractions

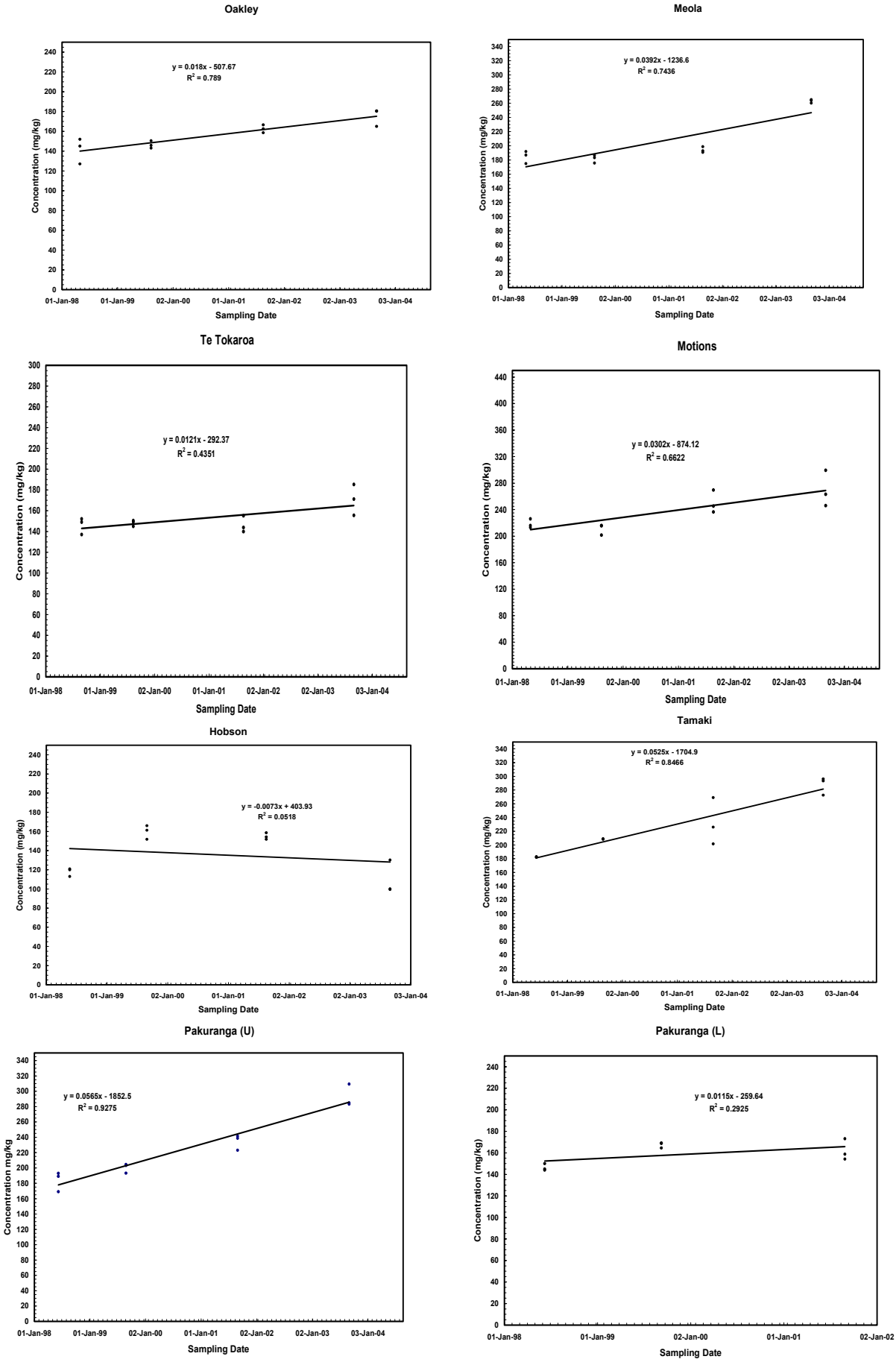


Figure 12 (contin.).

Zinc concentrations (mg kg^{-1}) in the <63µm sediment fractions

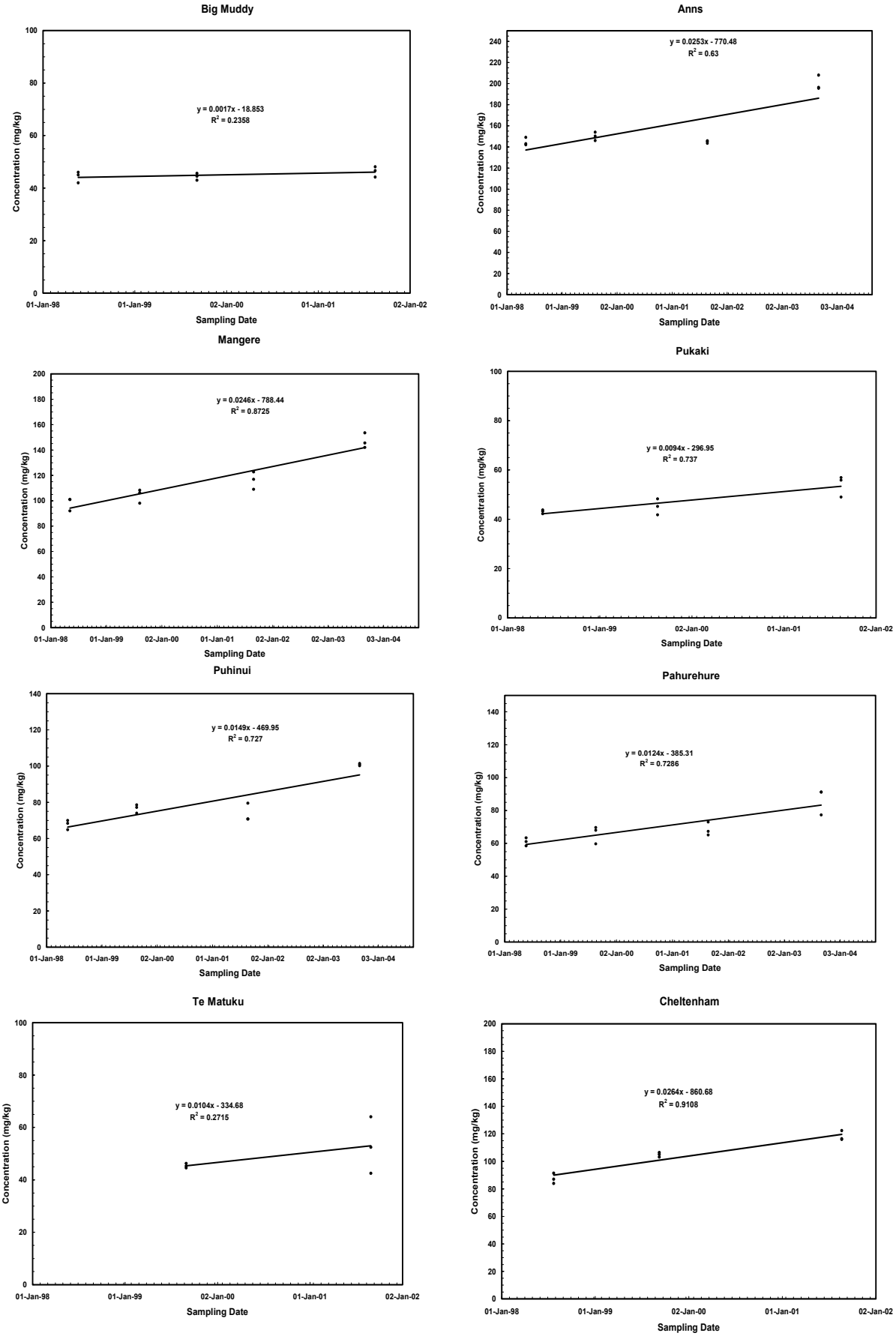


Figure 12 (contin.). Zinc concentrations (mg kg) in the <63µm sediment fractions

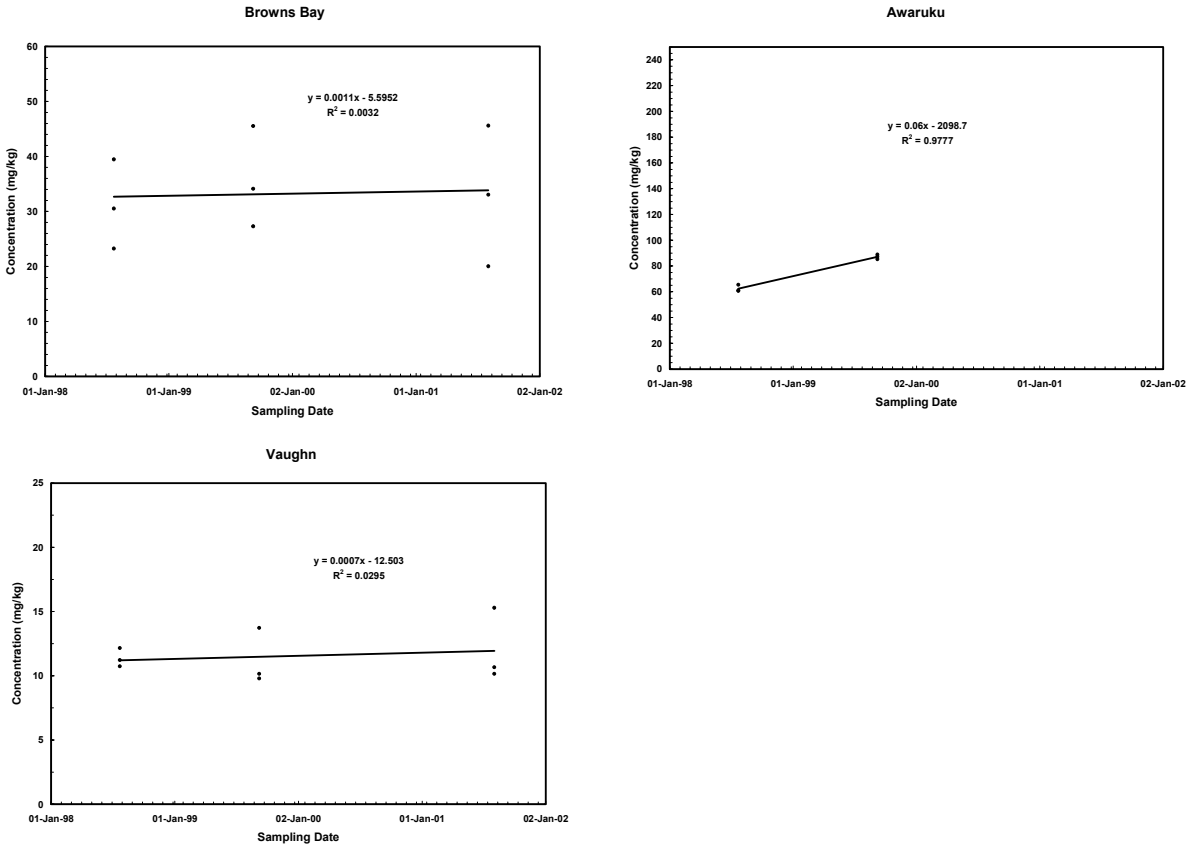


Figure 13.

Copper concentrations (mg kg^{-1}) in the <63µm sediment fractions

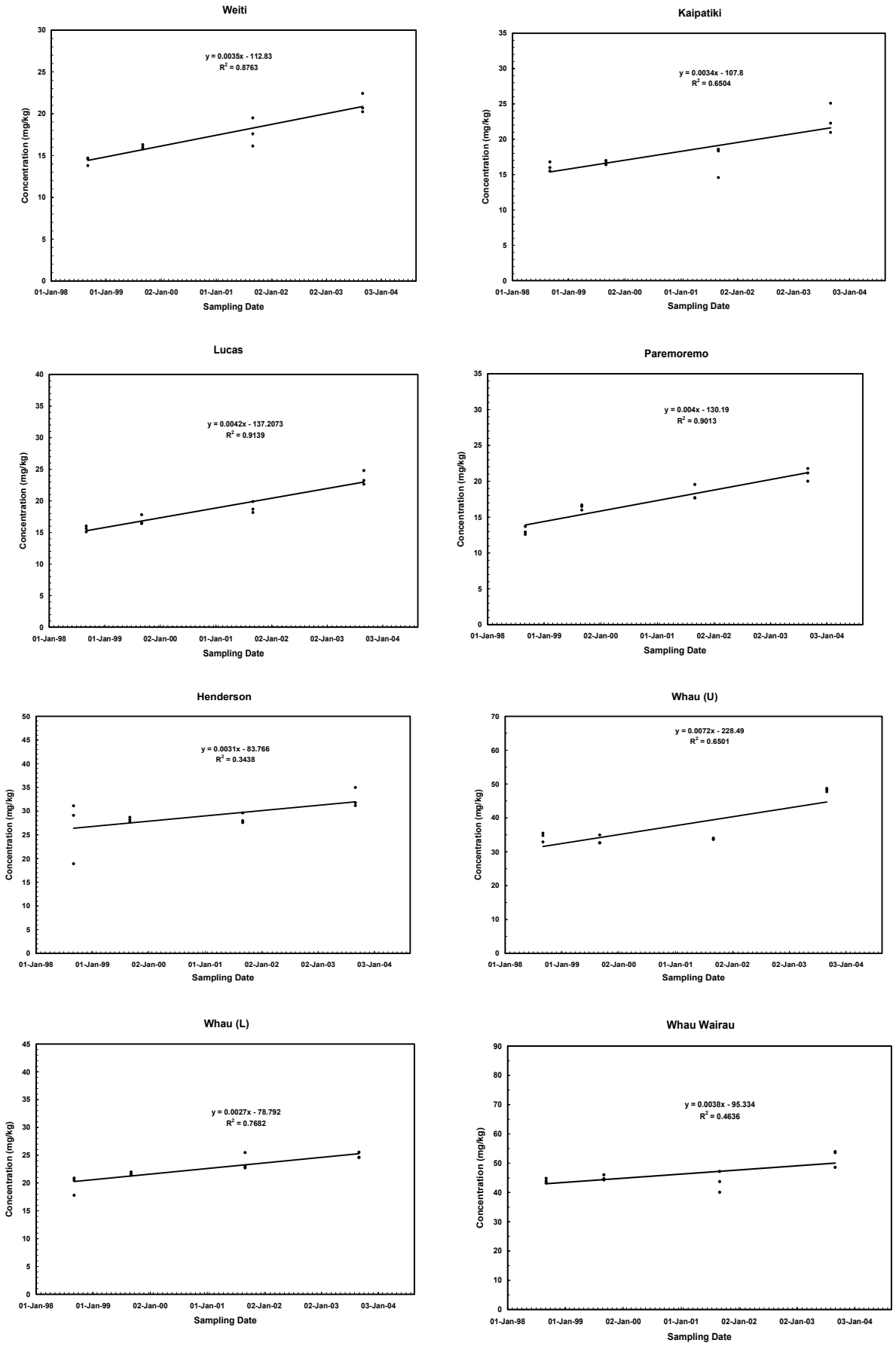


Figure 13 (Contin.).

Copper concentrations (mg kg^{-1}) in the <63µm sediment fractions

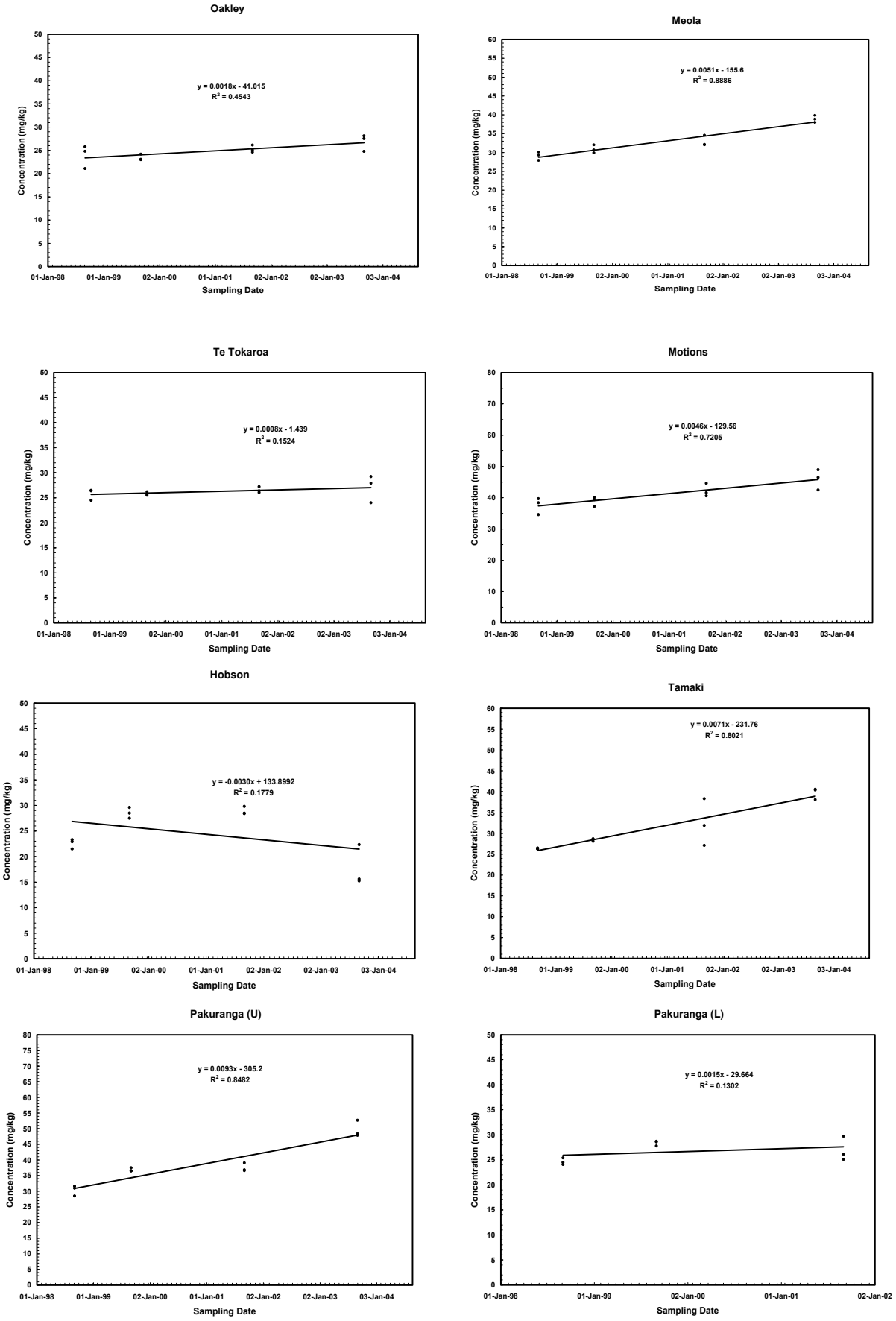


Figure 13 (Contin.).

Copper concentrations (mg kg^{-1}) in the <63µm sediment fractions

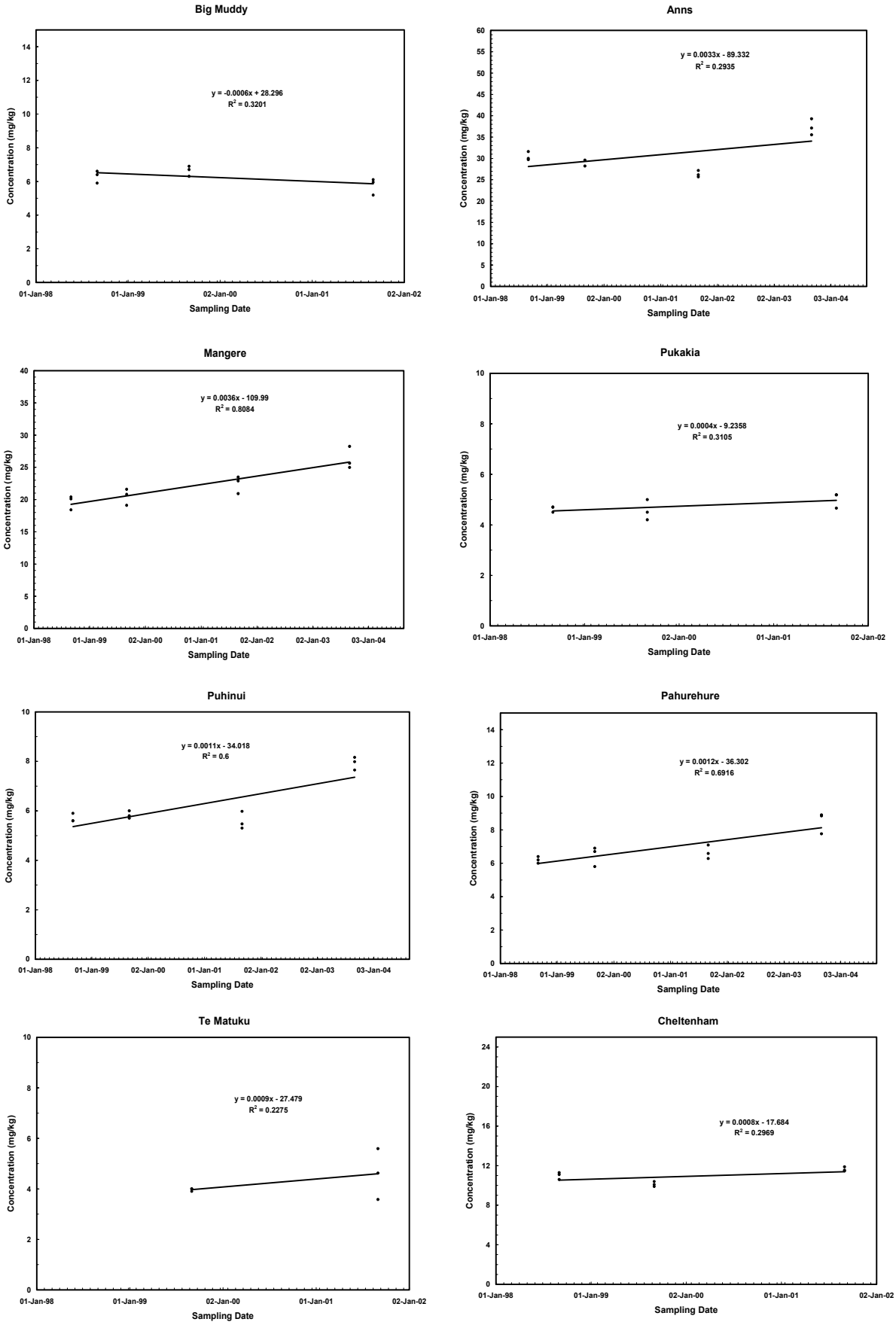


Figure 13 (Contin.).

Copper concentrations (mg kg^{-1}) in the <63µm sediment fractions

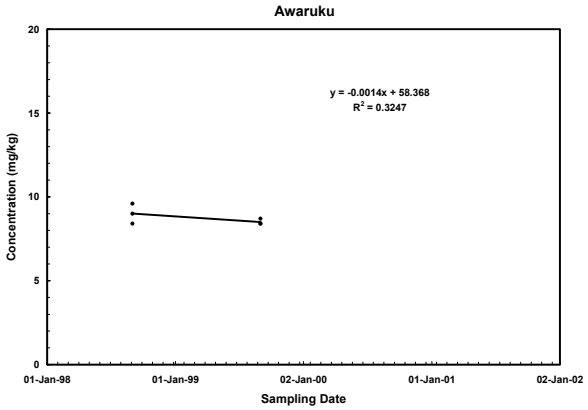


Figure 14.

Lead concentrations (mg kg) in the <63µm sediment fractions

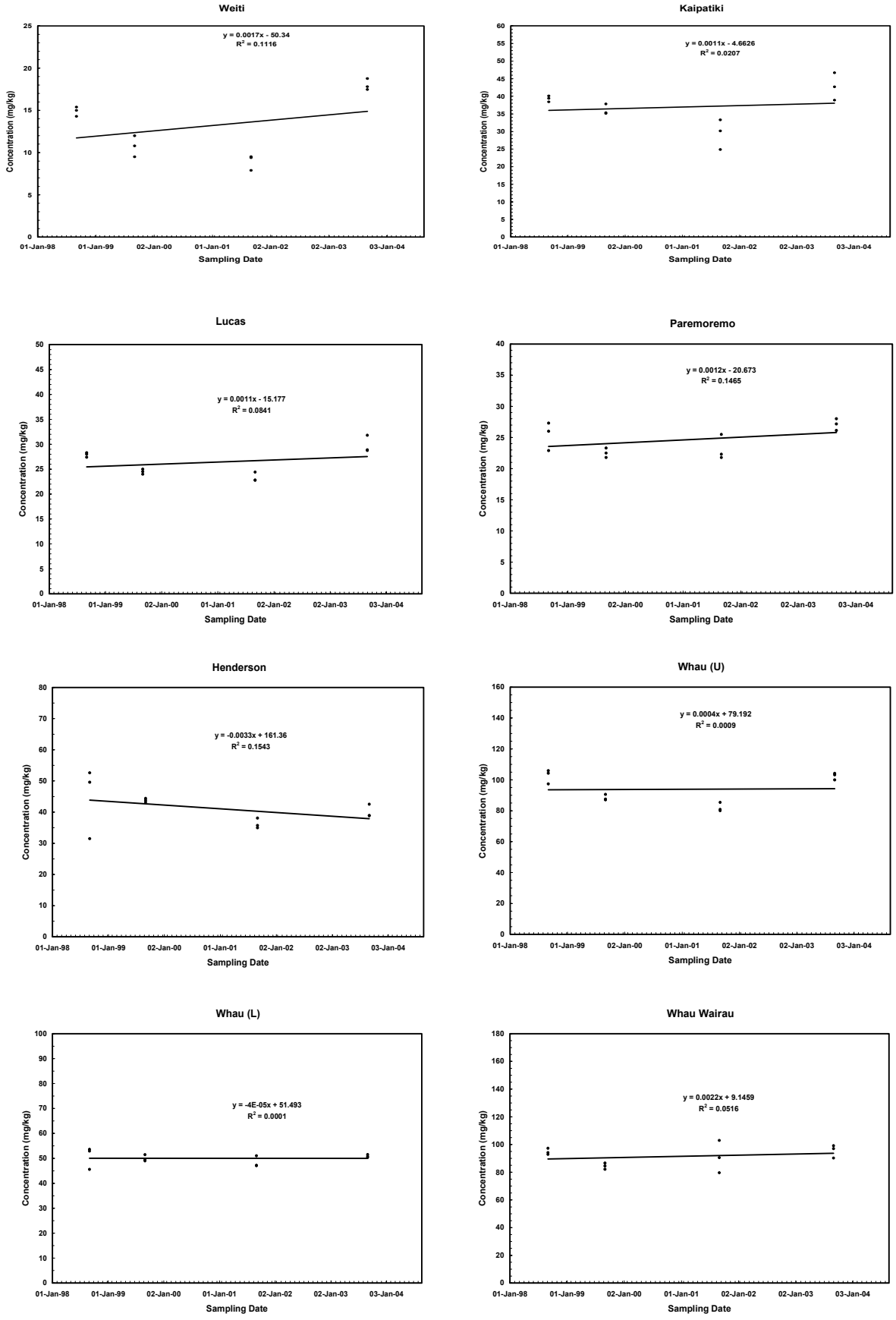


Figure 14 (Contin.).

Lead concentrations (mg kg^{-1}) in the <63µm sediment fractions

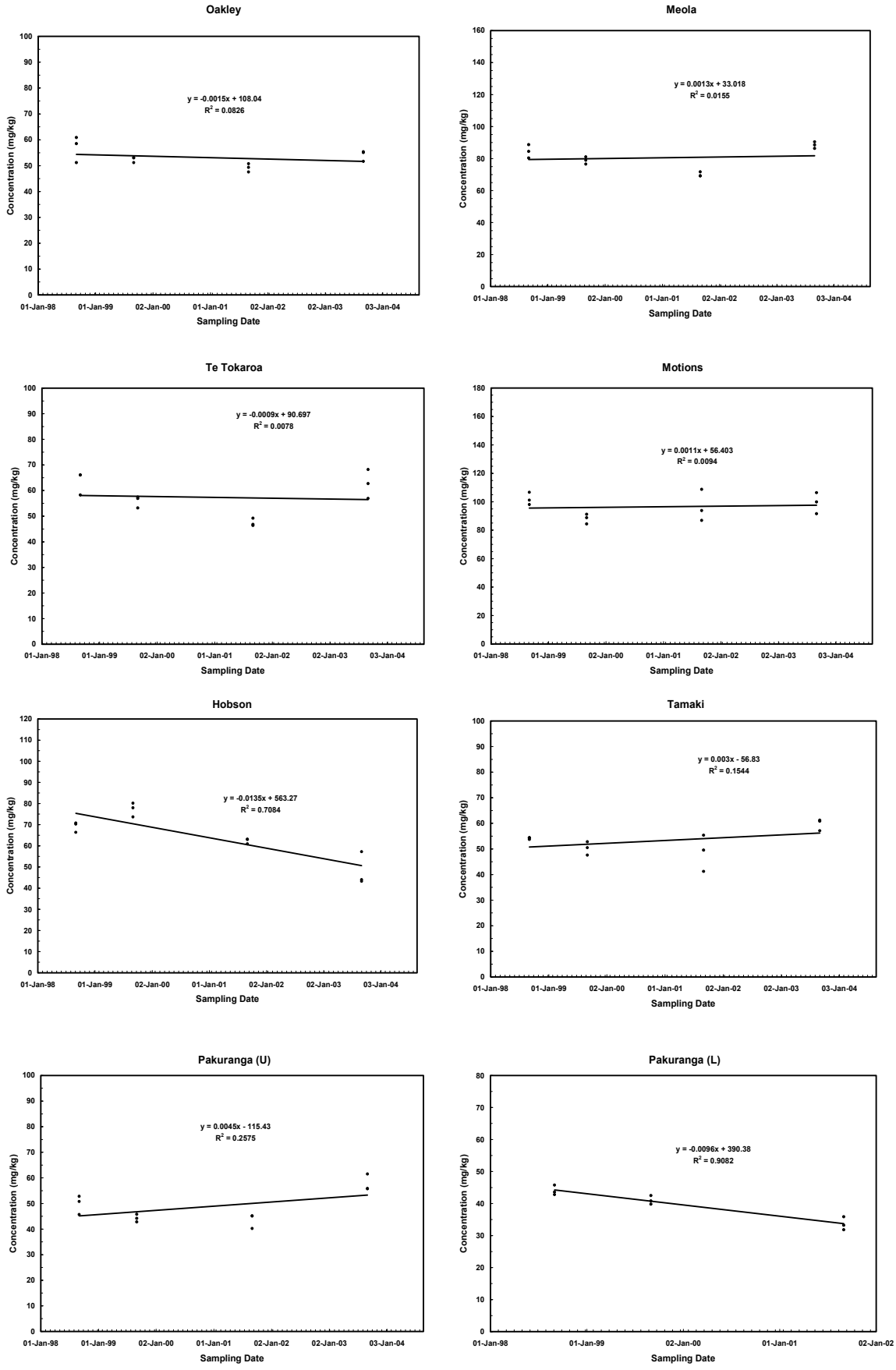


Figure 14 (Contin.).

Lead concentrations (mg kg-1) in the <63µm sediment fractions

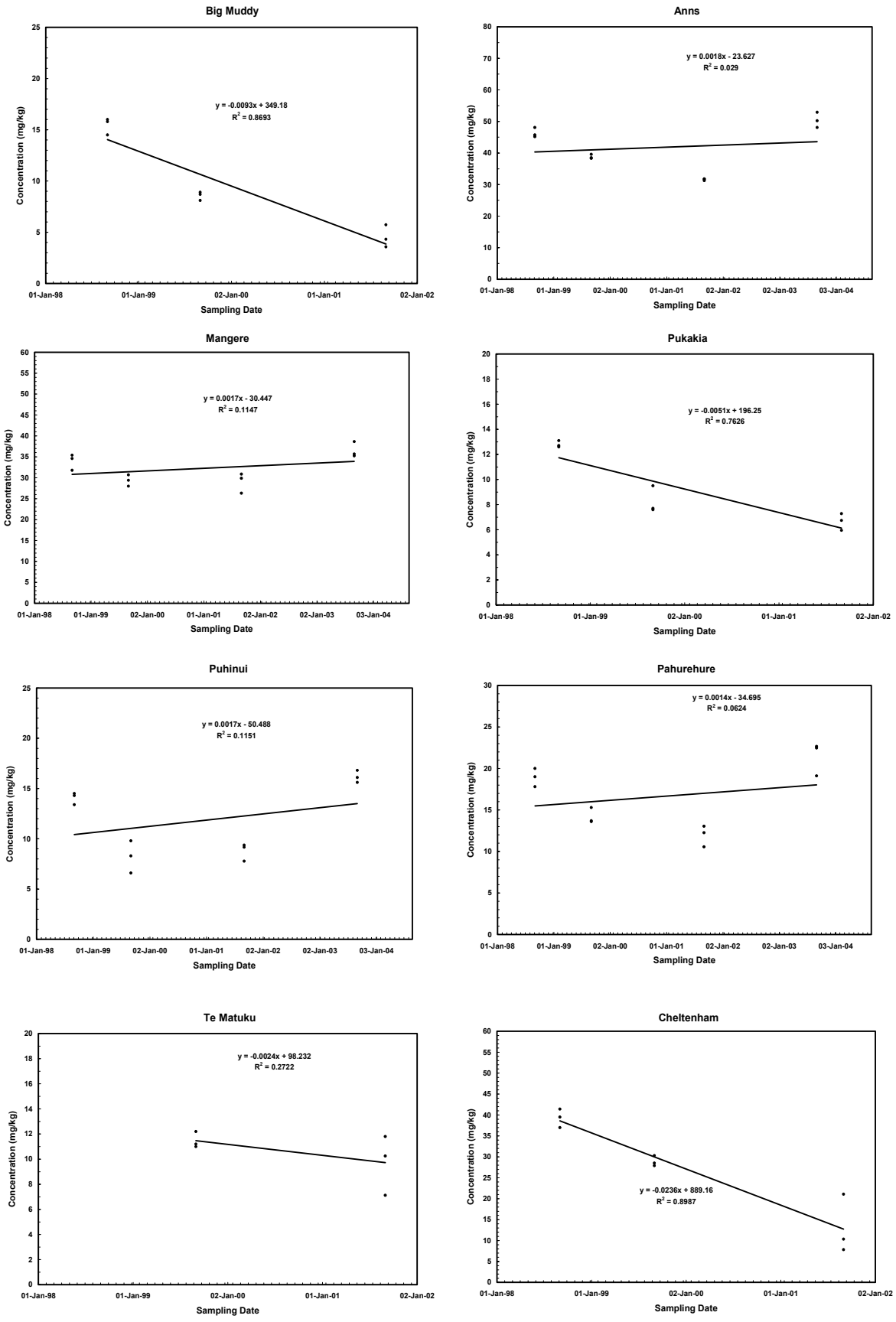
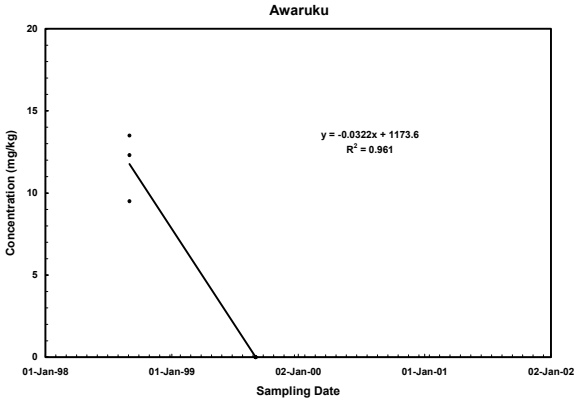


Figure 14 (Contin.).

Lead concentrations (mg kg^{-1}) in the <63µm sediment fractions



5.0 References

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Appendix 1

Analytical Procedures and Quality Assurance

Metals

Sediment samples for weak-acid extraction were prepared by wet-sieving approximately 60 mL of sample through a 63 μm plastic mesh with 300 mL of deionised water. The filtrate was centrifuged at 3000 rpm for 20 minutes before the supernatant liquid was decanted. Approximately 2.5 g of sediment residue was placed in 50 mL polypropylene centrifuge tubes. Separate samples were dried at 105 °C overnight for moisture-content determination. To each tube 40 mL of 2M HCl was added to extract the reactive fraction of metals. The tubes were placed on their sides on a shaking table at 100 rpm for 24 hours. Samples were then centrifuged at 3000 rpm for 15 minutes and the supernatant was decanted into new tubes for analysis. The extracts were analysed for zinc, copper and lead by Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS). Concentrations of metals were corrected for moisture content and expressed as metal content (μg)/dry weight of sediment (g).

Sediment samples for hot acid digestion were freeze-dried and sieved through 500 μm mesh. Composite samples of approximately 1g were prepared from the 3 replicates of each site. These were digested for 3 hours at 100 °C in 10 mL of 3:1 HCl:HNO_3. A further 5 mL of concentrated HNO_3 was added to each tube and the digestions continued for another hour (or until the digests cleared and the remaining grains appeared clean). The samples were then cooled, diluted to 50mL and centrifuged at 2500 rpm for 10 minutes to remove the remaining debris. The extracts were decanted into clean tubes and analysed for zinc, copper and lead by Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS) as described above.

Calculations were based on standard calibrations with acidic working standards prepared from commercially-available stock solutions. QA assessment of the calibrations was carried out by analysing AQC standards made up from appropriate metal salts.

To assess analytical performance, 5 samples collected and analysed in 1999 were re-analysed in 2001 and have now been re-analysed in 2003. The results are given in Tables 5 and 6 and show the variability over time of the analytical procedure. These replicate results for the 1999 samples are compared with the results for samples collected in 1999 (obviously the same results), 2001 and 2003 in Figure 15 for the sediment silt fraction (<63μm) and in Figure 16 for total sediment (<500 μm fraction). Estimates of the error (± Standard Error of Means) are shown.

This graphical presentation indicates that there has been no consistent trends over time in the analytical accuracy for zinc, copper and lead.

Table 5.

Metal concentrations (mg kg^{-1}) in sediment silt fractions (<63 μm 2M HCl extraction) of 1999 samples analysed in 1999, 2001 and 2003.

Site	Sample OA65/**	Zn 2003	2001	1999	Cu 2003	2001	1999	Pb 2003	2001	1999
Whau (U)	71	229.5	245.5	236.4	31.2	34.8	32.6	80.4	86.5	87.5
Tamaki	52	227.5	211.7	209.1	30.7	28.3	28.6	53.4	47.9	52.8
Motions	77	233.2	196.7	201.6	40.7	38.3	37.2	88.6	76.6	84.4
Meola	79	201.8	176.9	186.5	33.6	31.5	32.0	82.1	70.0	81.1
Te Matuku	56	62.2	48.0	45.3	5.8	4.0	4.0	13.9	10.1	11.2

Table 6.

Metal concentrations (mg kg^{-1}) in total sediment (<500 μm hot acid digestion) of 1999 samples analysed in 1999, 2001 and 2003.

Site	Sample OA65/**	Zn 2003	2001	1999	Cu 2003	2001	1999	Pb 2003	2001	1999
Meola	79-81	280	306.3	261	38	35.6	38.3	80.2	75.8	74.4
Motions	76-78	259	212.8	197.1	26	25.8	22.3	55.3	54.5	44.5
Whau (U)	70-72	247	238.0	237.2	41	37.5	35.1	80.4	78.4	74.7
Tamaki	52-54	179	148.1	164.7	30	33.2	30.3	41.0	34.9	37.4
Te Matuku	55-57	35	30.9	29.3	5	7.1	5.1	8.5	2.9	6.7

Figure 15.

Extractable metal concentrations measured in a) samples collected from 4 sites in 1999, 2001 and 2003 (actual values), and b) from repeated analysis in 1999, 2001 and 2003 of the same samples collected from 4 sites in 1999. Metals were extracted by weak acid digestion of the <63 µm sediment fraction. Error bars are SEM (Standard Error of Means).

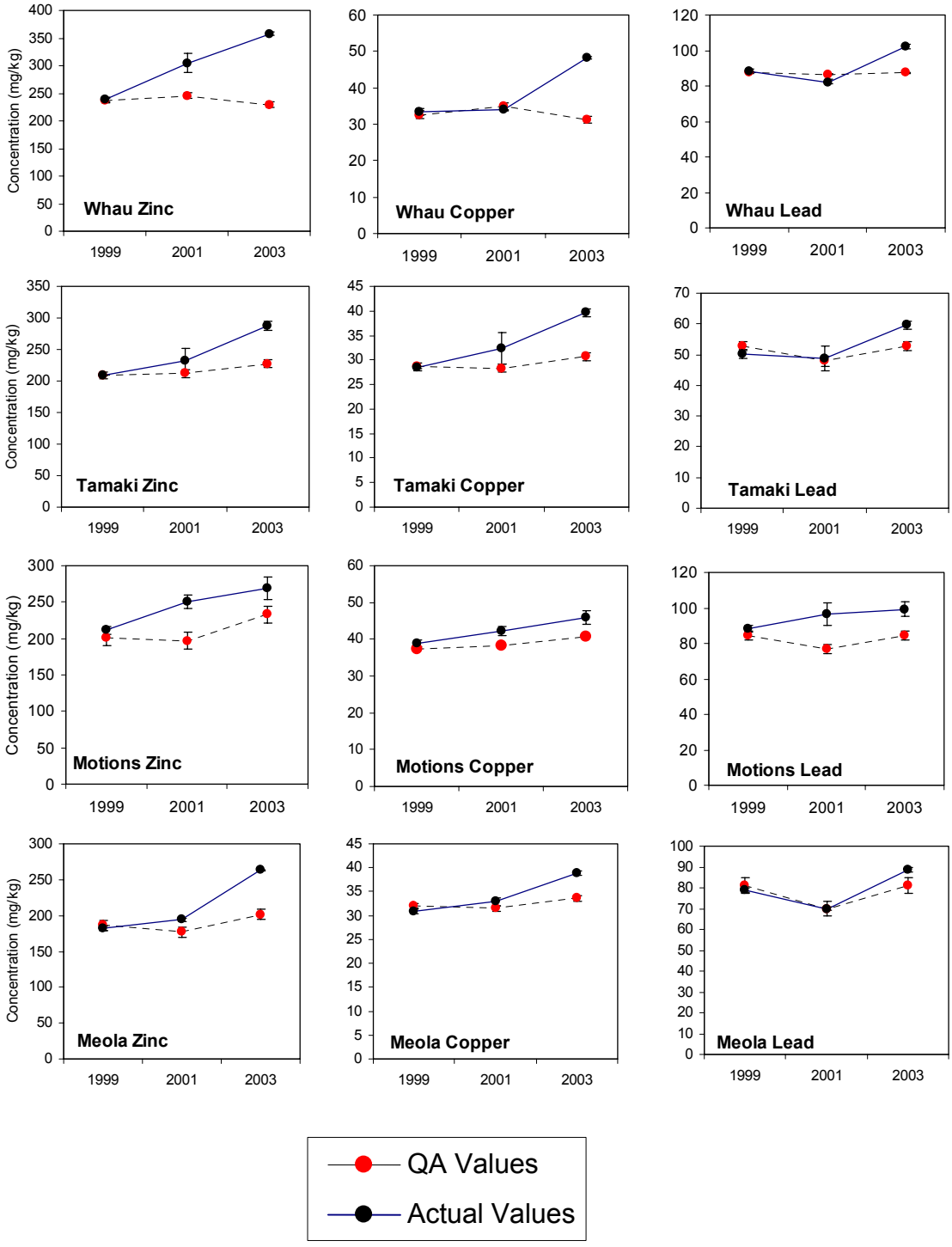
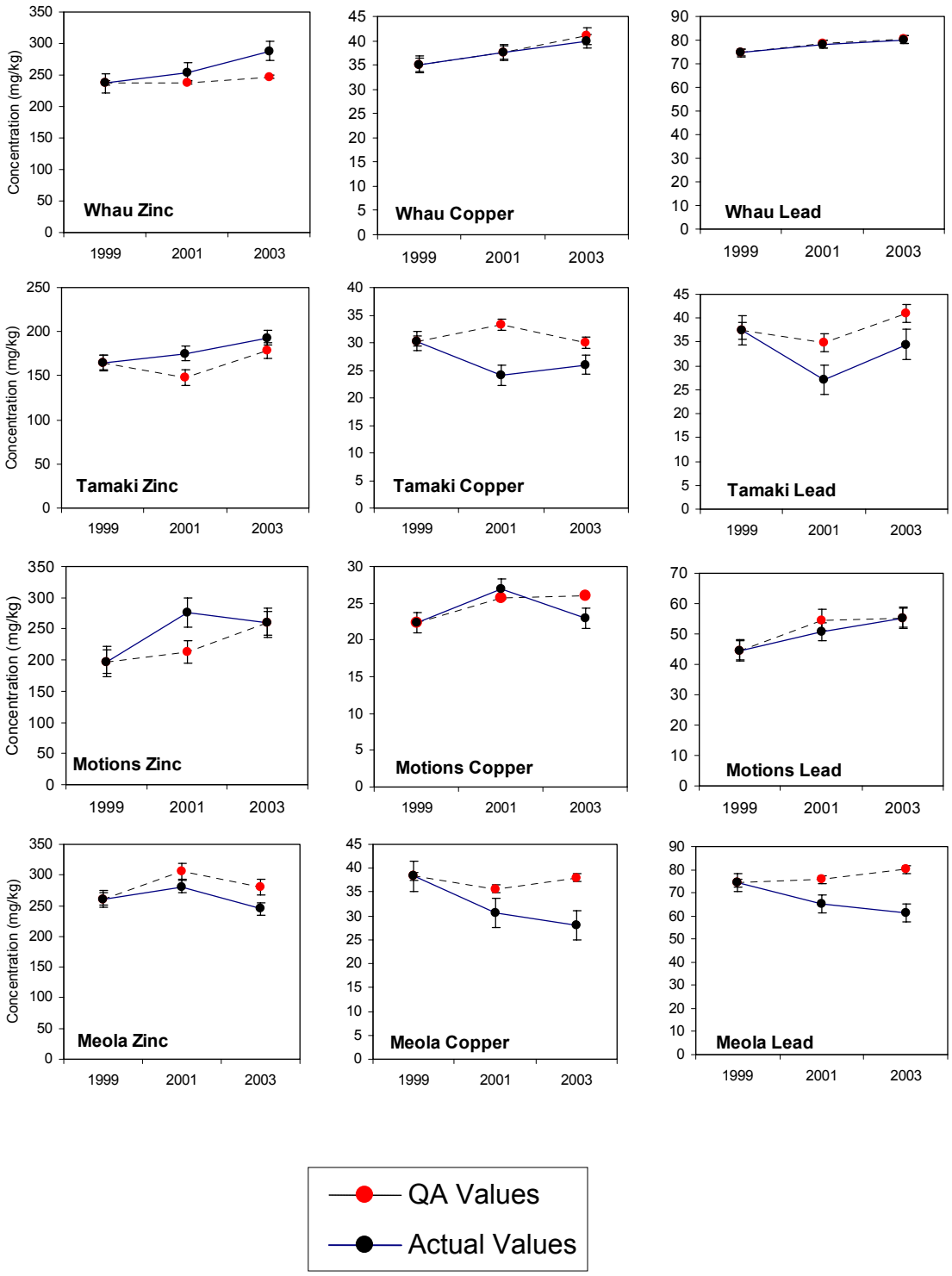


Figure 16.

Total metal concentrations measured in a) samples collected from 4 sites in 1999, 2001 and 2003 (actual values), and b) from repeated analysis in 1999, 2001 and 2003 of the same samples collected from 4 sites in 1999. Metals were extracted by hot acid digestion of the <500 µm sediment fraction. Error bars are SEM (Standard Error of Means).



Total Organic Carbon

Samples were prepared for analysis by freeze-drying and sieving through a 500 μm plastic mesh. TOC was determined using an Elementor Combustion Analyser.

OC and PCB analysis

Samples were homogenised, freeze-dried and sieved (<500 μm) to remove debris. Subsamples were extracted and the extracts analysed by electron capture detection (GC-ECD) for OC pesticides and by capillary gas chromatography using mass selective detection in selected ion mode (GC-MS-SIM) for PCBs. Detection limits for pesticides and PCBs were <0.0005 mg kg^{-1} dw.

Athough this is the first time OCs have been determined in this programme, an initial assessment of analytical performance was obtained by analysing 5 archived samples from the 1999 survey and comparing concentrations with 5 samples taken in 2003 from the same sites as 1999 (Table 7). Since these OCs have not been used in the catchments over recent years it is reasonable to assume that the concentrations in 2003 would be similar to those in 1999.

An indication of analytical precision was obtained by analysing duplicate samples in separate batches from 5 sites in the 2003 survey (Table 8).

Table 7.

OC pesticides and total PCB concentrations ((<500 μm mg kg⁻ dw) measured in archived samples in 1999 and samples taken in 2003.

Site Code	No. of OCs detected		Hexa-hlorobenzene		Beta-BHC		Dieldrin		Endosulfan I		Endosulfan II		Endosulfan sulphate	
	1999	2003	1999	2003	1999	2003	1999	2003	1999	2003	1999	2003	1999	2003
OA65/52	7	1					0.001	0.0008	0.0053		0.0039		0.0022	
OA65/56	0	0												
OA65/71	4	6		0.0013			0.0013	0.0015						0.00245
OA65/77	4	3					0.0016	0.001						
OA65/79	8	4	0.0022		0.0014		0.003							

Site Code	2,4'-DDD		2,4'-DDT		4,4'-DDE		4,4'-DDD		4,4'-DDT		PCB-118 (Penta)		PCB-153 (Hexa)		PCB-138 (Hexa)		Total PCB (detected)	
	1999	2003	1999	2003	1999	2003	1999	2003	1999	2003	1999	2003	1999	2003	1999	2003	1999	2003
OA65/52					0.0009		0.0011		0.0021				0.001				0.001	<0.03
OA65/56																		
OA65/71					0.0023	0.0018	0.0022	0.0013	0.0035	0.0028		0.001	0.002		0.001		0.003	<0.03
OA65/77	0.002						0.003	0.001	0.0025	0.0008		0.001						
OA65/79	0.005		0.0078	0.0113	0.0027	0.0018	0.0134	0.013	0.071	0.086	0.001	0.001	0.002		0.002		0.005	<0.03

Table 8.

OC pesticides and total PCB concentrations (<500 μm mg kg⁻ dw) in duplicate samples from 2003 analysed in separate batches.

Site name	Site Id	Dieldrin		2,4'-DDT		4,4'-DDE		4,4'-DDD		4,4'-DDT	
		1	2	1	2	1	2	1	2	1	2
Whau Wairau	08/03/03	0.0012	0.0016	< 0.0005	< 0.0005	0.0021	0.0024	0.0021	0.0021	< 0.0005	0.0038
Meola	10/03/02	< 0.0005	0.0011	0.0207	0.0266	0.0022	0.0029	0.0215	0.0292	0.2	0.4
Henderson	05/03/01	0.0015	0.0016	< 0.0005	0.0006	0.0132	0.0146	0.0057	0.0065	0.006	0.0095
Whau (L)	07/03/01	0.0006	0.0015	< 0.0005	< 0.0005	0.0008	0.0015	0.0009	0.0016	< 0.0005	0.0069
Mangere	19/03/01	0.001	0.0015	< 0.0005	< 0.0005	0.0026	0.005	0.001	0.0017	< 0.0005	0.0027

Site name	Site Id	PCB-101 (Penta)		PCB-110 (Penta)		PCB-138 (Hexa)		PCB-149 (Hexa)		PCB-153 (Hexa)	
		1	2	1	2	1	2	1	2	1	2
Whau Wairau	08/03/03	0.002	< 0.001	0.002	< 0.001	0.004	< 0.001	0.002	< 0.001	0.004	< 0.001
Meola	10/03/02	0.001	0.002	0.001	0.002	0.001	0.004	0.001	0.002	0.002	0.003
Henderson	05/03/01	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001
Whau (L)	07/03/01	0.001	0.002	< 0.001	0.002	0.002	0.003	0.001	0.002	0.002	0.003
Mangere	19/03/01	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001

Particle size analysis

Samples were freeze-dried, sieved (<500 μm), dispersed in hydrogen peroxide solution to destroy organic matter and analysed on a Galai laser analyser in the 0-300 μm mode. Samples were also analysed in the 2-600 μm mode was if they had been found to contain a significant volume of particles greater than 300 μm in previous surveys. To assess the analytical performance, 5 samples from the 1999 survey were re-analysed in the 0-300 μm mode. The results are shown in Tables 9 and 10.

Table 9.

Distribution of surface area (%) for five samples collected in 1999 and analysed in 1999, 2001 and 2003.

Size	OA65-52/			OA65-56/			OA65-71/			OA65-77/			OA65-79/		
Fraction (μm)	1999	2001	2003	1999	2001	2003	1999	2001	2003	1999	2001	2003	1999	2001	2003
0.0 - 3.9	18	2	22	3	0	2	16	0	30	8	1	9	15	1	24
3.9 - 7.8	9	0	9	1	0	1	9	0	12	3	0	4	8	1	11
7.8 - 15.6	11	1	6	1	0	1	9	2	10	2	1	3	9	1	9
15.6 - 31.3	7	1	4	1	1	1	8	4	7	3	2	3	6	3	6
31.3 -62.5	8	9	10	6	7	6	13	21	11	8	9	8	7	9	8
62.5 -125	27	45	22	30	34	23	28	49	21	39	47	39	31	43	24
125 - 250	21	43	28	57	57	62	18	23	9	37	40	34	24	41	19
250 - 300	0	0	0	1	1	2	0	1	0	0	0	0	0	0	0

Table 10.

Distribution of volume (%) for five samples collected in 1999 and analysed in 1999, 2001 and 2003.

Size	OA65-52/			OA65-56/			OA65-71/			OA65-77/			OA65-79/		
Fraction µm)	1999	2001	2003	1999	2001	2003	1999	2001	2003	1999	2001	2003	1999	2001	2003
0.0 - 3.9	1	0	1	0	0	0	1	0	1	0	0	0	0	0	1
3.9 - 7.8	1	0	1	0	0	0	1	0	2	0	0	0	1	0	1
7.8 - 15.6	2	0	1	0	0	0	2	0	2	0	0	0	1	0	2
15.6 - 31.3	2	0	1	0	0	0	3	1	4	1	0	1	2	1	2
31.3 -62.5	6	4	6	2	3	2	10	11	12	4	4	4	5	4	6
62.5 -125	39	37	29	22	25	16	41	48	44	37	39	39	40	36	38
125 - 250	50	59	61	73	70	77	43	39	34	58	56	55	51	59	51
250 - 300	0	0	0	2	2	4	0	1	0	1	1	0	0	1	0

Appendix 2

Concentrations of metals in samples from 1998, 1999, 2001 and 2003 surveys

Table 11.

Total concentrations (mg kg⁻, <500 µm, hot acid digest) of zinc, copper and lead. ns = not sampled.

	ZINC				COPPER				LEAD			
	2003	2001	1999	1998	2003	2001	1999	1998	2003	2001	1999	1998
Hobson	39.0	47.5	52.4	46.0	4.0	6.6	8.4	5.6	14.6	11.1	22.1	17.8
Lucas	96.0	113.1	96.6	96.9	20.0	26.2	21.9	19.1	24.0	19.4	23.3	22.3
Oakley	160.0	161.8	159.1	161.0	29.0	31.6	40.7	31.8	49.6	44.1	52.5	57.6
Mangere	146.0	154.6	136.5	137.0	29.0	36.8	30.8	29.4	31.2	31.5	34.3	37.4
Puhinui	103.0	108.6	109.4	99.0	9.0	11.0	15.7	10.8	13.4	7.2	14.4	12.4
Pakuranga (L)	ns	160.9	134.2	145.0	ns	21.6	20.4	20.9	ns	22.4	26.7	30.9
Browns	ns	43.2	22.1	43.9	ns	2.0	1.3	2.3	ns	0.0	3.9	4.6
Awaruku	25.0	26.4	13.6	24.4	2.0	1.5	0.9	1.7	4.0	0.0	2.5	1.3
Vaughans	22.0	24.7	18.0	22.5	2.0	1.2	1.4	1.4	3.1	0.0	4.2	0.0
Anns	176.0	183.9	188.0	180.5	35.0	37.8	45.3	43.8	37.3	32.1	45.0	47.1
Tamaki	193.0	175.0	164.7	145.0	26.0	24.1	30.3	19.8	34.5	27.1	37.4	34.2
Pakuranga (U)	190.0	176.6	138.1	183.0	31.0	28.1	29.8	28.8	34.9	23.4	27.5	41.0
Te Matuku	ns	38.5	29.3	ns	ns	3.0	5.1	ns	ns	1.9	6.7	ns
Big Muddy	ns	57.2	52.4	61.5	ns	9.2	8.6	10.1	ns	2.4	9.1	9.6
Pukaki	ns	76.1	72.0	74.0	ns	16.2	14.3	11.9	ns	5.2	14.2	9.0
Weiti	47.0	52.2	42.5	49.0	12.0	9.7	13.0	11.8	10.1	3.9	9.2	5.4
Paremoremo	84.0	99.4	90.9	96.9	20.0	25.3	32.8	23.1	23.4	21.6	24.2	24.0
Henderson	187.0	171.8	193.8	177.5	37.0	33.6	38.9	44.3	40.8	30.5	48.7	32.5

Table 11. (contin.)

Total concentrations (mg kg^{-1}, <500 µm, hot acid digest) of zinc, copper and lead. ns = not sampled

	ZINC				COPPER				LEAD			
	2003	2001	1999	1998	2003	2001	1999	1998	2003	2001	1999	1998
Kaipatiki	106.0	99.5	82.5	96.9	16.0	18.4	14.2	16.0	27.7	20.9	25.6	29.0
Whau (L)	173.0	166.9	170.0	163.0	28.0	30.7	35.2	28.8	52.1	44.5	57.7	62.0
Whau (U)	288.0	254.2	237.2	252.0	40.0	37.6	35.1	37.5	80.2	78.3	74.7	99.0
Whau Wairau	206.0	229.0	259.6	207.0	45.0	47.3	64.4	53.5	65.8	70.4	106.6	92.3
Motions	260.0	276.1	197.1	294.0	23.0	26.9	22.3	24.4	55.3	50.7	44.5	65.5
Cheltenham	ns	48.7	27.3	47.2	ns	2.2	1.7	2.8	ns	5.1	7.2	11.0
Pahurehure	66.0	72.0	71.7	64.0	8.0	7.3	10.0	13.8	14.6	7.1	15.2	6.5
Meola	245.0	280.9	261.0	280.0	28.0	30.6	38.3	38.9	61.2	65.3	74.4	94.0
Te Tokaroa	90.0	99.9	71.2	100.0	9.0	7.1	6.9	7.3	25.8	18.0	17.6	24.9

Table 12.

Zinc concentrations (mg kg^{-1}, means, standard error of means, 2M HCl extractable) in silt (<63 μm). Listed in order of decreasing 2003 concentration.

Site	2003		2001		1999		1998	
	mean	SE	mean	SE	mean	SE	mean	SE
Whau (U)	357.7	3.0	305.0	17.5	239.4	4.0	226.7	4.9
Pakuranga (U)	292.5	8.4	234.5	5.7	200.4	3.6	183.7	7.4
Whau Wairau	288.6	9.7	279.2	8.5	224.1	2.3	204.3	3.0
Tamaki (U)	287.3	7.4	232.2	19.7	208.7	0.2	182.3	0.3
Motions	269.5	15.7	250.4	9.9	211.1	4.8	218.3	3.9
Meola	263.1	1.4	194.2	2.4	181.8	3.2	184.7	5.1
Anns	199.9	4.0	144.7	0.7	150.0	2.3	144.7	2.2
Henderson	179.0	5.6	170.1	4.5	162.6	2.3	154.3	21.3
Whau (L)	177.1	2.6	165.2	4.0	143.1	1.3	124.3	5.7
Oakley	175.3	5.2	162.5	2.3	146.4	2.2	141.3	7.5
Te Tokoroa	170.6	8.6	146.2	4.6	148.1	1.7	146.0	4.6
Mangere	147.0	3.4	116.2	4.0	104.2	3.1	98.0	3.0
Kaipatiki	142.7	8.1	109.6	8.5	101.9	1.2	92.3	1.4
Lucas	119.3	3.2	103.8	1.7	95.0	3.0	77.4	1.1
Hobson	109.9	10.1	155.0	2.0	159.7	4.1	118.0	2.5
Puhinui	100.8	0.4	73.7	2.9	76.6	1.4	67.8	1.5
Paremoremo	92.5	2.5	90.0	3.4	77.0	0.7	68.9	3.2
Pahurehure	86.6	4.6	68.5	2.3	65.8	3.1	61.0	1.4
Weiti	75.5	0.7	64.1	3.2	54.3	0.6	44.5	0.9

Table 13.

Copper concentrations (mg kg^{-1}, means, standard error of means, 2M HCl extractable) in silt (<63 μm) in 2003, 2001, 1999 and 1998. Listed in order of decreasing 2003 concentration.

Site	2003		2001		1999		1998	
	mean	SE	mean	SE	mean	SE	mean	SE
Whau Wairau	52.0	1.7	43.6	2.1	45.0	0.5	44.0	0.5
Pakuranga (U)	49.6	1.5	37.5	0.8	36.8	0.3	30.4	1.0
Whau (U)	48.2	0.3	33.9	0.1	33.4	0.8	34.4	0.8
Motions	46.0	1.9	42.3	1.2	38.9	0.9	37.6	1.5
Tamaki (U)	39.7	0.8	32.4	3.2	28.5	0.2	26.4	0.1
Meola	38.9	0.5	32.9	0.8	30.9	0.6	29.1	0.6
Anns	37.3	1.1	26.3	0.4	20.5	8.4	30.4	0.6
Henderson	32.6	1.2	28.4	0.6	28.2	0.3	26.4	3.8
Te Tokoroa	27.1	1.6	26.6	0.4	25.8	0.2	25.8	0.7
Oakley	26.8	1.0	25.3	0.5	23.4	0.4	23.9	1.4
Mangere	26.3	1.0	22.4	0.8	20.5	0.7	19.6	0.6
Whau (L)	24.9	0.3	23.7	0.9	21.7	0.2	19.7	1.0
Lucas	23.6	0.6	18.9	0.5	16.9	0.5	15.6	0.3
Kaipatiki	22.8	1.2	17.2	1.3	16.7	0.2	16.1	0.4
Weiti	21.1	0.7	17.7	1.0	16.0	0.1	14.4	0.3
Paremoremo	21.0	0.5	18.3	0.6	16.4	0.2	13.1	0.3
Hobson	17.7	2.3	28.9	0.5	28.5	0.6	22.6	0.5
Pahurehure	8.5	0.4	6.6	0.2	6.5	0.3	6.2	0.1
Puhinui	7.9	0.2	5.6	0.2	5.8	0.1	5.7	0.1

Table 14.

Lead concentrations (mg kg^{-1}, means, standard error of means, 2M HCl extractable) in silt (<63 μm) in 2003, 2001, 1999 and 1998. Listed in order of decreasing 2003 concentration.

Site	2003		2001		1999		1998	
	mean	SE	mean	SE	mean	SE	mean	SE
Whau (U)	102.5	1.3	82.1	1.7	88.4	1.1	102.5	2.6
Motions	99.3	4.3	96.5	6.5	88.1	2.0	102.0	2.5
Whau Wairau	95.5	2.7	91.0	6.8	84.4	1.3	94.8	1.3
Meola	88.5	1.2	70.0	0.8	78.9	1.3	84.5	2.4
Te Tokoroa	62.6	3.3	47.5	0.9	55.9	1.3	63.5	2.6
Tamaki (U)	59.7	1.3	48.7	4.1	50.3	1.5	54.1	0.2
Pakuranga (U)	57.7	1.9	43.5	1.6	44.3	0.9	49.8	2.1
Oakley	54.0	1.2	49.2	0.9	52.4	0.6	56.9	2.9
Whau (L)	50.9	0.3	48.4	1.3	50.0	0.8	50.7	2.6
Anns	50.4	1.4	31.6	0.2	38.8	0.4	46.3	0.9
Hobson	48.2	4.5	62.4	0.7	77.3	1.9	69.2	1.4
Kaipatiki	42.7	2.2	29.4	2.5	36.1	0.9	39.3	0.5
Henderson	40.1	1.2	36.3	0.9	43.8	0.3	44.6	6.6
Mangere	36.5	1.1	29.0	1.4	29.4	0.8	33.9	1.1
Lucas	29.8	1.0	23.3	0.5	24.5	0.3	27.9	0.3
Paremoremo	27.1	0.5	23.2	1.2	22.5	0.4	25.4	1.3
Pahurehure	21.4	1.2	12.0	0.7	14.2	0.6	18.9	0.6
Weiti	18.0	0.4	8.9	0.5	10.8	0.7	14.9	0.3
Puhinui	16.2	0.3	8.8	0.5	8.2	0.9	14.1	0.3

Appendix 3

Total organic carbon concentrations in 2003 and Loss on Ignition in 1998, 1999, 2001

Table 15.

Total Organic Carbon concentrations (g 100g^{-1} dw, means and standard error of mean) for samples collected in 2003 and LOI (%, means and standard error of means) for samples collected in 2001, 1999 and 1998. Listed in order of decreasing TOC (2003) concentrations.

Site	2003		2001		1999		1998	
	mean	SE	mean	SE	mean	SE	mean	SE
Henderson	2.78	0.05	8.15	0.19	8.52	0.05	6.79	0.07
Whau (L)	2.02	0.03	8.09	0.08	6.93	0.06	7.01	0.29
Paremoremo	2.63	0.02	7.76	0.12	7.32	0.15	7.48	0.26
Anns	1.61	0.03	7.47	0.01	7.26	0.08	7.06	0.11
Whau (U)	2.67	0.06	7.09	0.08	6.03	0.14	6.04	0.08
Whau Wairau	1.72	0.05	6.82	0.39	6.77	0.11	6.12	0.13
Meola	1.72	0.03	6.56	0.09	5.81	0.28	7.1	0.16
Lucas	2.01	0.07	5.96	0.16	6.01	0.24	5.9	0.12
Mangere	1.57	0.02	5.89	0.12	6.05	0.06	5.78	0.15
Oakley	2.26	0.10	5.81	0.12	6.77	0.07	7.63	0.23
Pukaki	1.11	0.02	5.47	0.47	6.7	0.24	7.61	0.14
Pahurehure	1.02	0.03	5.28	0.06	2.98	0.03	3.97	0.45
Puhinui	1.11	0.02	5.17	0.18	5.54	0.11	5.55	0.12
Kaipatiki	1.46	0.02	5.05	0.2	4.59	0.09	5.76	0.19
Pakuranga (U)	1.66	0.16	4.46	0.24	6.35	0.08	5.64	0.08
Tamaki	1.34	0.04	4.25	0.24	6.49	0.04	5.55	0.13
Pakuranga (L)	1.37	0.17	3.81	0.16	5.33	0.05	4.31	0.07
Weiti	1.05	0.04	3.5	0.34	3.4	0.1	4.05	0.18

Table 15. (contin.)

Total Organic Carbon concentrations (g 100g^{-1} dw, means and standard error of mean) for samples collected in 2003 and LOI (%, means and standard error of means) for samples collected in 2001, 1999 and 1998. Listed in order of decreasing TOC (2003) concentrations.

Site	2003	2001	1999	1998	Site	2003	2001	1999
	mean	SE	mean	SE	mean	SE	mean	SE
Motions	1.07	0.02	3.38	0.1	3.76	0.12	3.28	0.04
Big Muddy	1.36	0.02	3.12	0.11	3.95	0.11	4.29	0.11
Te Tokaroa	0.51	0.02	2.16	0.07	0.91	0.06	1.63	0.07
Te Matuku	0.38	0.01	1.25	0.08	1.21	0.07	0	0
Awaruka	0.10	0.01	0.76	0.04	0.83	0.03	0.61	0.14
Hobson	0.16	0.01	0.75	0.01	1.81	0.08	0.79	0.03
Cheltenham	0.15	0.003	0.62	0.05	1.01	0.02	0.99	0.2
Vaughans	0.08	0.003	0.6	0.09	0.77	0.01	0.53	0.04
Browns	0.08	0.003	0.51	0.07	0.64	0.01	0.41	0.05

Appendix 4

Individual sample results

Table 16

Metal concentrations in silt fraction (2M HCl extraction)

Sample Code	Site Name	Zinc	Copper	Lead
		mg kg^{-1} dw	mg kg^{-1} dw	mg kg^{-1} dw
01/03/01	Weiti	75.24	20.70	17.48
01/03/02		74.31	20.23	17.82
01/03/03		76.84	22.43	18.77
02/03/01	Kaipatiki	158.39	25.09	46.65
02/03/02		138.16	22.27	42.66
02/03/03		131.55	20.97	38.89
03/03/01	Lucas	125.70	24.79	31.79
03/03/02		117.03	23.23	28.89
03/03/03		115.25	22.63	28.75
04/03/01	Paremoremo	92.11	21.16	27.18
04/03/02		96.92	21.78	28.01
04/03/03		88.42	20.01	26.13
05/03/01	Henderson	172.87	31.15	38.83
05/03/02		173.92	31.77	38.92
05/03/03		190.31	34.99	42.54
06/03/01	Whau (U)	357.52	48.30	103.23
06/03/02		352.50	47.71	99.95
06/03/03		362.93	48.73	104.17
07/03/01	Whau (L)	180.92	25.55	51.51
07/03/02		178.22	24.58	50.39
07/03/03		172.02	24.63	50.80
08/03/01	Whau Wairau	302.30	53.58	99.13
08/03/02		269.91	48.59	90.24
08/03/03		293.56	53.96	97.05
09/03/01	Oakley	180.31	27.53	55.06
09/03/02		180.55	28.11	55.35
09/03/03		164.90	24.80	51.66
10/03/01	Meola	265.10	39.83	88.51
10/03/02		263.92	37.99	86.37
10/03/03		260.33	38.84	90.47
11/03/01	Te Tokaroa	185.20	29.24	68.23
11/03/02		171.16	27.92	62.72
11/03/03		155.39	24.00	56.95
12/03/01	Motions	299.32	48.94	106.43

Table 16 (contin.)

Metal concentrations in silt fraction (2M HCl extraction)

Sample Code	Site Name	Zinc	Copper	Lead
		mg kg^{-1} dw	mg kg^{-1} dw	mg kg^{-1} dw
12/03/02		263.11	46.49	99.94
12/03/03		246.06	42.47	91.60
13/03/01	Hobson	99.43	15.61	43.30
13/03/02		100.17	15.26	44.04
13/03/03		130.21	22.33	57.24
14/03/01	Tamaki	272.56	38.07	57.10
14/03/02		293.27	40.55	60.82
14/03/03		296.17	40.39	61.23
15/03/01	Pakuranga (U)	284.92	47.86	55.83
15/03/02		309.40	52.67	61.53
15/03/03	Pakuranga (U)	283.26	48.37	55.75
18/03/01	Anns	196.33	37.10	50.24
18/03/02		207.94	39.27	52.92
18/03/03		195.54	35.52	48.08
19/03/01	Mangere	142.01	24.98	35.25
19/03/02		145.52	25.64	35.69
19/03/03		153.50	28.25	38.65
21/03/01	Puhinui	100.17	8.16	16.81
21/03/02		101.45	7.65	16.10
21/03/03		100.84	7.99	15.61
22/03/01	Pahurehure	91.17	8.83	22.47
22/03/02		91.26	8.89	22.66
22/03/03		77.32	7.77	19.11

Table 17

Total Organic Carbon and Loss on Ignition

Site	Sample Code	TOC (g $100g^{-1}$ dw) 2003	LOI (%) 2001	LOI (%) 1999	LOI (%) 1998
Weiti	01/03/01	1.12	2.95	3.99	2.83
	01/03/02	1.04	3.42	4.39	2.89
	01/03/03	0.98	4.12	3.77	2.79
Kaipatiki	02/03/01	1.48	5.16	5.58	3.74
	02/03/02	1.48	5.32	6.14	4.07
	02/03/03	1.42	4.66	5.56	3.31
Lucas	03/03/01	1.91	5.64	5.91	4.48
	03/03/02	1.98	6.08	6.10	4.86
	03/03/03	2.15	6.16	5.69	5.10
Paremoremo	04/03/01	2.61	7.81	6.96	6.75
	04/03/02	2.67	7.95	7.64	6.91
	04/03/03	2.60	7.53	7.83	7.21
Henderson	05/03/01	2.77	8.12	6.93	4.30
	05/03/02	2.71	8.49	6.68	5.04
	05/03/03	2.87	7.85	6.76	5.06
Whau (U)	06/03/01	2.79	7.19	6.12	4.89
	06/03/02	2.57	7.13	6.13	4.78
	06/03/03	2.66	6.94	5.88	4.71
Whau (L)	07/03/01	2.02	8.12	7.57	5.07
	07/03/02	2.07	8.21	6.86	5.26
	07/03/03	1.98	7.94	6.60	5.07
Whau Wairau	08/03/01	1.79	7.29	5.88	4.73
	08/03/02	1.62	6.04	6.13	4.78
	08/03/03	1.74	7.12	6.34	4.00
Oakley	09/03/01	2.09	6.04	8.09	5.12
	09/03/02	2.23	5.71	7.37	5.24
	09/03/03	2.45	5.67	7.43	5.50
Meola	10/03/01	1.76	6.46	7.36	5.04
	10/03/02	1.72	6.75	7.13	5.77
	10/03/03	1.67	6.47	6.80	5.67
Te Tokaroa	11/03/01	0.50	2.31	1.76	1.23
	11/03/02	0.48	2.07	1.58	1.18
	11/03003	0.54	2.11	1.55	1.21
Motions	12/03/01	1.10	3.25	3.20	2.38
	12/03/02	1.07	3.51	3.32	2.54
	12/03/03	1.03	ns	3.33	2.39
Hobson	13/03/01	0.16	0.73	0.77	0.48

Table 17. (contin.)

Total Organic Carbon and Loss on Ignition

		TOC (g $100g^{-1}$ dw)	LOI (%)	LOI (%)	LOI (%)
Site	Sample Code	2003	2001	1999	1998
Hobson	13/03/02	0.15	0.76	0.75	0.59
	13/03/03	0.17	0.75	0.84	0.61
Tamaki	14/03/01	1.40	3.81	4.80	2.89
	14/03/02	1.27	4.62	4.37	2.81
	14/03/03	1.35	4.33	4.64	2.84
Pakuranga (U)	15/03/01	1.88	4.32	5.78	3.22
	15/03/02	1.74	4.12	5.51	3.07
	15/03/03	1.36	4.93	5.64	4.30
Pakuranga (L)	16/03/01	1.12	3.81	4.18	3.66
	16/03/02	1.30	3.54	4.37	3.47
	16/03/03	1.69	4.09	4.38	3.40
Big Muddy	17/03/01	1.36	3.25	4.21	3.34
	17/03/02	1.33	2.98	4.15	3.18
	17/03/03	1.39	ns	4.51	3.19
Anns	18/03/01	1.63	7.46	7.14	5.98
	18/03/02	1.65	7.48	6.85	5.59
	18/03/03	1.56	7.48	7.19	5.71
Mangere	19/03/01	1.59	5.90	6.03	4.86
	19/03/02	1.60	6.09	5.79	4.73
	19/03/03	1.53	5.67	5.51	4.66
Pukaki	20/03/01	1.07	6.33	6.40	5.58
	20/03/02	1.14	5.35	6.18	5.20
	20/03/03	1.13	4.72	6.66	5.17
Puhinui	21/03/01	1.14	5.34	5.63	3.71
	21/03/02	1.10	4.80	5.32	3.63
	21/03/03	1.09	5.37	5.71	3.21
Pahurehure	22/03/01	1.07	5.40	3.07	2.11
	22/03/02	1.04	5.22	4.32	2.75
	22/03/03	0.96	5.21	4.52	3.15
Te Matuku	23/03/01	0.39	1.33	ns	ns
	23/03/02	0.40	1.31	ns	ns
	23/03/03	0.36	1.09	ns	ns
Cheltenham	24/03/01	0.16	0.71	1.25	1.13
	24/03/02	0.15	0.59	1.12	1.17
	24/03/03	0.15	0.56	0.61	1.18
Browns	25/03/01	0.08	0.43	0.49	0.60
	25/03/02	0.09	0.46	0.33	0.58
	25/03/03	0.08	0.65	0.42	0.44

Table 17 (contin.)

Total Organic Carbon and Loss on Ignition

		TOC (g $100g^{-1}$ dw)	LOI (%)	LOI (%)	LOI (%)
Site	Sample Code	2003	2001	1999	1998
Awaruku	26/03/01	0.11	0.69	0.73	0.81
	26/03/02	0.09	0.75	0.77	0.81
	26/03/03	0.09	0.84	0.34	0.87
Vaughans	27/03/01	0.07	0.46	0.46	0.72
	27/03/02	0.08	0.56	0.58	0.71
	27/03/03	0.08	0.78	0.56	0.70

Table 18

OC pesticides (mg kg⁻ dw)

Site Code	Site name	Hexa-chlorobenzene	Alpha-BHC	Beta-BHC	Gamma-BHC (Lindane)	Delta-BHC	Heptachlor	Heptachlor epoxide	Aldrin	Dieldrin	Endrin	Endrin Aldehyde
01/03/01	Weiti	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
01/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
01/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
02/03/01	Kaipatiki	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
02/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
02/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
03/03/01	Lucas	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
03/03/02		< 0.0005	< 0.0005	< 0.0005	0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0005	< 0.0005	< 0.0005
03/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
04/03/01	Paremoremo	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
04/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
04/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
05/03/01	Henderson	< 0.0005	< 0.0005	< 0.0005	0.0006	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0015	< 0.0005	< 0.0005
05/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0007	< 0.0005	< 0.0005
05/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
06/03/01	Whau (U)	0.0013	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.001	< 0.0005	< 0.0005
06/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0018	< 0.0005	< 0.0005
06/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0017	< 0.0005	< 0.0005
07/03/01	Whau (L)	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0006	< 0.0005	< 0.0005
07/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0006	< 0.0005	< 0.0005
07/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0006	< 0.0005	< 0.0005

Table 18 (contin.)

OC pesticides (mg kg⁻ dw)

Site Code	Site name	Hexa-chlorobenzene	Alpha-BHC	Beta-BHC	Gamma-BHC (Lindane)	Delta-BHC	Heptachlor	Heptachlor epoxide	Aldrin	Dieldrin	Endrin	Endrin Aldehyde
08/03/01	Whau Wairau	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.001	< 0.0005	< 0.0005
08/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0007	< 0.0005	< 0.0005
08/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0012	< 0.0005	< 0.0005
09/03/01	Oakley	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
09/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
09/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
10/03/01	Meola	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
10/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
10/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
11/03/01	Te Tokaroa	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
11/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
11/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
12/03/01	Motions	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0007	< 0.0005	< 0.0005
12/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0013	< 0.0005	< 0.0005
12/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.001	< 0.0005	< 0.0005
13/03/01	Hobson	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
13/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
13/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
14/03/01	Tamaki	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0007	< 0.0005	< 0.0005
14/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005

Table 18 (contin.)

OC pesticides (mg kg^{-1} dw)

Site Code	Site name	Hexa-chlorobenzene	Alpha-BHC	Beta-BHC	Gamma-BHC (Lindane)	Delta-BHC	Heptachlor	Heptachlor epoxide	Aldrin	Dieldrin	Endrin	Endrin Aldehyde
14/03/03	Tamaki	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0009	< 0.0005	< 0.0005
15/03/01	Pakuranga (U)	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
15/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0008	< 0.0005	< 0.0005
15/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
16/03/01	Pakuranga (L)	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0012	< 0.0005	< 0.0005
16/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
16/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
17/03/01	Big Muddy	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
17/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
17/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
18/03/01	Anns	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0013	< 0.0005	< 0.0005
18/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0013	< 0.0005	< 0.0005
18/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0017	< 0.0005	< 0.0005
19/03/01	Mangere	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.001	< 0.0005	< 0.0005
19/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0016	< 0.0005	< 0.0005
19/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0015	< 0.0005	< 0.0005
20/03/01	Pukaki	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
20/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
20/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005

Table 18 (contin.)

OC pesticides (mg kg^{-1} dw)

Site Code	Site name	Hexa-chlorobenzene	Alpha-BHC	Beta-BHC	Gamma-BHC (Lindane)	Delta-BHC	Heptachlor	Heptachlor epoxide	Aldrin	Dieldrin	Endrin	Endrin Aldehyde
21/03/01	Puhinui	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
21/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
21/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
22/03/01	Pahurehure	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
22/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
22/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
23/03/01	Te Matuku	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
23/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
23/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
24/03/01	Cheltenham	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
24/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
24/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
25/03/01	Browns	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
25/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
25/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
26/03/01	Awaruku	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
26/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
26/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
27/03/01	Vaughans	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005

Table 18 (contin.)

OC pesticides (mg kg^{-1} dw)

Site Code	Site name	Hexa-chlorobenzene	Alpha-BHC	Beta-BHC	Gamma-BHC (Lindane)	Delta-BHC	Heptachlor	Heptachlor epoxide	Aldrin	Dieldrin	Endrin	Endrin Aldehyde
27/03/02	Vaughans	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
27/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005

Table 19 OC Analysis (mg kg^{-1} dw)

Site Code	Site name	Endosulfan I	Endosulfan II	Endosulfan sulphate	2,4'-DDE	2,4'-DDD	2,4'-DDT	4,4'-DDE	4,4'-DDD	4,4'-DDT	Total Chlordane ((cis+trans)*100/42)	cis-Chlordane	trans-Chlordane	Methoxy-chlor
01/03/01	Weiti	0.0019	0.0016	0.0006	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
01/03/02		0.0026	0.0021	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0005	0.0072	< 0.002	< 0.0005	< 0.0005	< 0.0005
01/03/03		0.0028	0.0017	0.0007	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
02/03/01	Kaipatiki	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0012	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
02/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
02/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0007	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
03/03/01	Lucas	< 0.0005	< 0.0005	0.0006	< 0.0005	< 0.0005	< 0.0005	0.0009	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
03/03/02		< 0.0005	< 0.0005	0.0007	< 0.0005	< 0.0005	< 0.0005	0.0008	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
03/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
04/03/01	Paremoremo	0.0015	0.002	0.0026	< 0.0005	< 0.0005	< 0.0005	0.0013	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
04/03/02		0.0012	0.0011	0.0011	< 0.0005	< 0.0005	< 0.0005	0.0008	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
04/03/03		0.0021	0.002	0.0012	< 0.0005	< 0.0005	< 0.0005	0.0014	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
05/03/01	Henderson	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0132	0.0057	0.006	< 0.002	< 0.0005	< 0.0005	< 0.0005
05/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0007	< 0.0005	0.0068	0.0031	0.0055	< 0.002	< 0.0005	< 0.0005	< 0.0005
05/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0006	< 0.0005	0.0065	0.0028	0.0057	< 0.002	< 0.0005	< 0.0005	< 0.0005
06/03/01	Whau (U)	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0012	0.0009	0.0028	< 0.002	< 0.0005	< 0.0005	< 0.0005
06/03/02		< 0.0005	< 0.0005	0.0025	< 0.0005	< 0.0005	< 0.0005	0.0021	0.0017	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005

Table 19 (contin.)

OC Analysis (mg kg⁻ dw)

Site Code	Site name	Endosulfan I	Endosulfan II	Endosulfan sulphate	2,4'-DDE	2,4'-DDD	2,4'-DDT	4,4'-DDE	4,4'-DDD	4,4'-DDT	Total Chlordane ((cis+trans)*100/42)	cis-Chlordane	trans-Chlordane	Methoxy-chlor
06/03/03	Whau (U)	< 0.0005	< 0.0005	0.0024	< 0.0005	< 0.0005	< 0.0005	0.002	0.0014	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
07/03/01	Whau (L)	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0008	0.0009	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
07/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0007	0.0011	0.0051	< 0.002	< 0.0005	< 0.0005	< 0.0005
07/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0008	0.0011	0.0022	< 0.002	< 0.0005	< 0.0005	< 0.0005
08/03/01	Whau Wairau	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.002	0.0016	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
08/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0012	0.0011	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
08/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0021	0.0021	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
09/03/01	Oakley	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0017	0.0019	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
09/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0019	0.0018	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
09/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0009	< 0.0005	0.0017	0.0017	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
10/03/01	Meola	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0013	0.0043	0.0032	< 0.002	< 0.0005	< 0.0005	< 0.0005
10/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0207	0.0022	0.0215	0.2	< 0.002	< 0.0005	< 0.0005	< 0.0005
10/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0019	0.0018	0.0121	0.054	< 0.002	< 0.0005	< 0.0005	< 0.0005
11/03/01	Te Tokaroa	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
11/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
11/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
12/03/01	Motions	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.001	0.0008	< 0.002	< 0.0005	< 0.0005	< 0.0005
12/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
12/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
13/03/01	Hobson	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005

Table 19 (contin.)

OC Analysis (mg kg^{-1} dw)

Site Code	Site name	Endosulfan I	Endosulfan II	Endosulfan sulphate	2,4'-DDE	2,4'-DDD	2,4'-DDT	4,4'-DDE	4,4'-DDD	4,4'-DDT	Total Chlordane ((cis+trans)*100/42)	cis-Chlordane	trans-Chlordane	Methoxy-chlor
13/03/02	Hobson	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
13/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
14/03/01	Tamaki	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
14/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
14/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
15/03/01	Pakuranga (U)	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
15/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0006	0.0009	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
15/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
16/03/01	Pakuranga (L)	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
16/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0015	< 0.002	< 0.0005	< 0.0005	< 0.0005
16/03/03		< 0.0005	< 0.0005	0.0007	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
17/03/01	Big Muddy	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
17/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
17/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
18/03/01	Anns	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0033	0.0012	0.0011	< 0.002	< 0.0005	< 0.0005	< 0.0005
18/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0034	0.0012	0.0013	< 0.002	< 0.0005	< 0.0005	< 0.0005
18/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0039	0.0011	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
19/03/01	Mangere	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0026	0.001	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
19/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0041	0.0016	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
19/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0036	0.0012	0.0012	< 0.002	< 0.0005	< 0.0005	< 0.0005

Table 19 (contin.)

OC Analysis (mg kg⁻ dw)

Site Code	Site name	Endosulfan I	Endosulfan II	Endosulfan sulphate	2,4'-DDE	2,4'-DDD	2,4'-DDT	4,4'-DDE	4,4'-DDD	4,4'-DDT	Total Chlordane ((cis+trans)*100/42)	cis-Chlordane	trans-Chlordane	Methoxy-chlor
20/03/01	Pukaki	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
20/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
20/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
21/03/01	Puhinui	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
21/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
21/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
22/03/01	Pahurehure	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0006	0.0006	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
22/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
22/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
23/03/01	Te Matuku	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
23/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
23/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
24/03/01	Cheltenham	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
24/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
24/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
25/03/01	Browns	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
25/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
25/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
26/03/01	Awaruku	< 0.0005	0.0007	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0005	< 0.002	< 0.0005	< 0.0005	0.0005
26/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005

Table 19 (contin.)

OC Analysis (mg kg⁻ dw)

Site Code	Site name	Endosulfan I	Endosulfan II	Endosulfan sulphate	2,4'-DDE	2,4'-DDD	2,4'-DDT	4,4'-DDE	4,4'-DDD	4,4'-DDT	Total Chlordane ((cis+trans)*100/42)	cis-Chlordane	trans-Chlordane	Methoxy-chlor
26/03/03	Awaruku	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
27/03/01	Vaughans	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
27/03/02		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005
27/03/03		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.002	< 0.0005	< 0.0005	< 0.0005

Table 20

Polychlorinated biphenyl compounds (mg kg^{-1} dw)

Site Code	Site Name	PCB-28 (Tri) + PCB-31 (Tri)	PCB-44 (Tetra)	PCB-49 (Tetra)	PCB-52 (Tetra)	PCB-60 (Tetra)	PCB-77 (Tetra)	PCB-81 (Tetra)	PCB-86 (Penta)	PCB-101 (Penta)	PCB-105 (Penta)	PCB-110 (Penta)	PCB-114 (Penta)	PCB-118 (Penta)	PCB-121 (Penta)	PCB-123 (Penta)	PCB-126 (Penta)	PCB-128 (Hexa)
01/03/01	Weiti	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
01/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
01/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
02/03/01	Kaipatiki	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
02/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
02/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
03/03/01	Lucas	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
03/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
03/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
04/03/01	Paremoremo	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
04/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
04/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
05/03/01	Henderson	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001
05/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
05/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
06/03/01	Whau (U)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
06/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001
06/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
07/03/01	Whau (L)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
07/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

Table 20 (contin.)

Polychlorinated biphenyl compounds (mg kg^{-1} dw)

Site Code	Site Name	PCB-28 (Tri) + PCB-31 (Tri)	PCB-44 (Tetra)	PCB-49 (Tetra)	PCB-52 (Tetra)	PCB-60 (Tetra)	PCB-77 (Tetra)	PCB-81 (Tetra)	PCB-86 (Penta)	PCB-101 (Penta)	PCB-105 (Penta)	PCB-110 (Penta)	PCB-114 (Penta)	PCB-118 (Penta)	PCB-121 (Penta)	PCB-123 (Penta)	PCB-126 (Penta)	PCB-128 (Hexa)
07/03/03	Whau (L)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
08/03/01	Whau Wairau	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001	0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001
08/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001
08/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001	0.002	< 0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001
09/03/01	Oakley	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
09/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
09/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
10/03/01	Meola	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
10/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001
10/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001
11/03/01	Te Tokaroa	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
11/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
11/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
12/03/01	Motions	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
12/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
12/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
13/03/01	Hobson	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
13/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
13/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
14/03/01	Tamaki	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

Table 20 (contin.)

Polychlorinated biphenyl compounds (mg kg⁻ dw)

Site Code	Site Name	PCB-28 (Tri) + PCB-31 (Tri)	PCB-44 (Tetra)	PCB-49 (Tetra)	PCB-52 (Tetra)	PCB-60 (Tetra)	PCB-77 (Tetra)	PCB-81 (Tetra)	PCB-86 (Penta)	PCB-101 (Penta)	PCB-105 (Penta)	PCB-110 (Penta)	PCB-114 (Penta)	PCB-118 (Penta)	PCB-121 (Penta)	PCB-123 (Penta)	PCB-126 (Penta)	
14/03/02	Tamaki	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
14/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
15/03/01	Pakuranga (U)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
15/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
15/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
16/03/01	Pakuranga (L)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
16/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
16/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
17/03/01	Big Muddy	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
17/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
17/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
18/03/01	Anns	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
18/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
18/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001
19/03/01	Mangere	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
19/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
19/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001
20/03/01	Pukaki	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
20/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
20/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

Table 20 (contin.)

Polychlorinated biphenyl compounds (mg kg⁻ dw)

Site Code	Site Name	PCB-28 (Tri) + PCB-31 (Tri)	PCB-44 (Tetra)	PCB-49 (Tetra)	PCB-52 (Tetra)	PCB-60 (Tetra)	PCB-77 (Tetra)	PCB-81 (Tetra)	PCB-86 (Penta)	PCB-101 (Penta)	PCB-105 (Penta)	PCB-110 (Penta)	PCB-114 (Penta)	PCB-118 (Penta)	PCB-121 (Penta)	PCB-123 (Penta)	PCB-126 (Penta)	
21/03/01	Puhinui	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
21/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
21/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
22/03/01	Pahurehure	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
22/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
22/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
23/03/01	Te Matuku	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
23/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
23/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
24/03/01	Cheltenham	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
24/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
24/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
25/03/01	Browns	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
25/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
25/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
26/03/01	Awaruku	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
26/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
26/03/03		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
27/03/01	Vaughans	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
27/03/02		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

Table 20 (contin.)

Polychlorinated biphenyl compounds (mg kg⁻ dw)

Site Code	Site Name	PCB-28 (Tri) + PCB-31 (Tri)	PCB-44 (Tetra)	PCB-49 (Tetra)	PCB-52 (Tetra)	PCB-60 (Tetra)	PCB-77 (Tetra)	PCB-81 (Tetra)	PCB-86 (Penta)	PCB-101 (Penta)	PCB-105 (Penta)	PCB-110 (Penta)	PCB-114 (Penta)	PCB-118 (Penta)	PCB-121 (Penta)	PCB-123 (Penta)	PCB-126 (Penta)	
27/03/03	Vaughans	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

Table 21

Polychlorinated biphenyl compounds (mg kg^{-1} dw)

Site Code	Site Name	PCB-138 (Hexa)	PCB-141 (Hexa)	PCB-149 (Hexa)	PCB-151 (Hexa)	PCB-153 (Hexa)	PCB-156 (Hexa)	PCB-157 (Hexa)	PCB-159 (Hexa)	PCB-167 (Hexa)	PCB-169 (Hexa)	PCB-170 (Hepta)	PCB-180 (Hepta)	PCB-189 (Hepta)	PCB-194 (Octa)	PCB-206 (Nona)	PCB-209 (Deca)	Total PCB (Sum of individual congeners)
01/03/01	Weiti	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
01/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
01/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
02/03/01	Kaipatiki	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
02/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
02/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
03/03/01	Lucas	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
03/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
03/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
04/03/01	Paremoremo	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
04/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
04/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
05/03/01	Henderson	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
05/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
05/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
06/03/01	Whau (U)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
06/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
06/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
07/03/01	Whau (L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03

Table 21 (contin.)

Polychlorinated biphenyl compounds (mg kg^{-1} dw)

Site Code	Site Name	PCB-138 (Hexa)	PCB-141 (Hexa)	PCB-149 (Hexa)	PCB-151 (Hexa)	PCB-153 (Hexa)	PCB-156 (Hexa)	PCB-157 (Hexa)	PCB-159 (Hexa)	PCB-167 (Hexa)	PCB-169 (Hexa)	PCB-170 (Hepta)	PCB-180 (Hepta)	PCB-189 (Hepta)	PCB-194 (Octa)	PCB-206 (Nona)	PCB-209 (Deca)	Total PCB (Sum of individual congeners)
07/03/02	Whau (L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
07/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
08/03/01	Whau Wairau	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
08/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
08/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
09/03/01	Oakley	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
09/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
09/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
10/03/01	Meola	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
10/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
10/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
11/03/01	Te Tokaroa	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
11/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
11/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
12/03/01	Motions	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
12/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
12/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
13/03/01	Hobson	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
13/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
13/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03

Table 21 (contin.)

Polychlorinated biphenyl compounds (mg kg^{-1} dw)

Site Code	Site Name	PCB-138 (Hexa)	PCB-141 (Hexa)	PCB-149 (Hexa)	PCB-151 (Hexa)	PCB-153 (Hexa)	PCB-156 (Hexa)	PCB-157 (Hexa)	PCB-159 (Hexa)	PCB-167 (Hexa)	PCB-169 (Hexa)	PCB-170 (Hepta)	PCB-180 (Hepta)	PCB-189 (Hepta)	PCB-194 (Octa)	PCB-206 (Nona)	PCB-209 (Deca)	Total PCB (Sum of individual congeners)
14/03/01	Tamaki	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
14/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
14/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
15/03/01	Pakuranga (U)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
15/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
15/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
16/03/01	Pakuranga (L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
16/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
16/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
17/03/01	Big Muddy	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
17/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
17/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
18/03/01	Anns	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
18/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
18/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
19/03/01	Mangere	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
19/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
19/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
20/03/01	Pukaki	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03

Table 22 (contin.)

Polychlorinated biphenyl compounds (mg kg^{-1} dw)

Site Code	Site Name	PCB-138 (Hexa)	PCB-141 (Hexa)	PCB-149 (Hexa)	PCB-151 (Hexa)	PCB-153 (Hexa)	PCB-156 (Hexa)	PCB-157 (Hexa)	PCB-159 (Hexa)	PCB-167 (Hexa)	PCB-169 (Hexa)	PCB-170 (Hepta)	PCB-180 (Hepta)	PCB-189 (Hepta)	PCB-194 (Octa)	PCB-206 (Nona)	PCB-209 (Deca)	Total PCB (Sum of individual congeners)
20/03/02	Pukaki	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
20/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
21/03/01	Puhinui	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
21/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
21/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
22/03/01	Pahurehure	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
22/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
22/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
23/03/01	Te Matuku	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
23/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
23/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
24/03/01	Cheltenham	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
24/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
24/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
25/03/01	Browns	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
25/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
25/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
26/03/01	Awaruku	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
26/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
26/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03

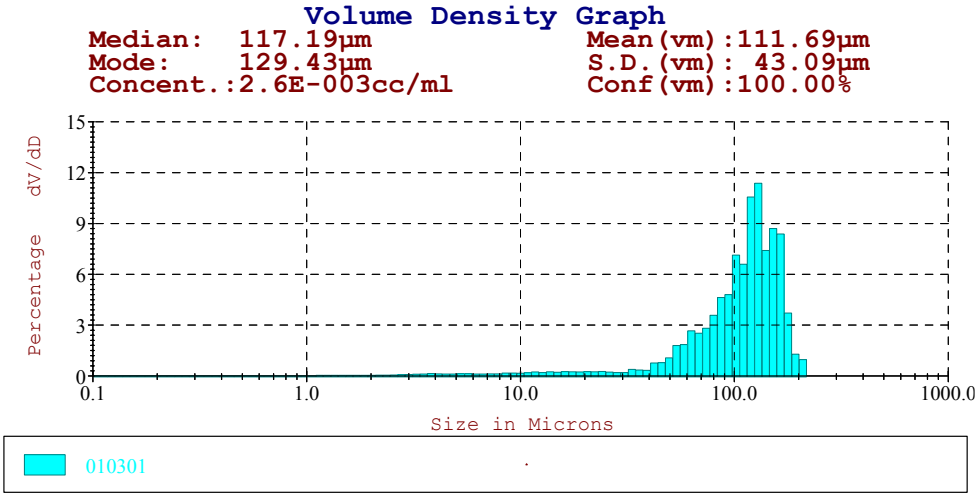
Table 22 (contin.)

Polychlorinated biphenyl compounds (mg kg^{-1} dw)

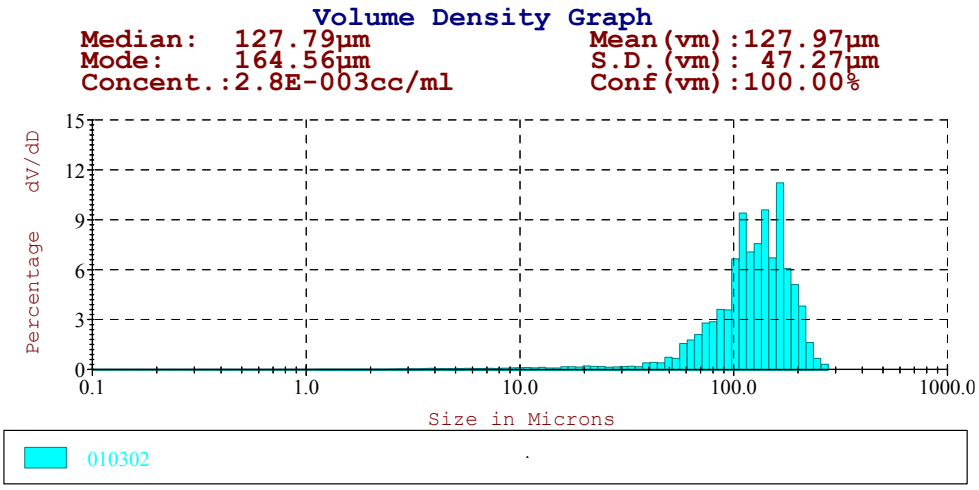
Site Code	Site Name	PCB-138 (Hexa)	PCB-141 (Hexa)	PCB-149 (Hexa)	PCB-151 (Hexa)	PCB-153 (Hexa)	PCB-156 (Hexa)	PCB-157 (Hexa)	PCB-159 (Hexa)	PCB-167 (Hexa)	PCB-169 (Hexa)	PCB-170 (Hepta)	PCB-180 (Hepta)	PCB-189 (Hepta)	PCB-194 (Octa)	PCB-206 (Nona)	PCB-209 (Deca)	Total PCB (Sum of individual congeners)
27/03/01	Vaughans	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
27/03/02		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03
27/03/03		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.03

Appendix 5

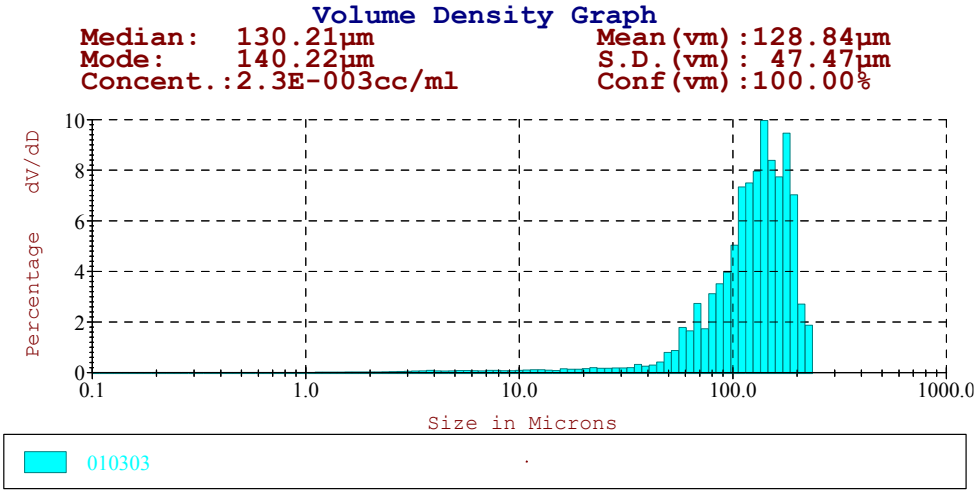
Weiti REP 1



REP 2



REP 3

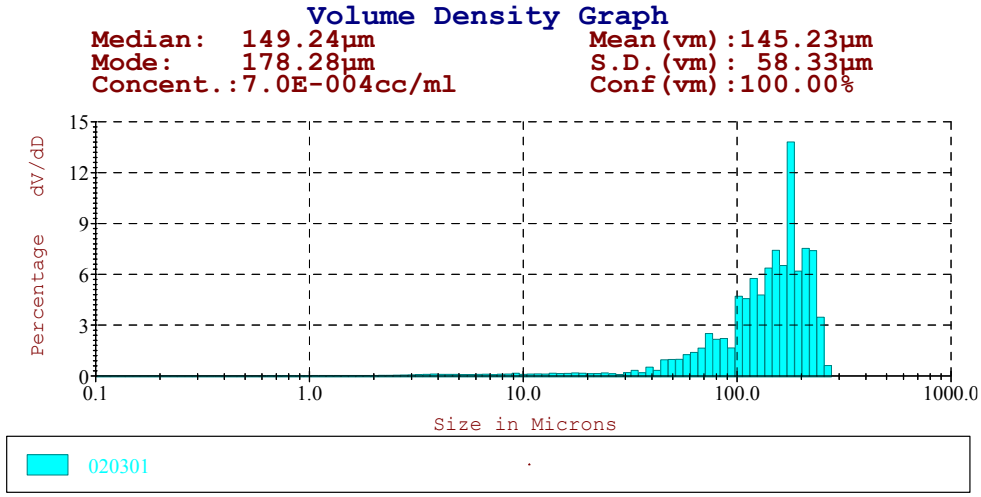


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	21.59	0.82
3.9-7.8	10.41	0.96
7.8-15.6	8.47	1.61
15.6-31.3	5.47	1.99
31.3-62.5	9.87	8.28
62.5-125.0	27.90	45.05
125.0-250.0	16.29	41.30
250.0-300.0	0.00	0.00

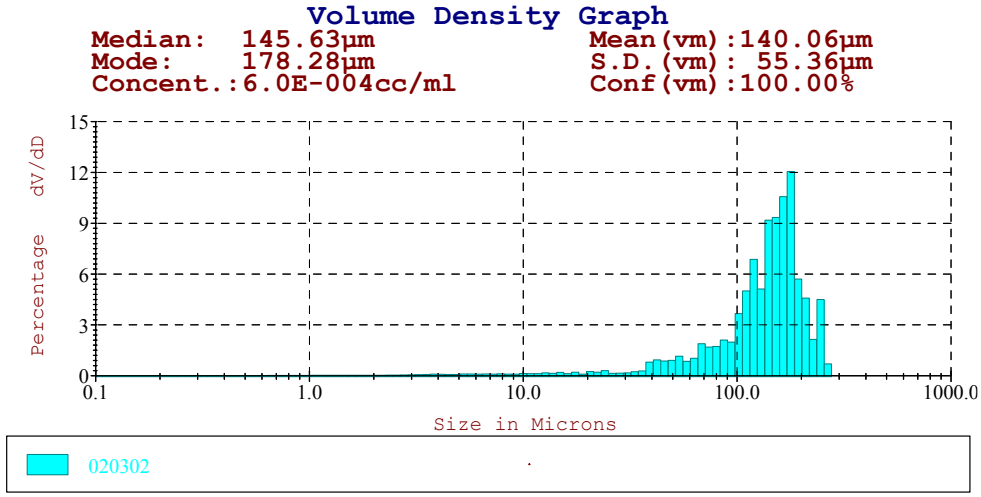
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	13.59	0.35
3.9-7.8	6.44	0.44
7.8-15.6	5.68	0.77
15.6-31.3	5.30	1.41
31.3-62.5	8.65	5.32
62.5-125.0	33.73	39.53
125.0-250.0	26.44	51.66
250.0-300.0	0.17	0.53

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	17.53	0.50
3.9-7.8	8.21	0.59
7.8-15.6	5.30	0.76
15.6-31.3	4.86	1.41
31.3-62.5	8.59	5.64
62.5-125.0	29.20	36.22
125.0-250.0	26.31	54.88
250.0-300.0	0.00	0.00

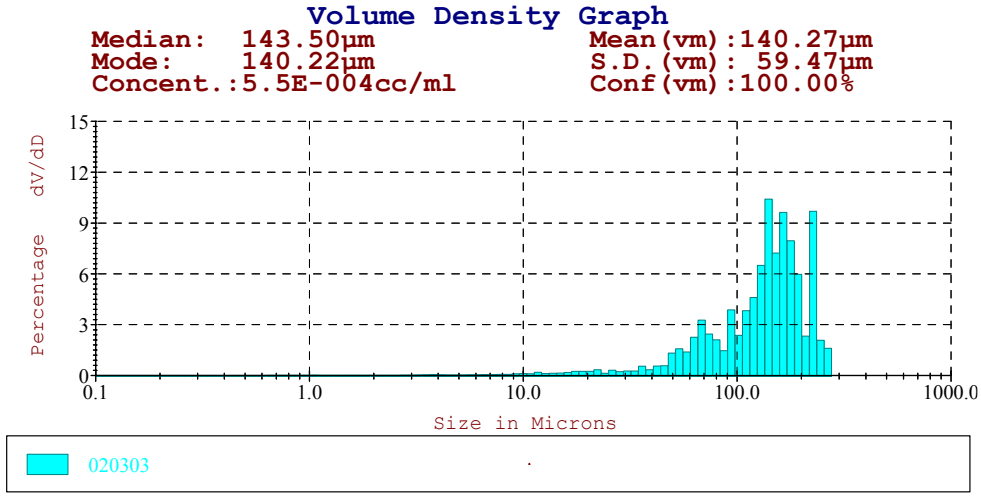
Kaipatiki – REP 1



REP 2



REP 3

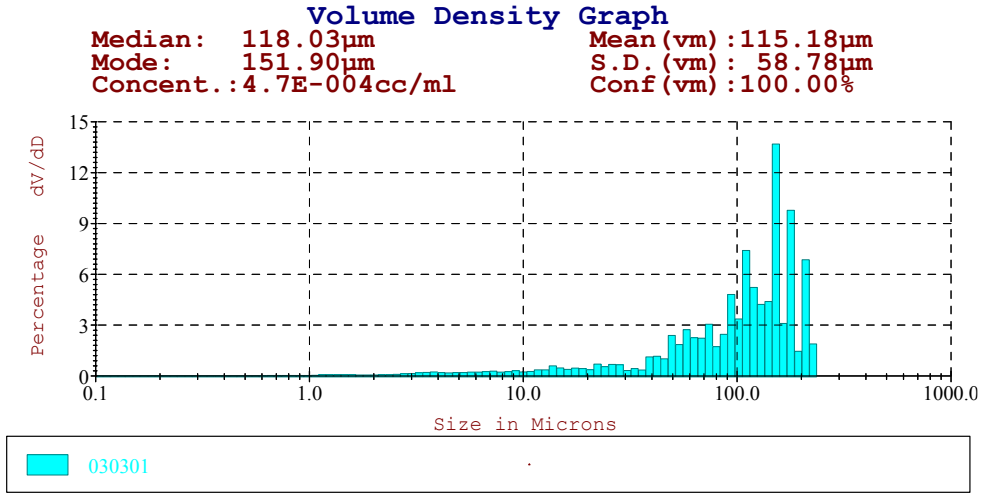


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	25.77	0.69
3.9-7.8	9.21	0.71
7.8-15.6	6.56	1.02
15.6-31.3	4.10	1.24
31.3-62.5	8.75	5.92
62.5-125.0	19.79	26.39
125.0-250.0	25.41	62.53
250.0-300.0	0.42	1.50

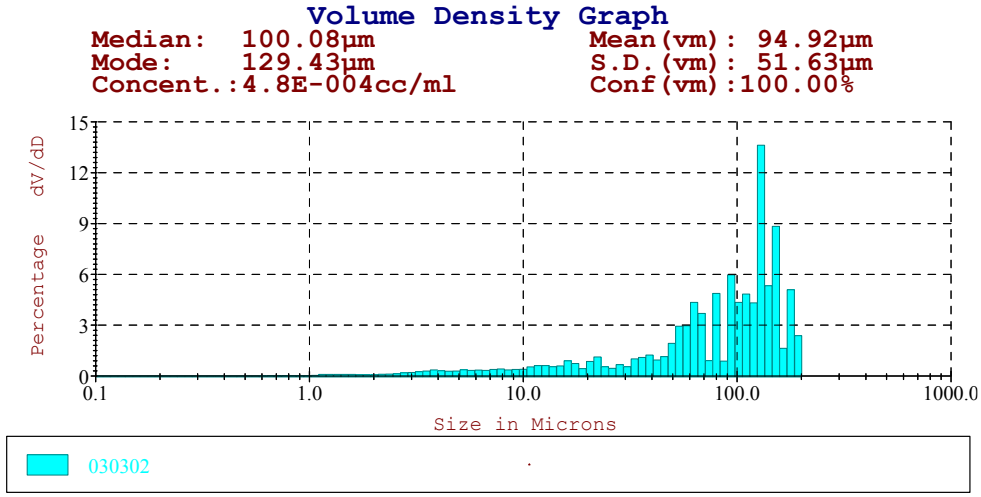
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	23.93	0.60
3.9-7.8	9.02	0.71
7.8-15.6	6.76	1.09
15.6-31.3	4.95	1.54
31.3-62.5	9.76	6.47
62.5-125.0	18.93	25.97
125.0-250.0	26.31	62.42
250.0-300.0	0.33	1.21

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	19.70	0.38
3.9-7.8	4.96	0.36
7.8-15.6	6.35	0.94
15.6-31.3	7.17	2.06
31.3-62.5	11.24	7.13
62.5-125.0	22.58	26.55
125.0-250.0	27.54	60.98
250.0-300.0	0.47	1.61

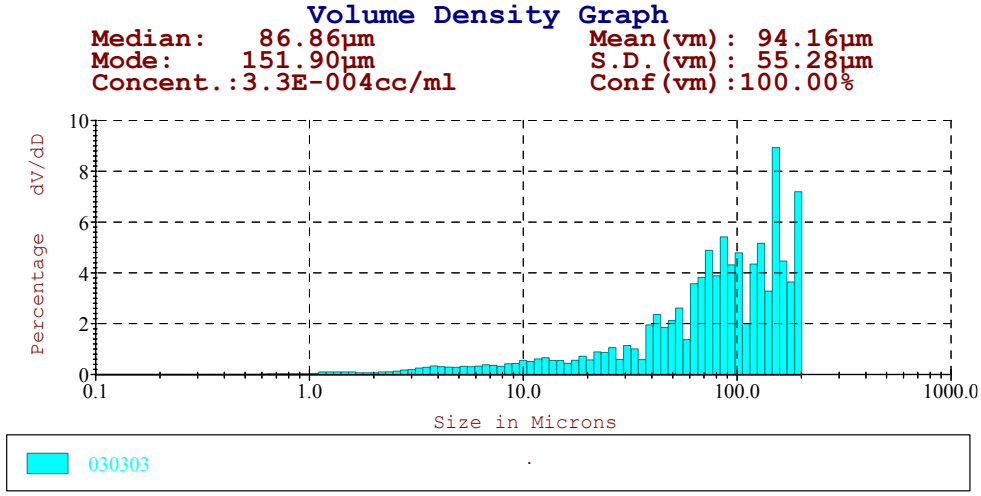
Lucas - REP 1



REP 2



REP 3

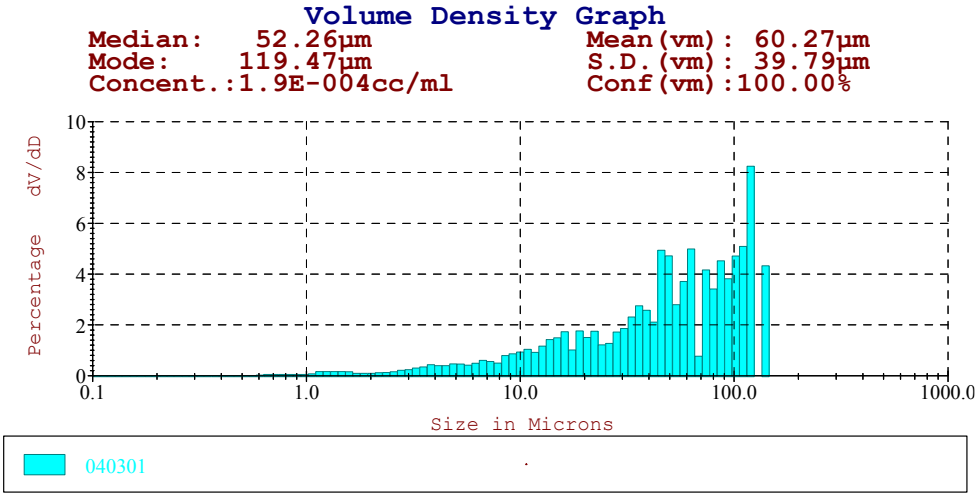


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	32.63	1.56
3.9-7.8	12.99	1.75
7.8-15.6	10.54	2.92
15.6-31.3	8.19	4.41
31.3-62.5	10.71	12.77
62.5-125.0	13.98	32.30
125.0-250.0	10.97	44.30
250.0-300.0	0.00	0.00

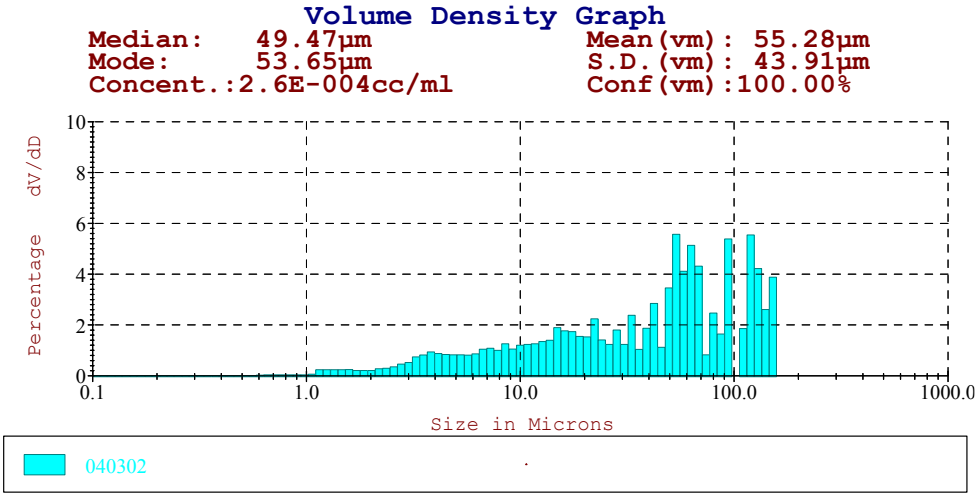
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	33.58	2.17
3.9-7.8	15.58	2.70
7.8-15.6	12.07	4.27
15.6-31.3	8.88	5.92
31.3-62.5	10.63	16.10
62.5-125.0	11.60	33.24
125.0-250.0	7.68	35.59
250.0-300.0	0.00	0.00

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	34.51	2.19
3.9-7.8	14.60	2.60
7.8-15.6	12.26	4.42
15.6-31.3	8.90	6.55
31.3-62.5	10.15	14.95
62.5-125.0	13.19	36.66
125.0-250.0	6.38	32.63
250.0-300.0	0.00	0.00

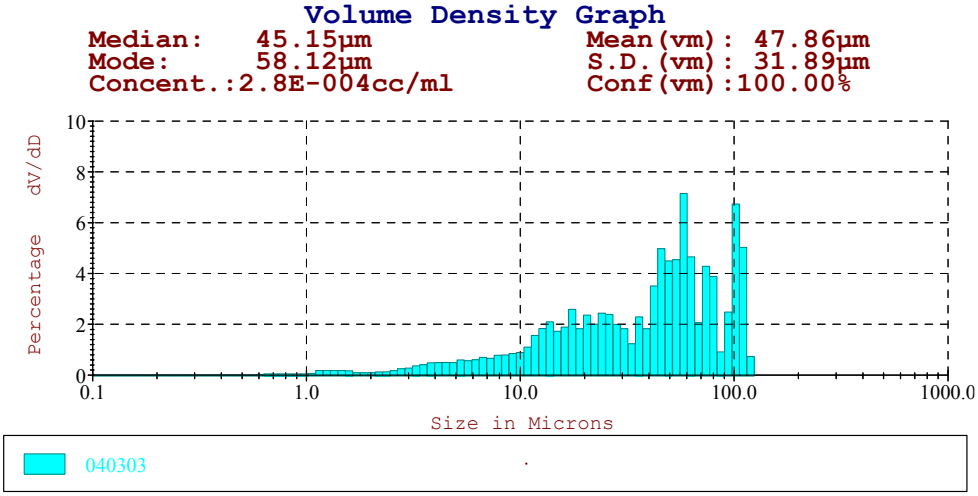
Paremoremo - REP 1



REP 2



REP 3

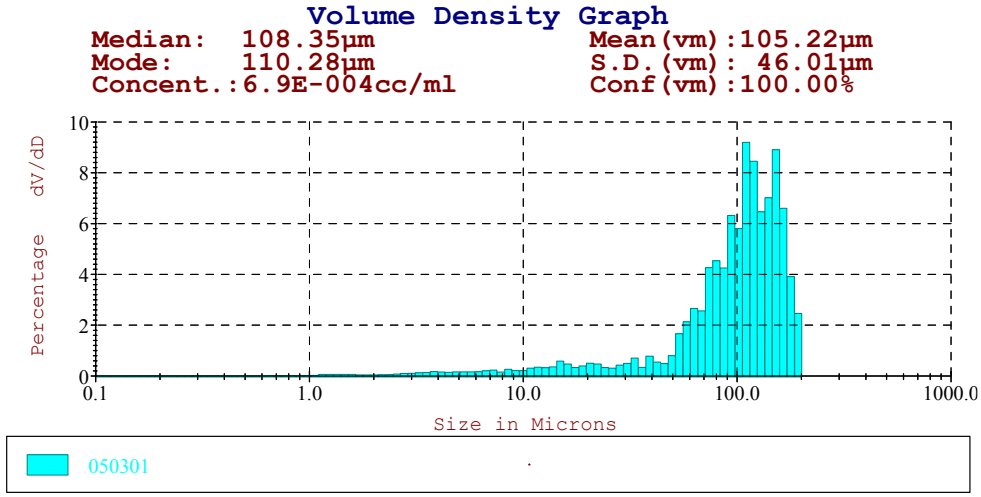


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	33.73	2.95
3.9-7.8	14.56	3.86
7.8-15.6	16.49	8.97
15.6-31.3	12.75	13.34
31.3-62.5	13.63	29.95
62.5-125.0	8.18	36.57
125.0-250.0	0.66	4.38
250.0-300.0	0.00	0.00

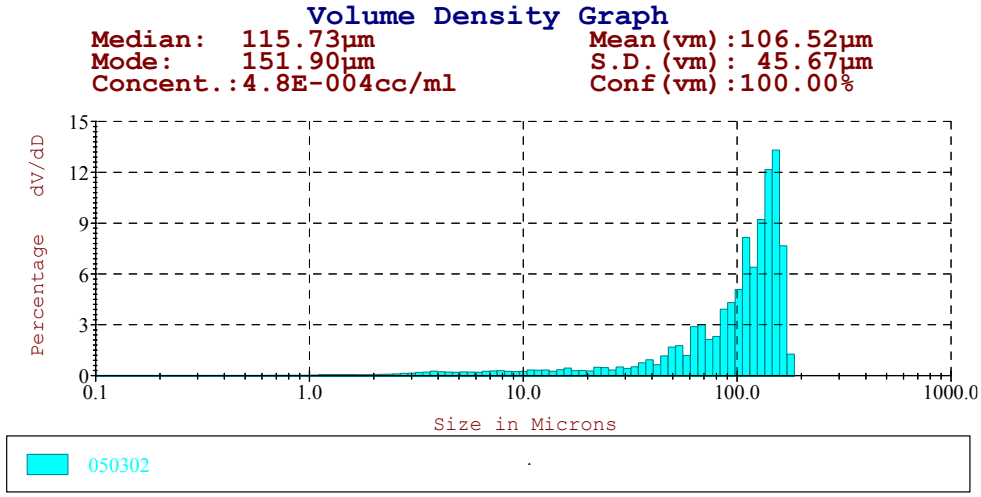
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	41.07	5.85
3.9-7.8	20.12	7.36
7.8-15.6	15.27	11.32
15.6-31.3	9.78	13.89
31.3-62.5	8.30	26.02
62.5-125.0	4.53	26.78
125.0-250.0	0.94	8.79
250.0-300.0	0.00	0.00

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	31.76	3.29
3.9-7.8	15.79	4.82
7.8-15.6	17.84	11.31
15.6-31.3	15.94	18.89
31.3-62.5	12.48	32.49
62.5-125.0	6.20	29.21
125.0-250.0	0.00	0.00
250.0-300.0	0.00	0.00

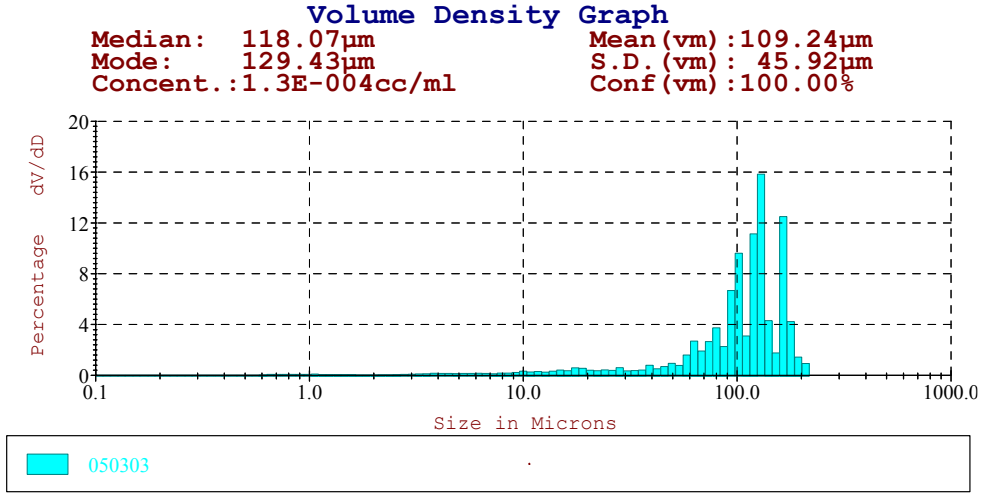
Henderson - REP 1



REP 2



REP 3

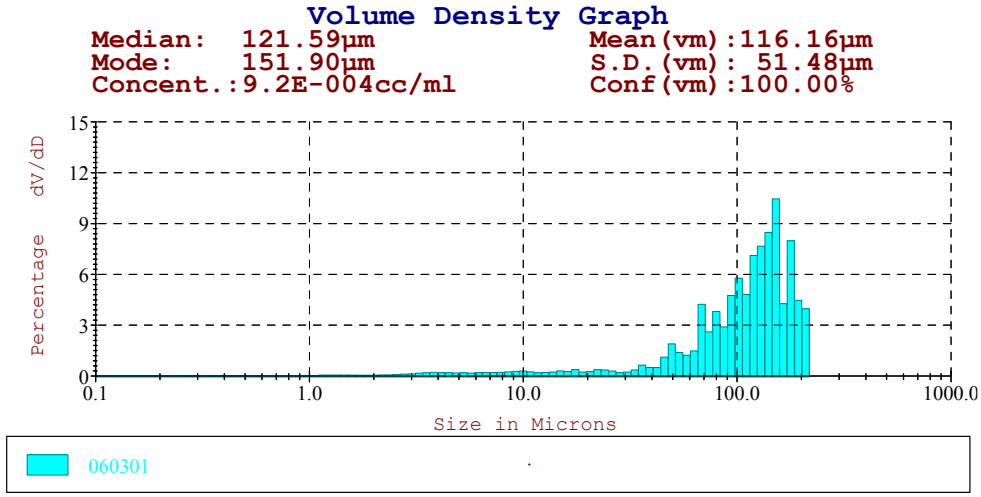


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	28.09	1.17
3.9-7.8	11.47	1.38
7.8-15.6	10.76	2.70
15.6-31.3	7.42	3.49
31.3-62.5	9.24	10.00
62.5-125.0	22.68	46.90
125.0-250.0	10.36	34.36
250.0-300.0	0.00	0.00

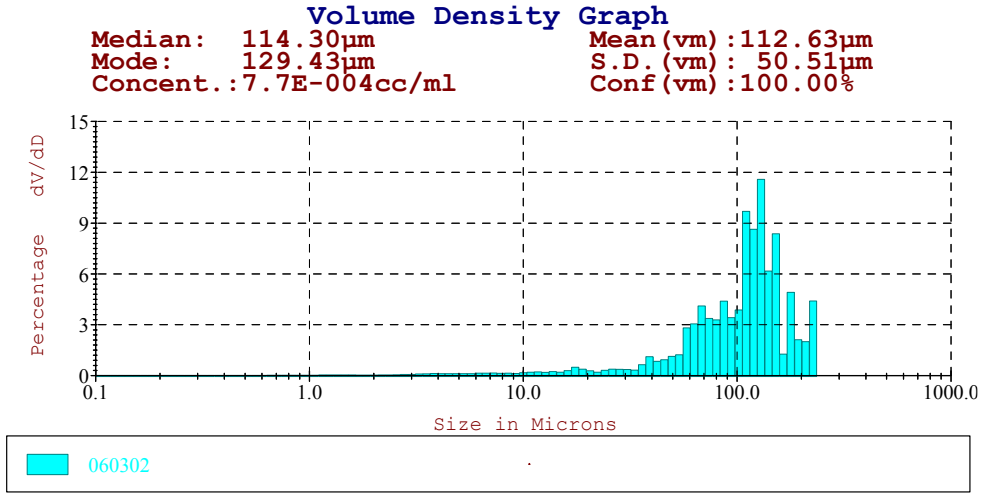
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	31.73	1.55
3.9-7.8	13.96	1.81
7.8-15.6	9.39	2.45
15.6-31.3	6.45	3.37
31.3-62.5	8.63	9.53
62.5-125.0	17.12	37.48
125.0-250.0	12.72	43.83
250.0-300.0	0.00	0.00

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	39.91	1.35
3.9-7.8	8.85	1.18
7.8-15.6	8.33	2.32
15.6-31.3	7.25	3.85
31.3-62.5	5.90	6.92
62.5-125.0	18.50	43.26
125.0-250.0	11.26	41.13
250.0-300.0	0.00	0.00

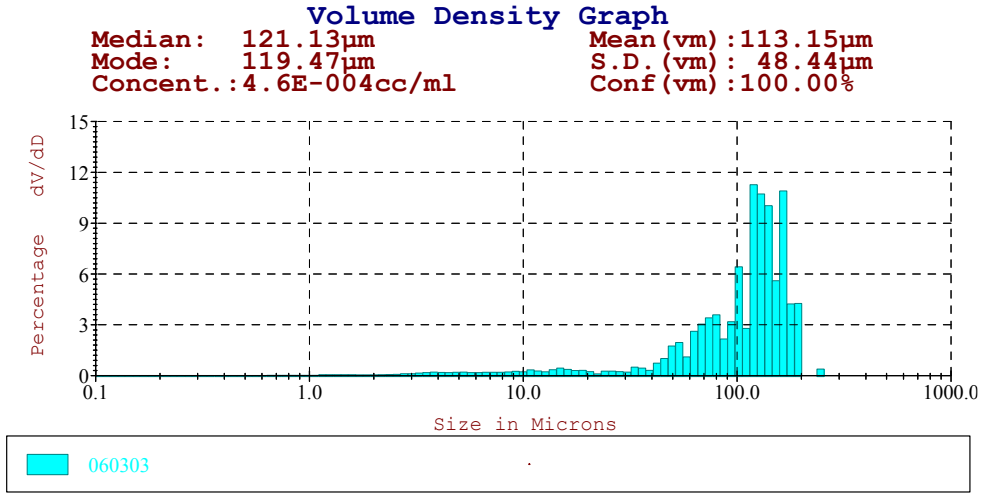
Whau (U) - REP 1



REP 2



REP 3

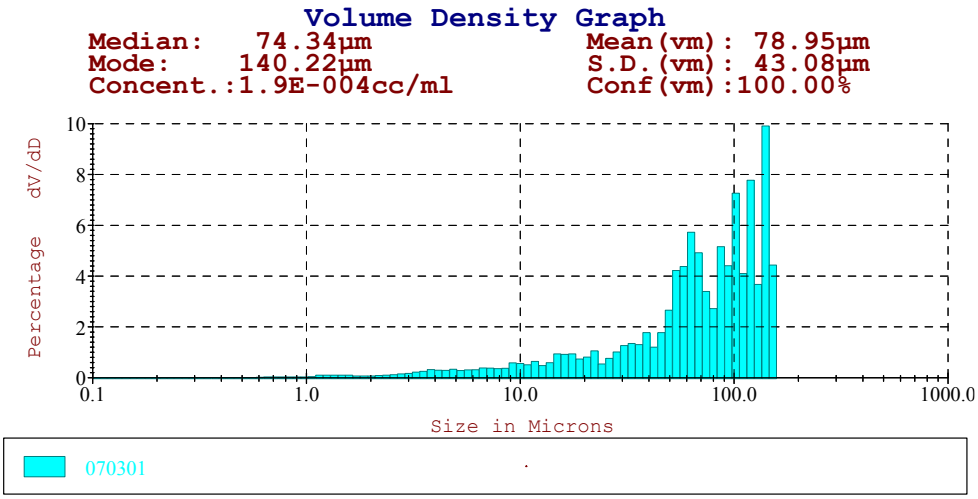


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	29.34	1.29
3.9-7.8	13.61	1.54
7.8-15.6	9.10	2.04
15.6-31.3	5.52	2.45
31.3-62.5	8.26	8.09
62.5-125.0	19.87	37.92
125.0-250.0	14.30	46.68
250.0-300.0	0.00	0.00

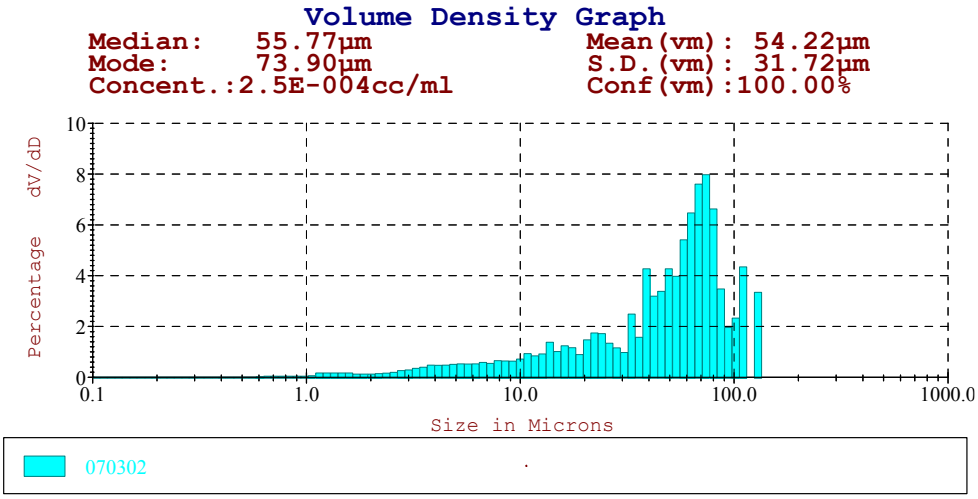
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	21.92	0.74
3.9-7.8	9.92	0.97
7.8-15.6	7.54	1.50
15.6-31.3	7.63	2.91
31.3-62.5	12.32	10.67
62.5-125.0	25.88	42.58
125.0-250.0	14.79	40.63
250.0-300.0	0.00	0.00

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	28.89	1.25
3.9-7.8	13.34	1.51
7.8-15.6	10.12	2.39
15.6-31.3	4.87	2.13
31.3-62.5	8.96	9.07
62.5-125.0	19.28	37.66
125.0-250.0	14.53	45.99
250.0-300.0	0.00	0.00

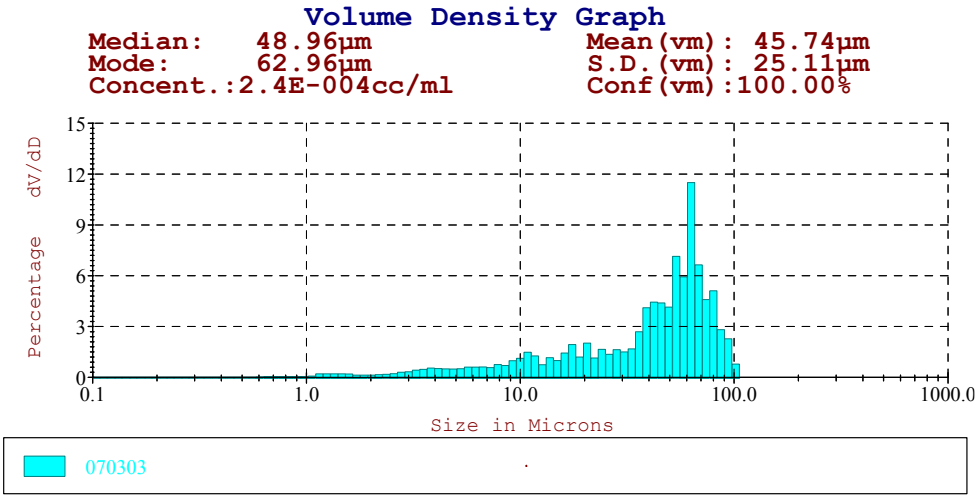
Whau (L) - REP 1



REP 2



REP 3

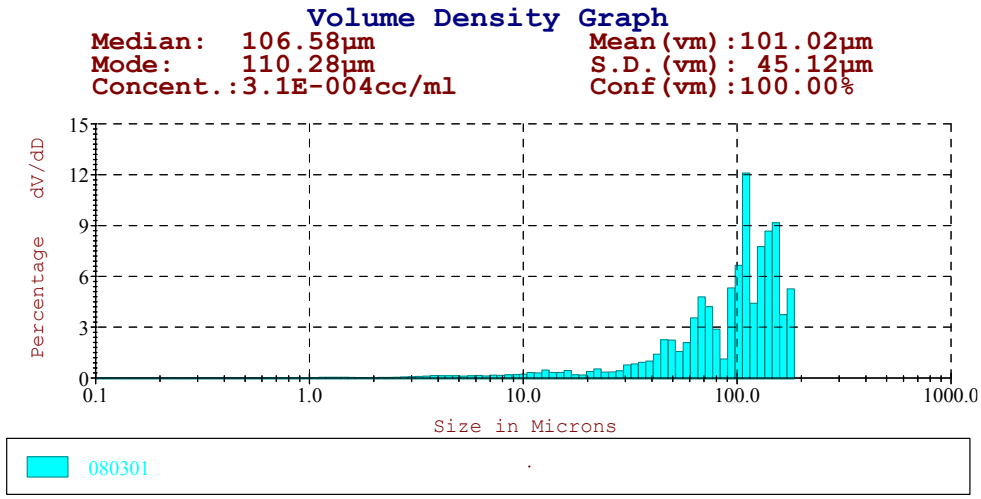


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	31.23	2.02
3.9-7.8	14.18	2.63
7.8-15.6	12.70	4.82
15.6-31.3	10.42	7.67
31.3-62.5	13.44	21.93
62.5-125.0	14.20	42.78
125.0-250.0	3.84	18.15
250.0-300.0	0.00	0.00

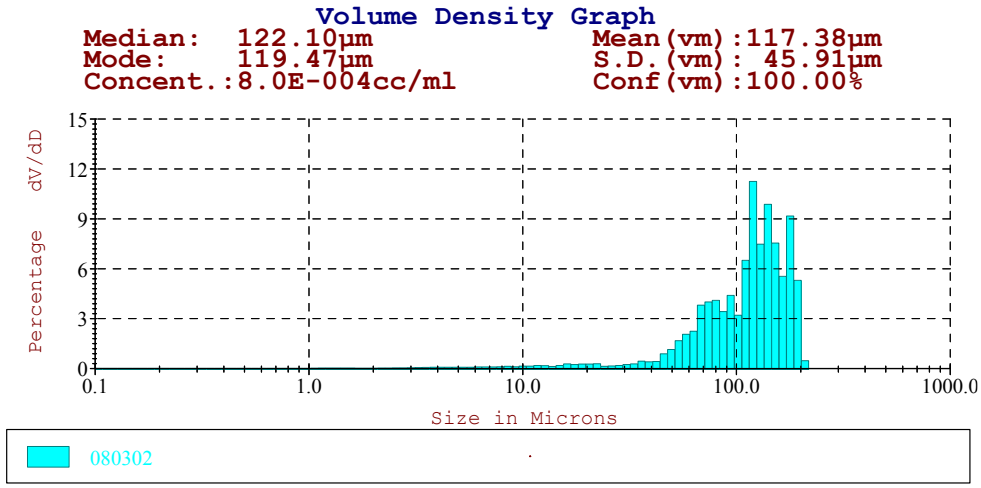
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	35.34	3.34
3.9-7.8	16.01	4.31
7.8-15.6	13.43	7.45
15.6-31.3	10.60	11.30
31.3-62.5	13.87	31.15
62.5-125.0	10.22	39.07
125.0-250.0	0.54	3.38
250.0-300.0	0.00	0.00

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	36.41	3.85
3.9-7.8	15.13	4.61
7.8-15.6	14.58	8.85
15.6-31.3	11.31	13.44
31.3-62.5	15.14	39.34
62.5-125.0	7.42	29.90
125.0-250.0	0.00	0.00
250.0-300.0	0.00	0.00

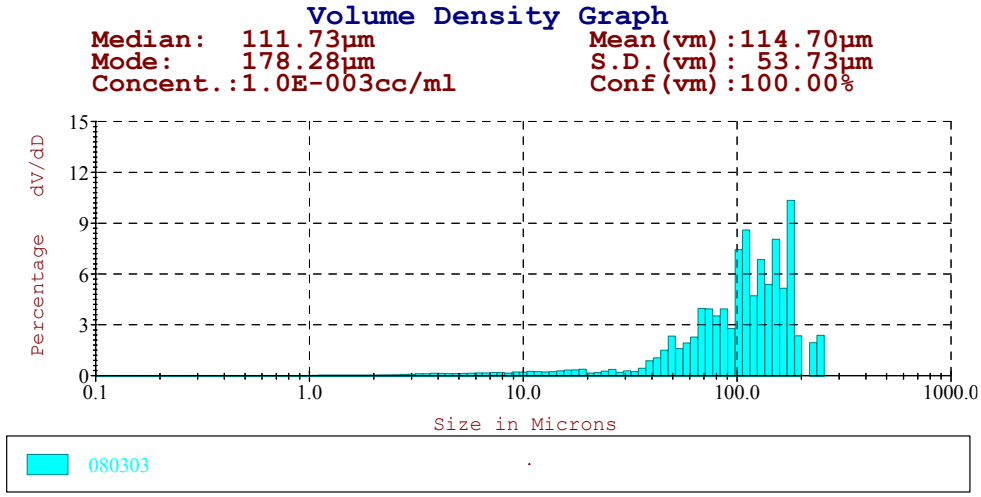
Whau Wairau – REP 1



REP 2



REP 3

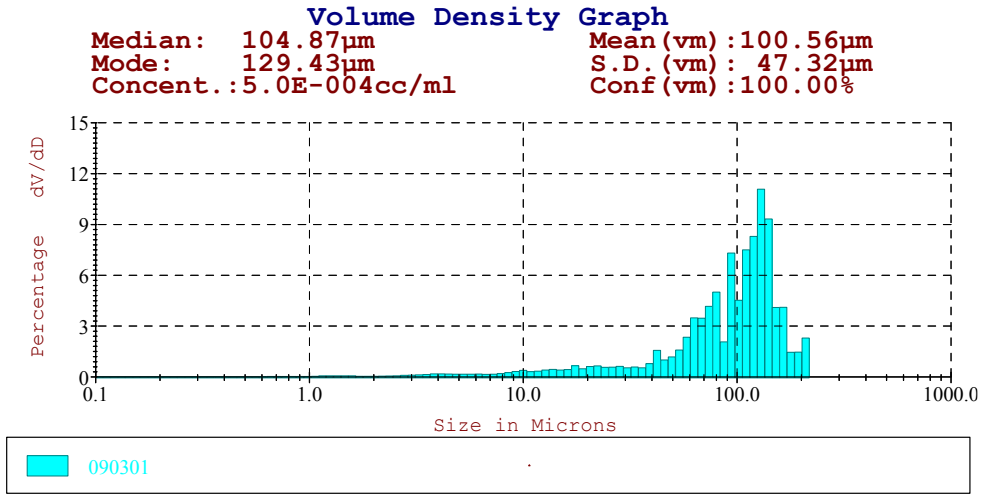


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	22.21	0.86
3.9-7.8	9.82	1.09
7.8-15.6	10.51	2.43
15.6-31.3	7.23	3.32
31.3-62.5	14.26	13.21
62.5-125.0	24.37	44.38
125.0-250.0	11.60	34.72
250.0-300.0	0.00	0.00

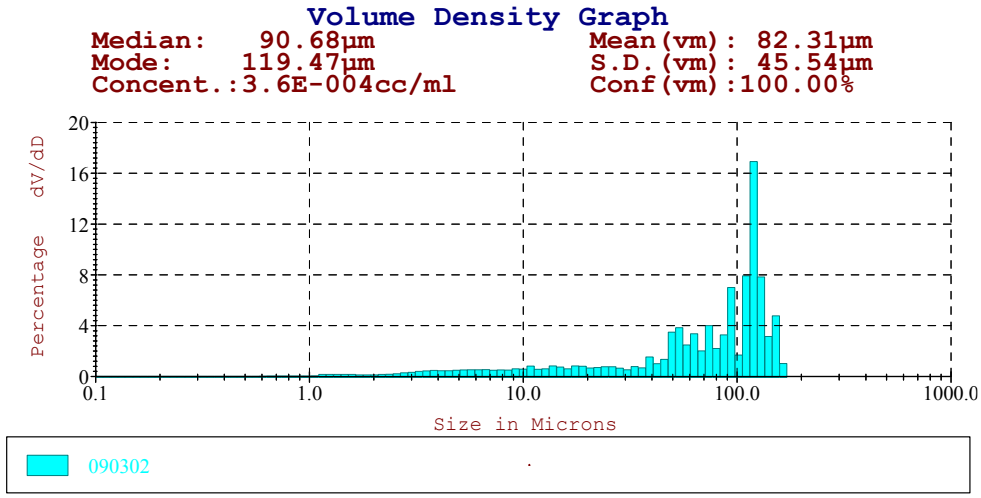
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	17.26	0.49
3.9-7.8	7.99	0.66
7.8-15.6	7.29	1.20
15.6-31.3	6.13	1.92
31.3-62.5	11.29	8.38
62.5-125.0	31.21	43.67
125.0-250.0	18.84	43.69
250.0-300.0	0.00	0.00

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	23.19	0.88
3.9-7.8	11.21	1.15
7.8-15.6	8.96	1.84
15.6-31.3	5.93	2.33
31.3-62.5	12.67	11.34
62.5-125.0	24.02	40.80
125.0-250.0	14.01	41.66
250.0-300.0	0.00	0.00

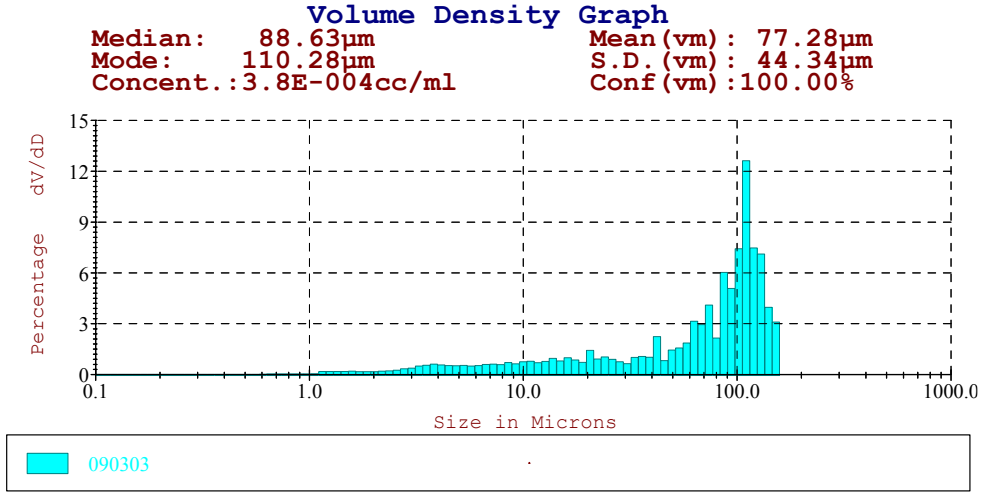
Oakley - REP 1



REP 2



REP 3

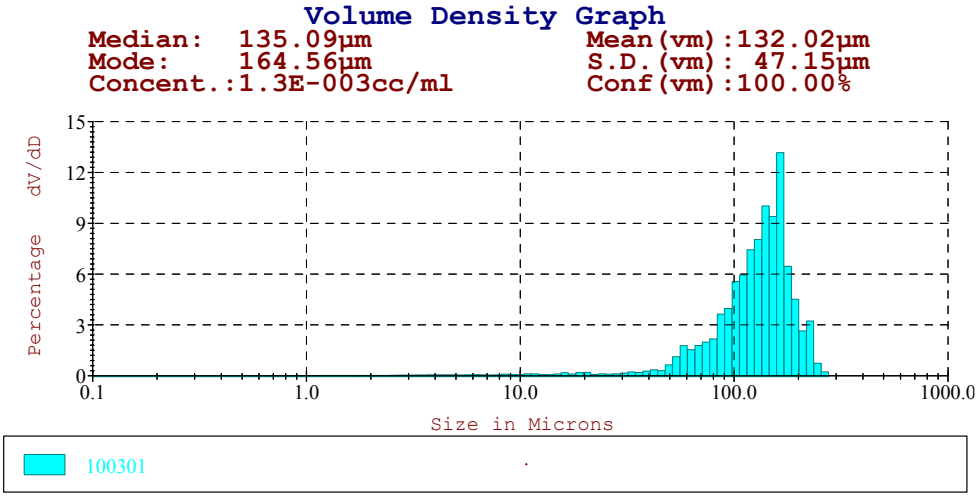


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	27.81	1.20
3.9-7.8	10.41	1.31
7.8-15.6	11.29	2.94
15.6-31.3	9.71	4.93
31.3-62.5	9.86	10.95
62.5-125.0	21.46	46.01
125.0-250.0	9.47	32.67
250.0-300.0	0.00	0.00

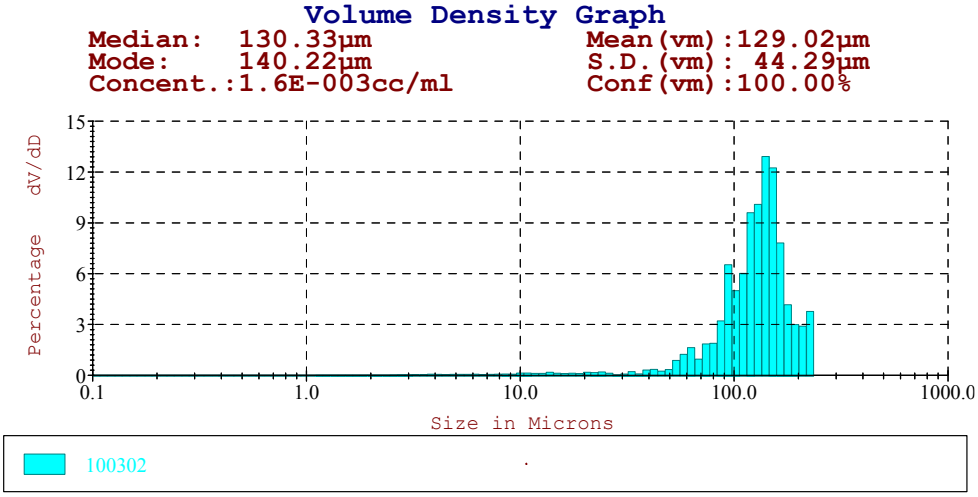
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	40.21	3.39
3.9-7.8	17.83	4.02
7.8-15.6	11.95	5.48
15.6-31.3	6.84	6.08
31.3-62.5	8.46	16.87
62.5-125.0	11.79	47.24
125.0-250.0	2.92	16.94
250.0-300.0	0.00	0.00

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	42.54	4.14
3.9-7.8	17.52	4.46
7.8-15.6	12.44	6.42
15.6-31.3	7.98	7.98
31.3-62.5	5.92	12.71
62.5-125.0	11.35	49.97
125.0-250.0	2.25	14.33
250.0-300.0	0.00	0.00

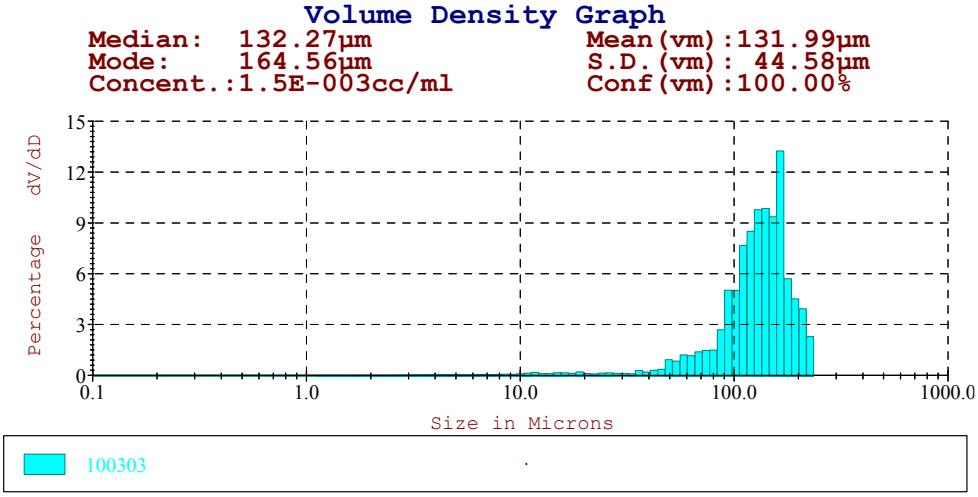
Meola - REP 1



REP 2



REP 3

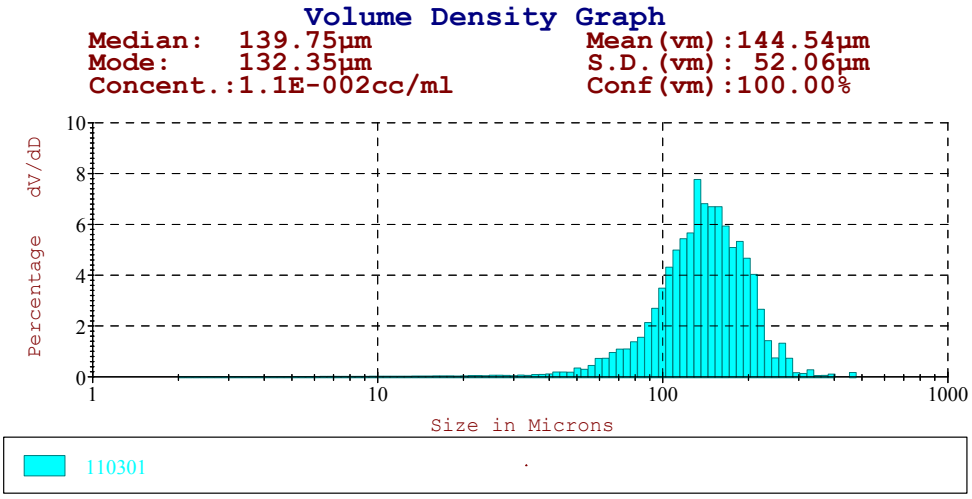


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	14.97	0.35
3.9-7.8	6.60	0.43
7.8-15.6	5.30	0.70
15.6-31.3	4.30	1.08
31.3-62.5	9.44	5.72
62.5-125.0	29.09	33.54
125.0-250.0	30.23	57.96
250.0-300.0	0.07	0.22

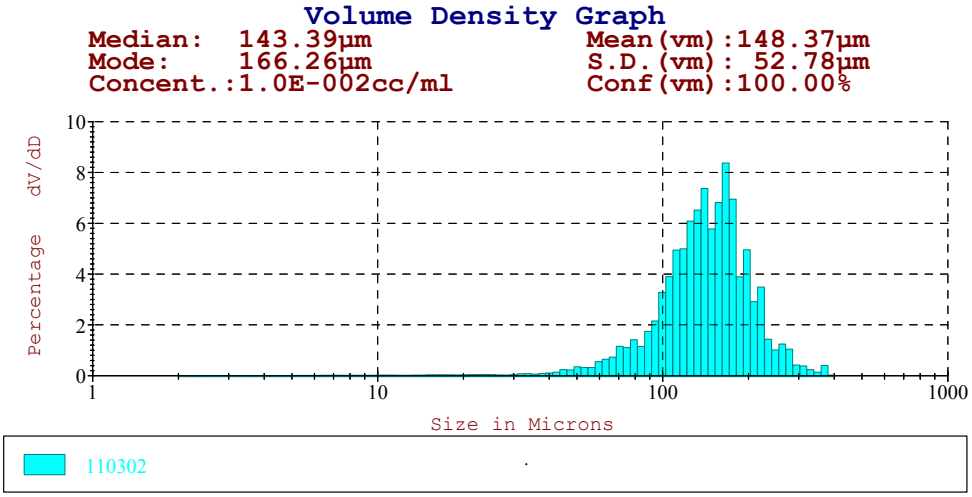
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	15.29	0.37
3.9-7.8	6.52	0.43
7.8-15.6	6.66	0.92
15.6-31.3	3.85	0.99
31.3-62.5	6.95	4.25
62.5-125.0	31.13	37.13
125.0-250.0	29.62	55.91
250.0-300.0	0.00	0.00

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	13.39	0.30
3.9-7.8	5.67	0.36
7.8-15.6	6.62	0.88
15.6-31.3	4.47	1.11
31.3-62.5	7.75	4.44
62.5-125.0	30.24	34.62
125.0-250.0	31.86	58.29
250.0-300.0	0.00	0.00

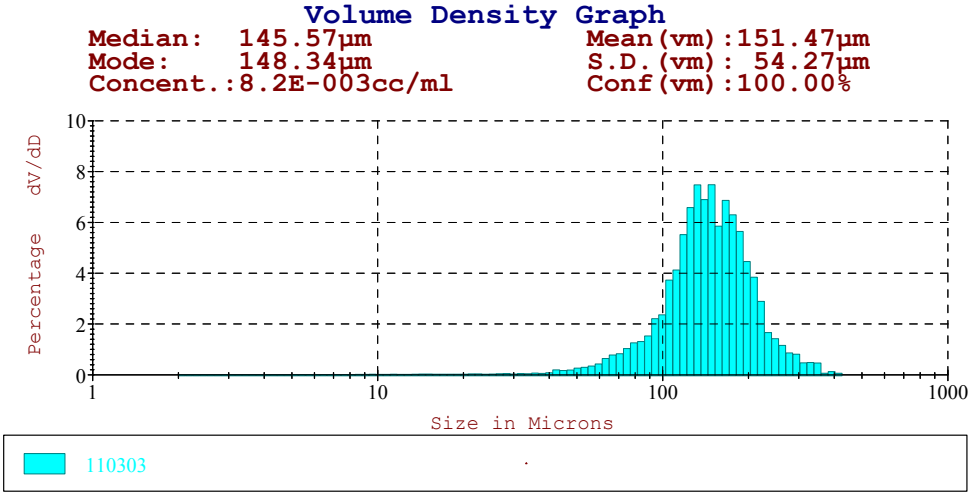
Te Tokaroa –REP 1



REP 2



REP 3

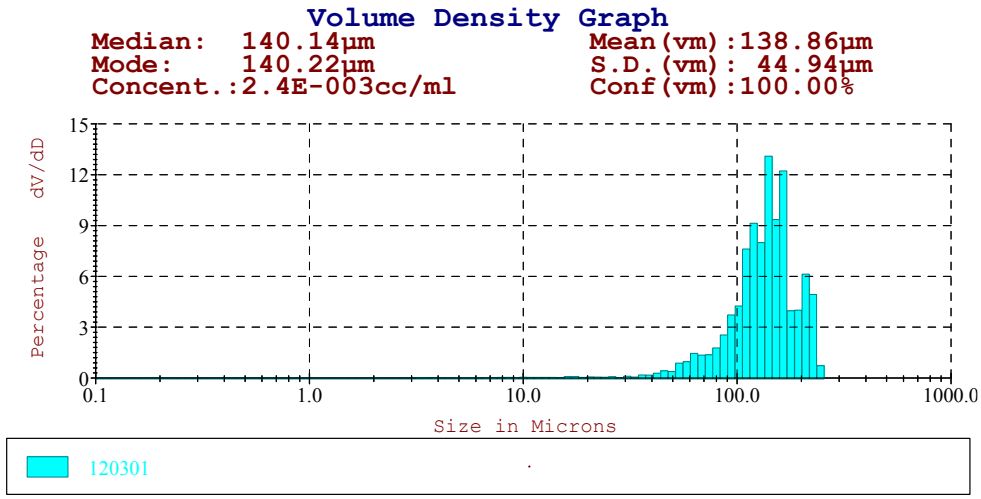


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	0.74	0.02
3.9-7.8	2.03	0.10
7.8-15.6	2.80	0.27
15.6-31.3	2.80	0.53
31.3-62.5	7.10	3.03
62.5-125.0	38.44	31.84
125.0-250.0	44.75	60.98
250.0-500.0	1.34	3.24

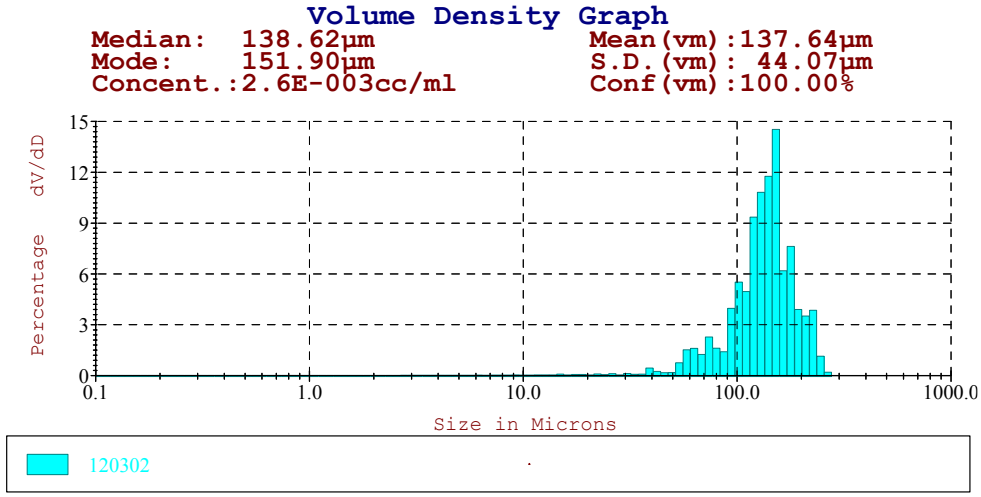
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	0.95	0.02
3.9-7.8	2.19	0.11
7.8-15.6	2.56	0.24
15.6-31.3	2.47	0.45
31.3-62.5	6.85	2.81
62.5-125.0	36.56	29.76
125.0-250.0	46.54	62.21
250.0-500.0	1.88	4.40

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	0.92	0.02
3.9-7.8	2.08	0.10
7.8-15.6	2.36	0.21
15.6-31.3	2.08	0.38
31.3-62.5	6.01	2.41
62.5-125.0	35.14	27.93
125.0-250.0	49.30	64.03
250.0-500.0	2.11	4.92

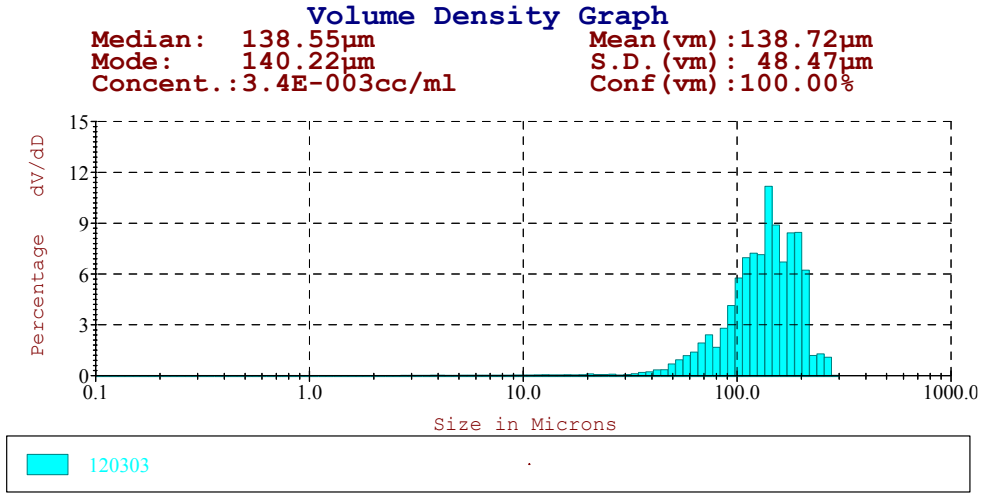
Motions - REP 1



REP 2



REP 3

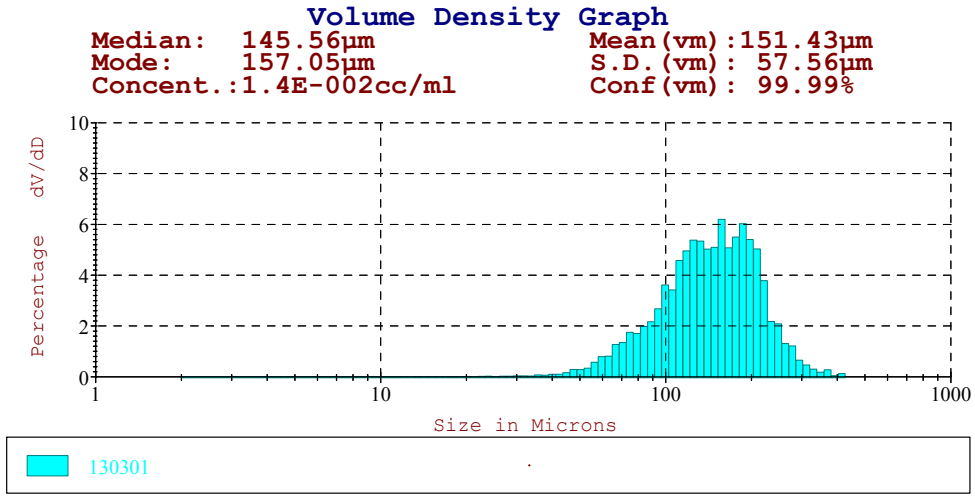


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	6.09	0.11
3.9-7.8	2.54	0.13
7.8-15.6	2.75	0.28
15.6-31.3	2.56	0.50
31.3-62.5	8.53	4.00
62.5-125.0	36.42	33.54
125.0-250.0	41.02	61.22
250.0-300.0	0.09	0.22

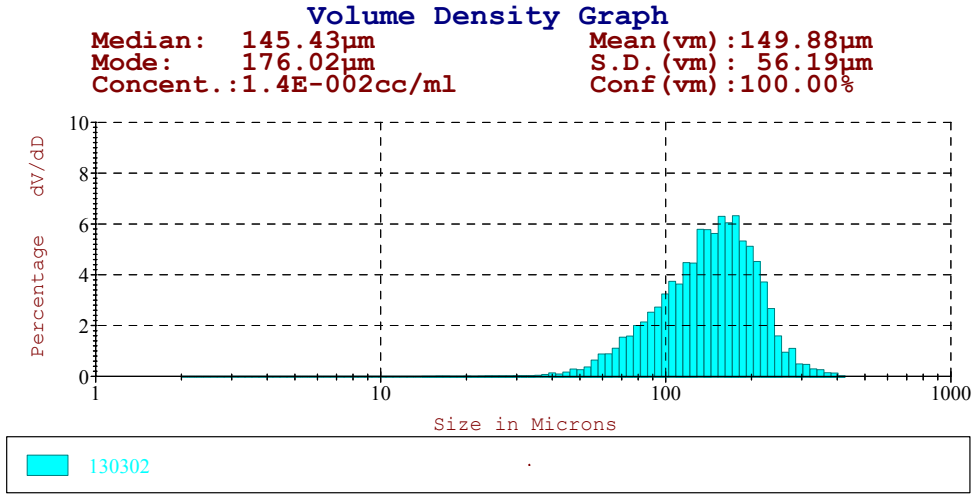
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	5.97	0.11
3.9-7.8	2.39	0.12
7.8-15.6	2.78	0.30
15.6-31.3	2.76	0.59
31.3-62.5	8.11	3.85
62.5-125.0	34.88	31.65
125.0-250.0	42.69	62.43
250.0-300.0	0.41	0.96

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	6.75	0.13
3.9-7.8	2.95	0.16
7.8-15.6	3.06	0.33
15.6-31.3	2.57	0.54
31.3-62.5	8.95	4.27
62.5-125.0	37.27	34.18
125.0-250.0	37.83	58.88
250.0-300.0	0.61	1.52

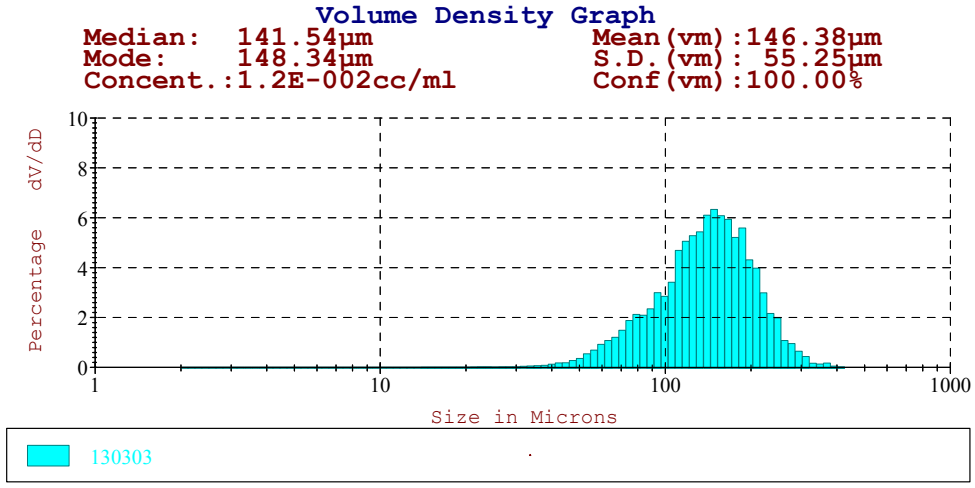
Hobson - REP 1



REP 2



REP 3

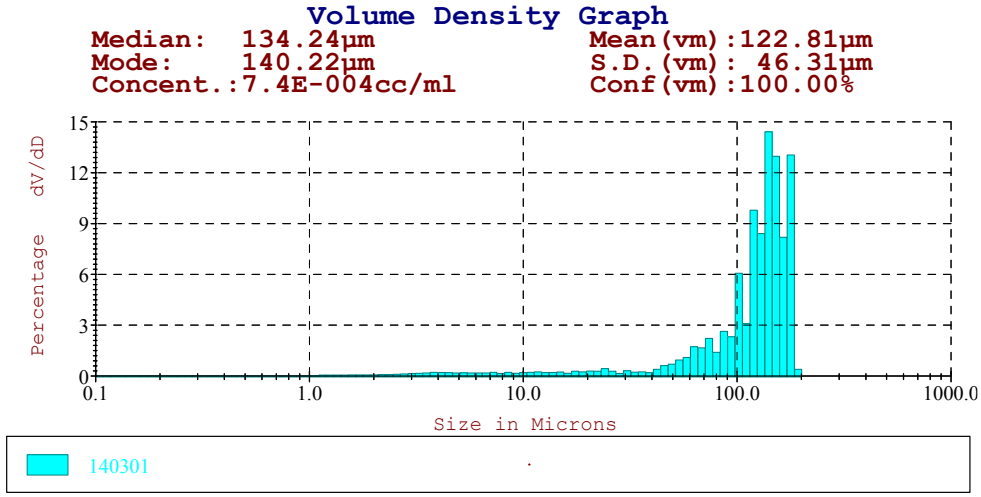


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	0.23	0.01
3.9-7.8	0.53	0.02
7.8-15.6	0.71	0.06
15.6-31.3	0.92	0.17
31.3-62.5	7.43	3.03
62.5-125.0	43.20	32.45
125.0-250.0	44.60	58.93
250.0-300.0	2.38	5.34

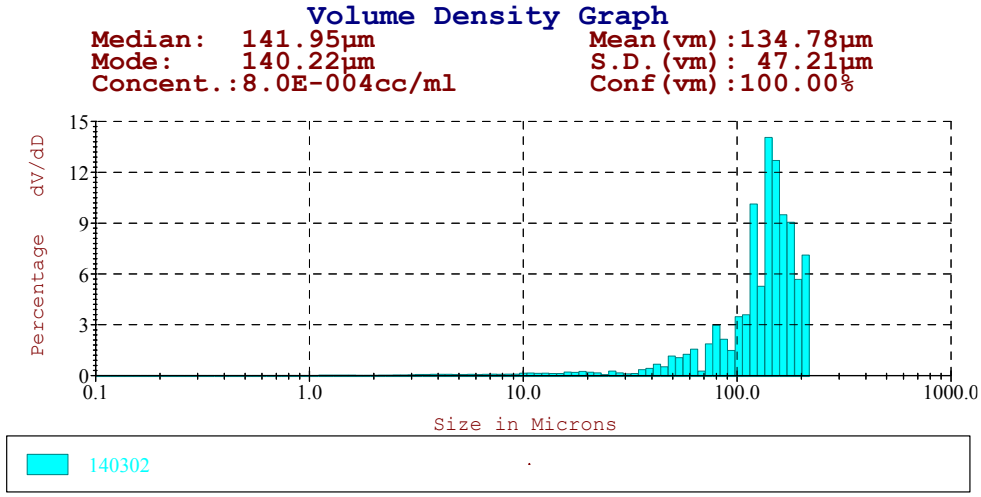
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	0.23	0.01
3.9-7.8	0.51	0.02
7.8-15.6	0.70	0.06
15.6-31.3	1.15	0.21
31.3-62.5	7.97	3.30
62.5-125.0	41.98	31.51
125.0-250.0	45.57	60.55
250.0-300.0	1.90	4.34

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	0.24	0.01
3.9-7.8	0.51	0.02
7.8-15.6	0.70	0.06
15.6-31.3	1.09	0.21
31.3-62.5	9.12	3.84
62.5-125.0	43.52	33.68
125.0-250.0	42.95	57.86
250.0-300.0	1.88	4.32

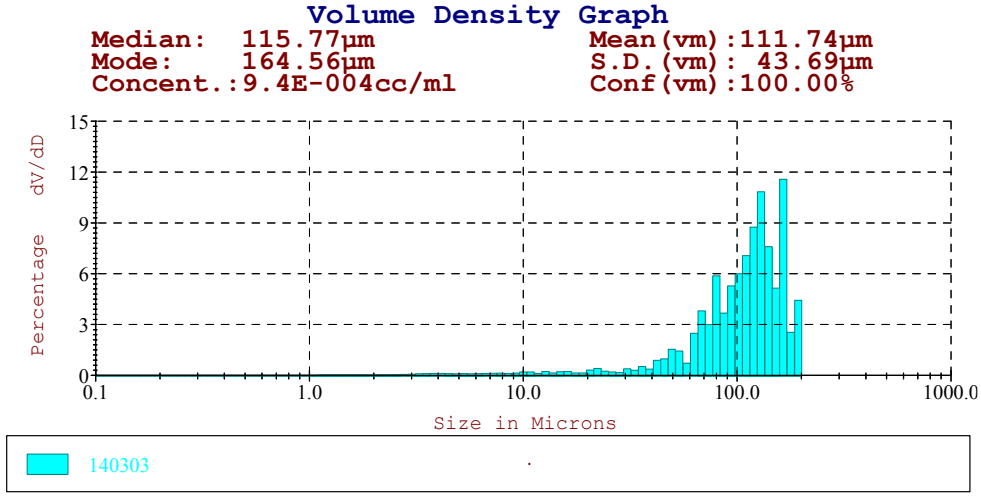
Tamaki - REP 1



REP 2



REP 3

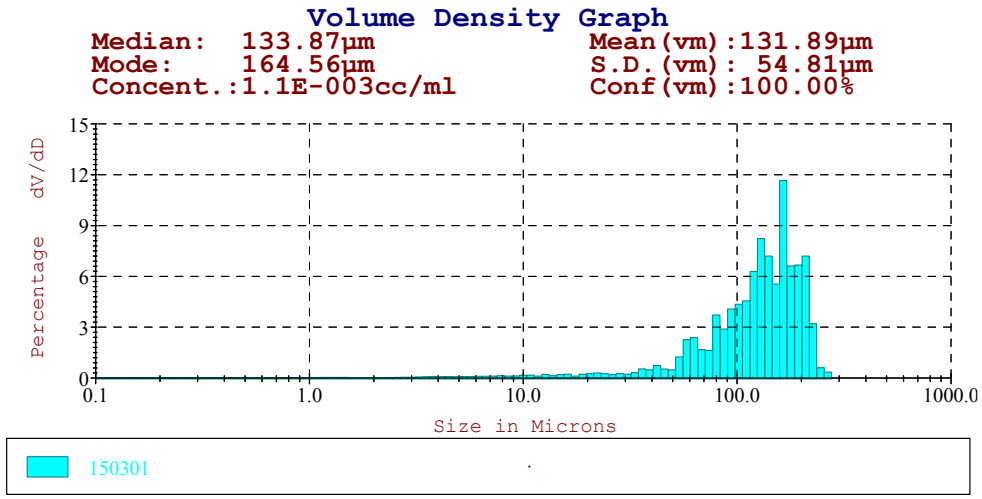


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	33.52	1.43
3.9-7.8	13.87	1.50
7.8-15.6	7.72	1.70
15.6-31.3	5.22	2.30
31.3-62.5	4.85	4.70
62.5-125.0	16.21	31.39
125.0-250.0	18.61	56.99
250.0-300.0	0.00	0.00

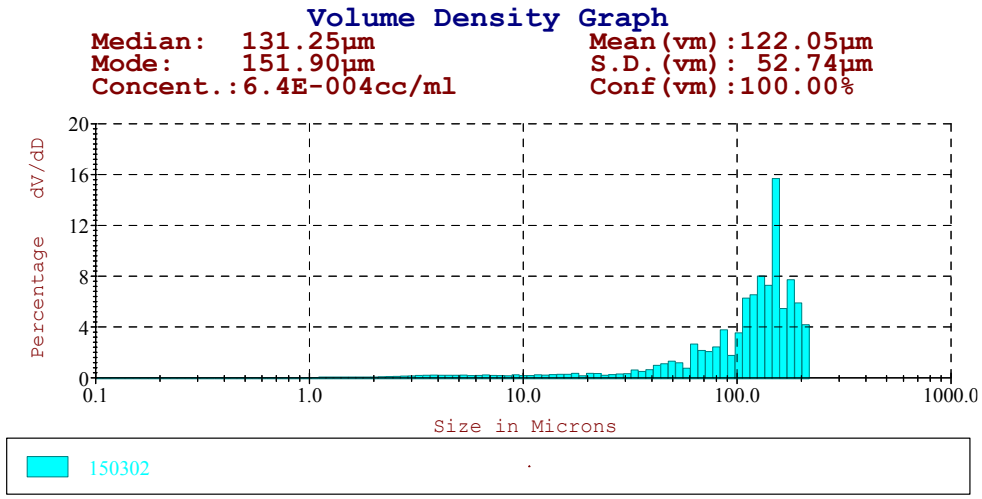
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	19.79	0.51
3.9-7.8	7.80	0.56
7.8-15.6	6.61	0.97
15.6-31.3	5.51	1.53
31.3-62.5	9.53	6.15
62.5-125.0	20.98	27.50
125.0-250.0	29.79	62.79
250.0-300.0	0.00	0.00

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	22.79	0.76
3.9-7.8	8.96	0.83
7.8-15.6	7.27	1.36
15.6-31.3	5.55	2.07
31.3-62.5	9.65	7.76
62.5-125.0	29.20	45.39
125.0-250.0	16.60	41.85
250.0-300.0	0.00	0.00

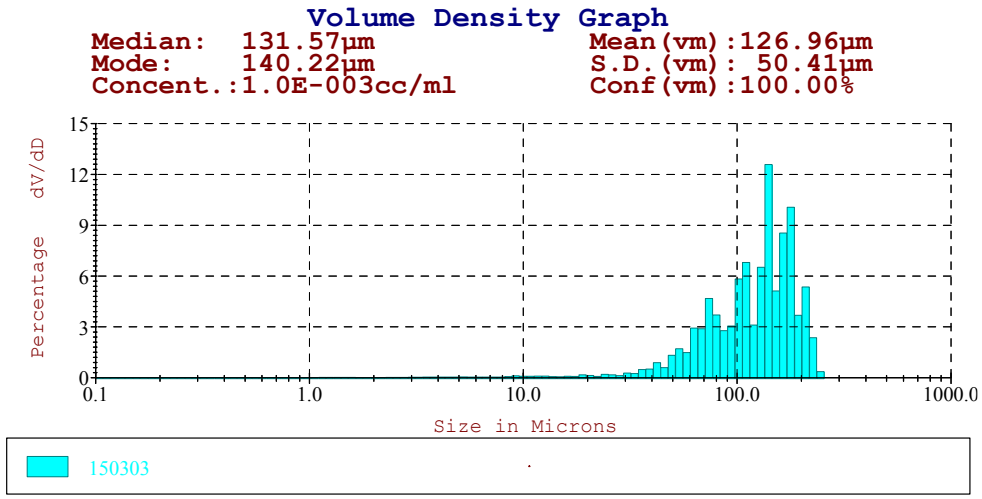
Pakuranga (U) - REP 1



REP 2



REP 3

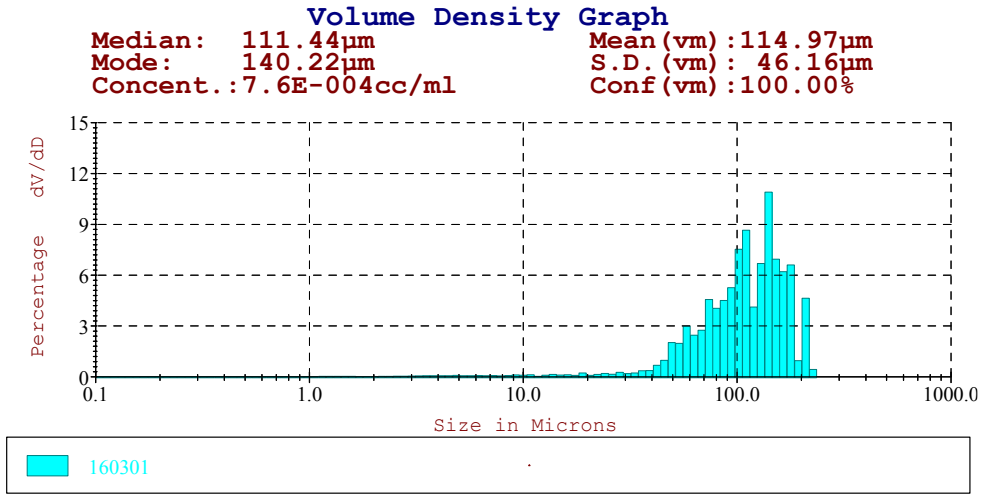


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	19.71	0.55
3.9-7.8	8.98	0.72
7.8-15.6	7.75	1.25
15.6-31.3	6.01	1.91
31.3-62.5	11.44	8.21
62.5-125.0	22.03	29.98
125.0-250.0	23.99	57.03
250.0-300.0	0.09	0.35

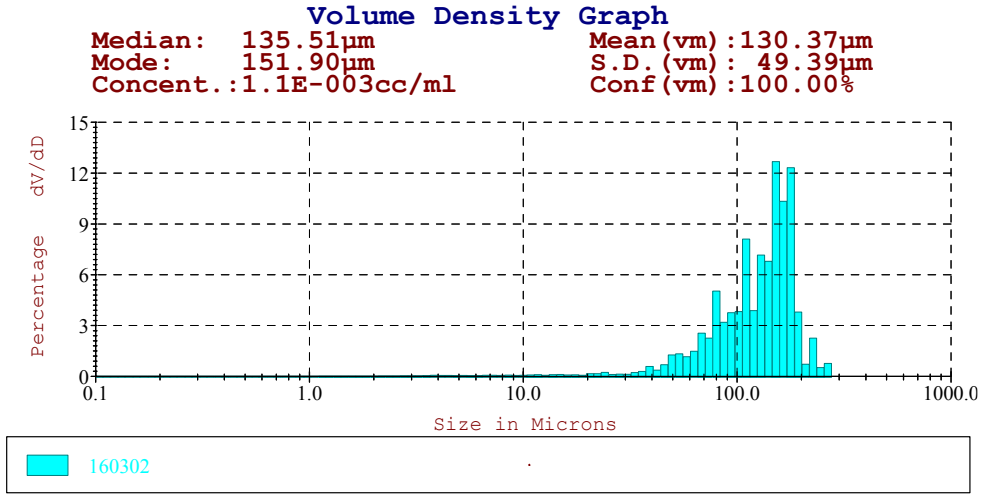
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	33.16	1.50
3.9-7.8	13.86	1.57
7.8-15.6	7.48	1.75
15.6-31.3	5.20	2.36
31.3-62.5	8.63	8.43
62.5-125.0	15.35	30.26
125.0-250.0	16.32	54.15
250.0-300.0	0.00	0.00

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	11.01	0.24
3.9-7.8	4.15	0.27
7.8-15.6	5.00	0.64
15.6-31.3	4.50	1.23
31.3-62.5	13.76	7.96
62.5-125.0	33.12	35.01
125.0-250.0	28.46	54.65
250.0-300.0	0.00	0.00

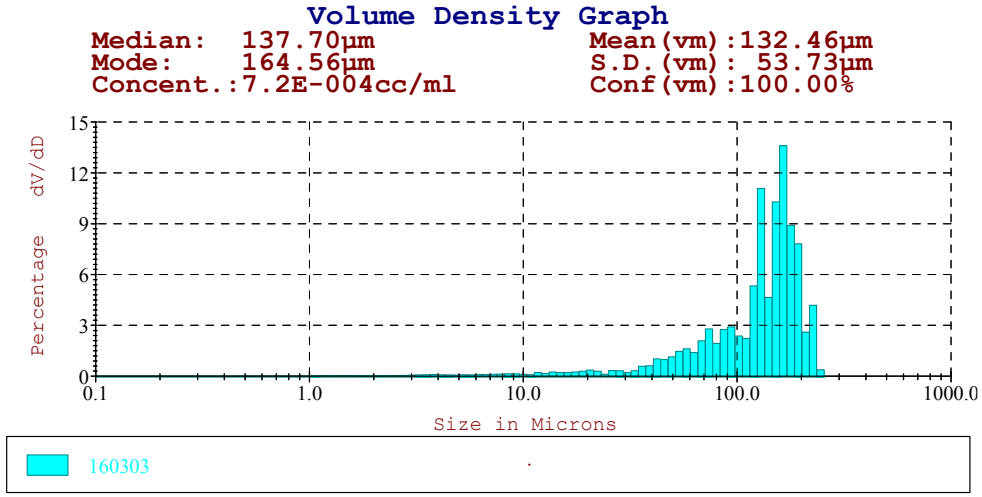
Pakuranga (L) - REP 1



REP 2



REP 3

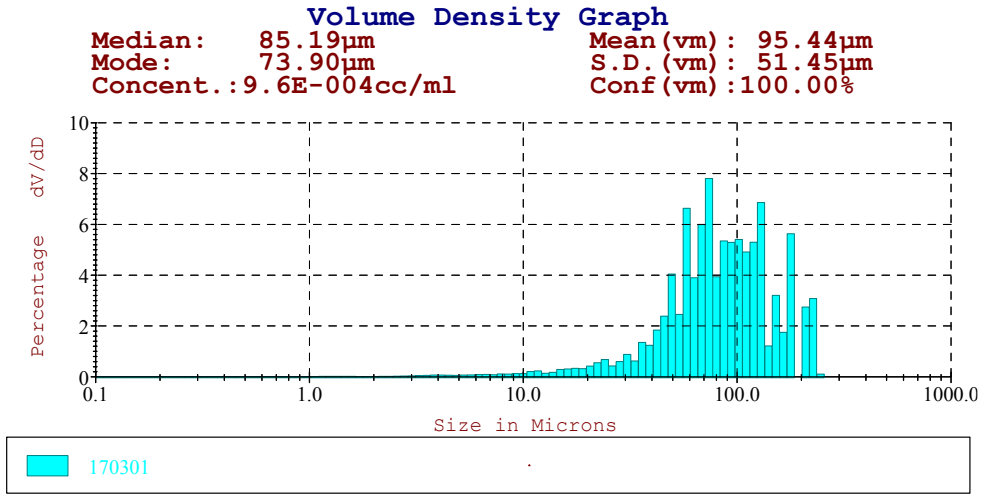


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	16.35	0.47
3.9-7.8	6.94	0.53
7.8-15.6	4.76	0.75
15.6-31.3	4.08	1.29
31.3-62.5	14.45	10.26
62.5-125.0	34.64	45.16
125.0-250.0	18.78	41.54
250.0-300.0	0.00	0.00

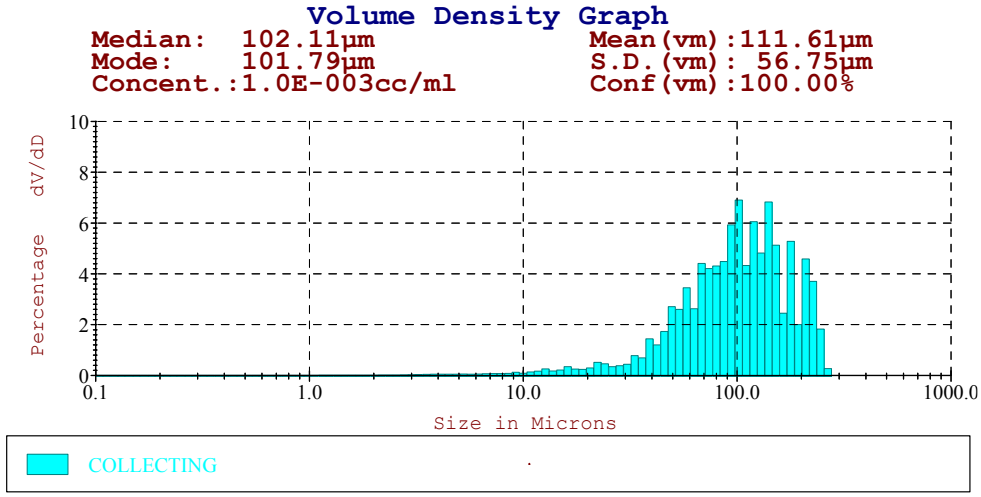
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	15.07	0.37
3.9-7.8	6.46	0.43
7.8-15.6	4.83	0.66
15.6-31.3	4.02	1.11
31.3-62.5	10.27	6.04
62.5-125.0	30.43	33.97
125.0-250.0	28.51	56.12
250.0-300.0	0.41	1.29

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	20.98	0.60
3.9-7.8	8.21	0.67
7.8-15.6	8.05	1.34
15.6-31.3	6.97	2.24
31.3-62.5	12.16	8.60
62.5-125.0	17.52	23.88
125.0-250.0	26.12	62.66
250.0-300.0	0.00	0.00

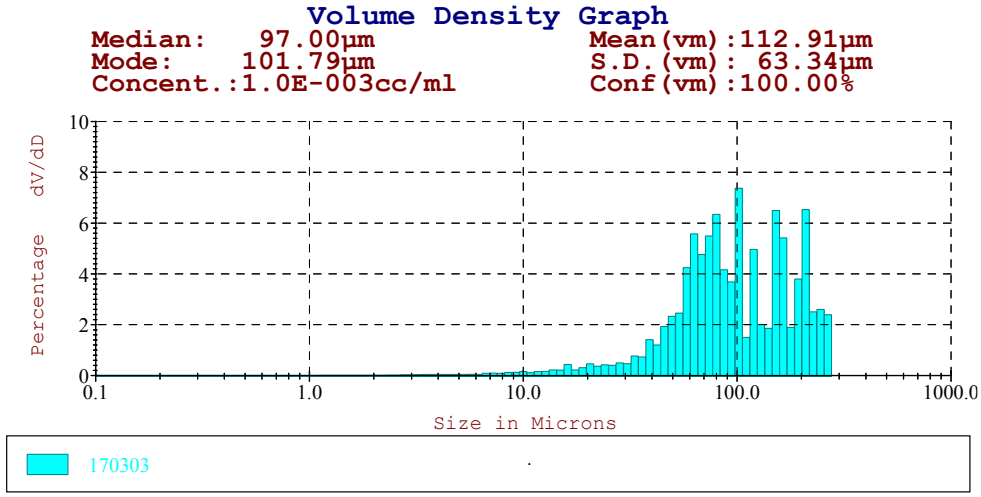
Big Muddy – REP 1



REP 2



REP 3

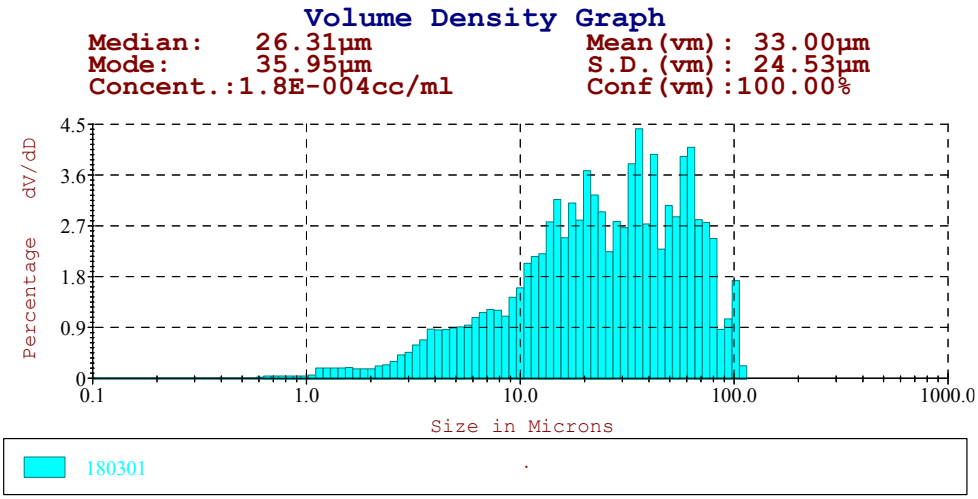


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	10.71	0.38
3.9-7.8	6.12	0.60
7.8-15.6	7.25	1.46
15.6-31.3	10.40	4.20
31.3-62.5	26.59	22.93
62.5-125.0	30.73	46.86
125.0-250.0	8.19	23.57
250.0-300.0	0.00	0.00

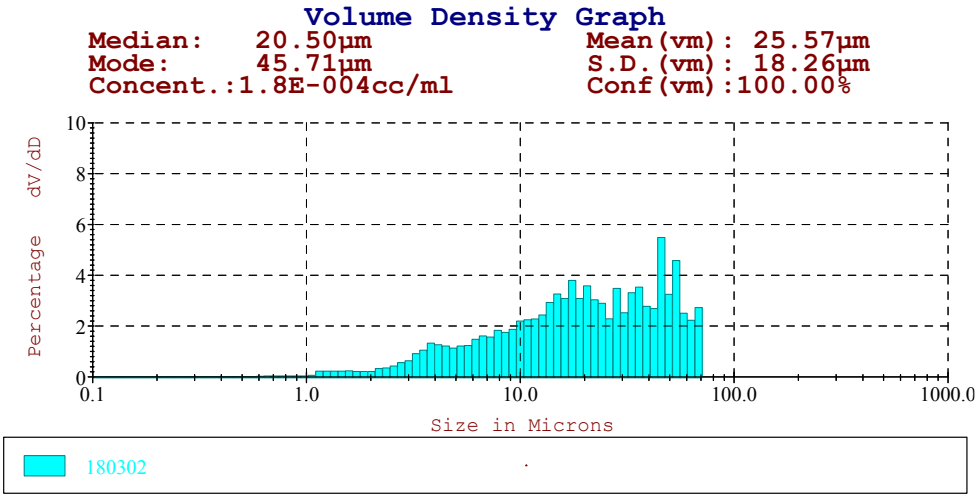
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	9.45	0.29
3.9-7.8	5.35	0.45
7.8-15.6	7.40	1.28
15.6-31.3	9.34	3.10
31.3-62.5	21.88	15.59
62.5-125.0	31.93	42.76
125.0-250.0	14.46	35.80
250.0-300.0	0.19	0.74

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	9.30	0.29
3.9-7.8	5.16	0.45
7.8-15.6	7.40	1.29
15.6-31.3	10.07	3.43
31.3-62.5	22.89	17.17
62.5-125.0	32.31	41.79
125.0-250.0	12.29	33.18
250.0-300.0	0.60	2.40

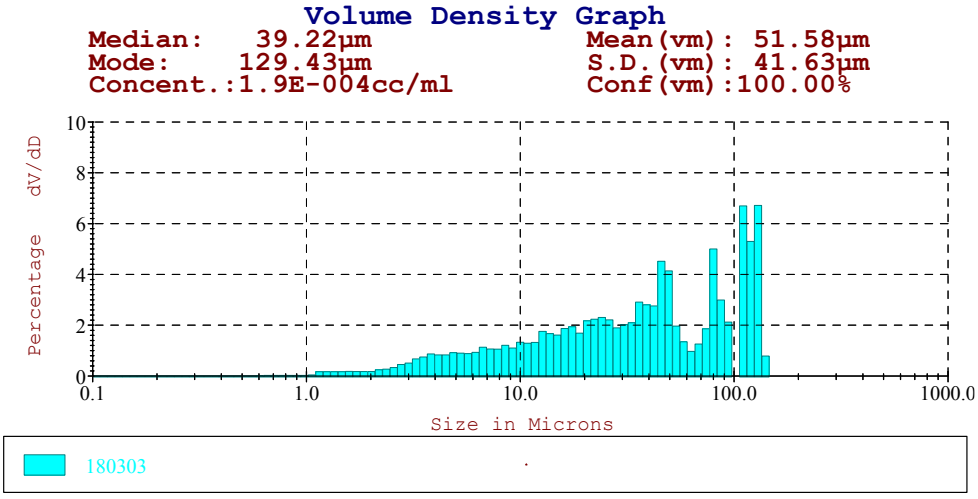
Anns – REP 1



REP 2



REP 3

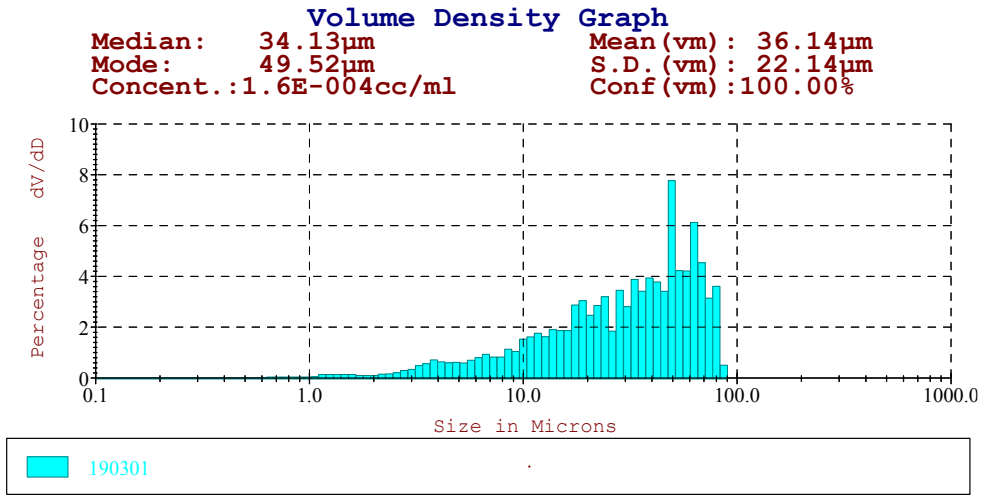


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	31.25	4.93
3.9-7.8	20.30	8.28
7.8-15.6	20.42	17.28
15.6-31.3	16.01	25.32
31.3-62.5	9.04	27.92
62.5-125.0	2.98	16.28
125.0-250.0	0.00	0.00
250.0-300.0	0.00	0.00

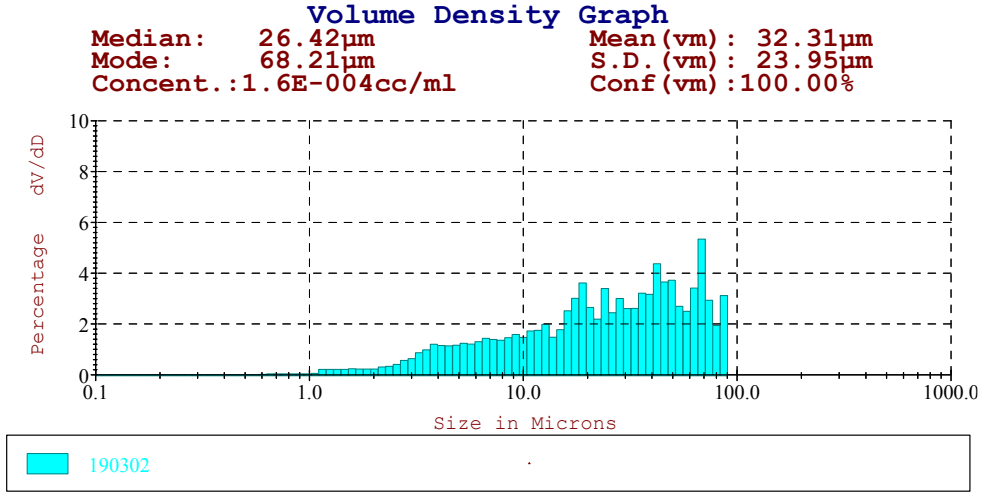
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	34.48	7.01
3.9-7.8	22.82	11.35
7.8-15.6	20.09	20.25
15.6-31.3	14.19	27.17
31.3-62.5	7.56	29.16
62.5-125.0	0.86	5.07
125.0-250.0	0.00	0.00
250.0-300.0	0.00	0.00

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	35.16	5.12
3.9-7.8	21.76	7.73
7.8-15.6	16.66	11.97
15.6-31.3	12.70	17.92
31.3-62.5	8.33	23.01
62.5-125.0	4.68	28.25
125.0-250.0	0.72	6.00
250.0-300.0	0.00	0.00

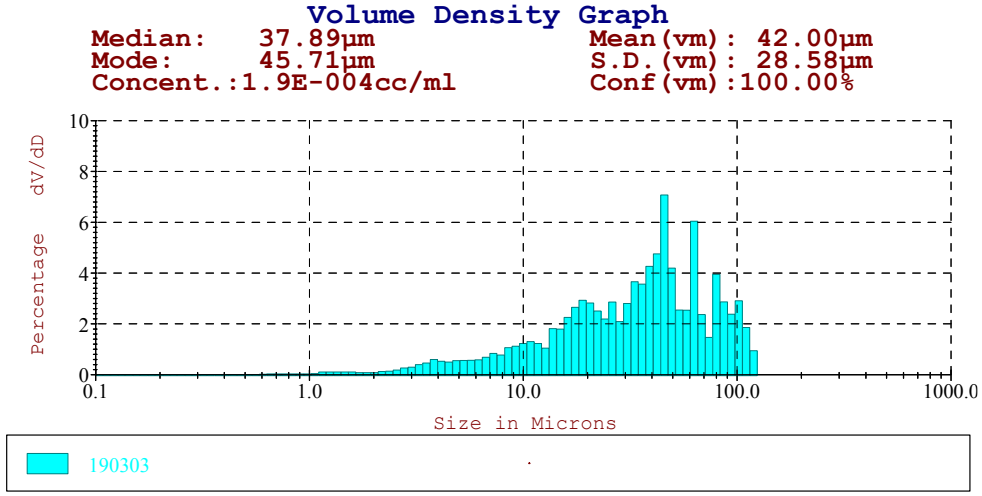
Mangere - REP 1



REP 2



REP 3

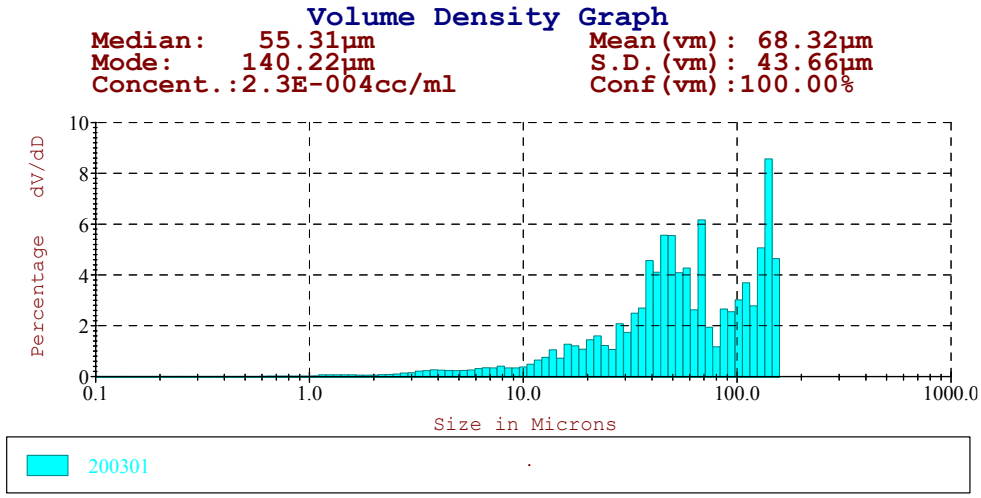


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	28.45	3.73
3.9-7.8	17.27	5.85
7.8-15.6	18.88	12.96
15.6-31.3	17.74	23.68
31.3-62.5	14.58	40.16
62.5-125.0	3.09	13.62
125.0-250.0	0.00	0.00
250.0-300.0	0.00	0.00

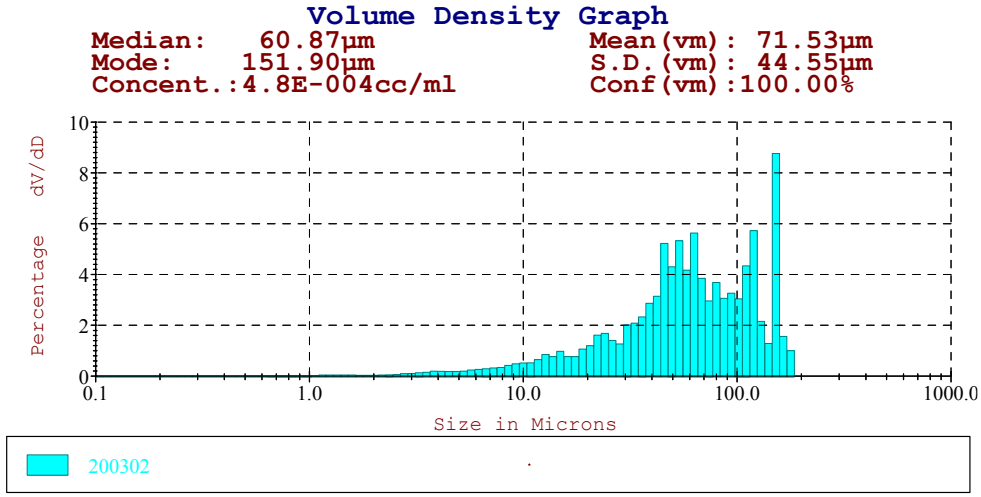
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	36.21	6.66
3.9-7.8	23.22	10.39
7.8-15.6	15.76	14.08
15.6-31.3	14.26	25.11
31.3-62.5	7.79	27.43
62.5-125.0	2.76	16.33
125.0-250.0	0.00	0.00
250.0-300.0	0.00	0.00

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	26.17	3.08
3.9-7.8	16.42	4.99
7.8-15.6	18.19	11.14
15.6-31.3	18.80	22.11
31.3-62.5	15.29	35.86
62.5-125.0	5.13	22.82
125.0-250.0	0.00	0.00
250.0-300.0	0.00	0.00

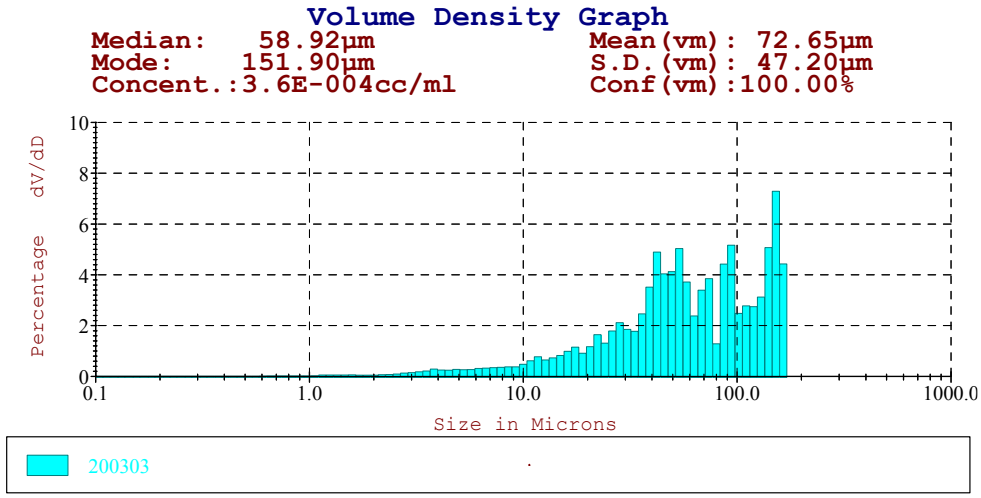
Pukaki - REP 1



REP 2



REP 3

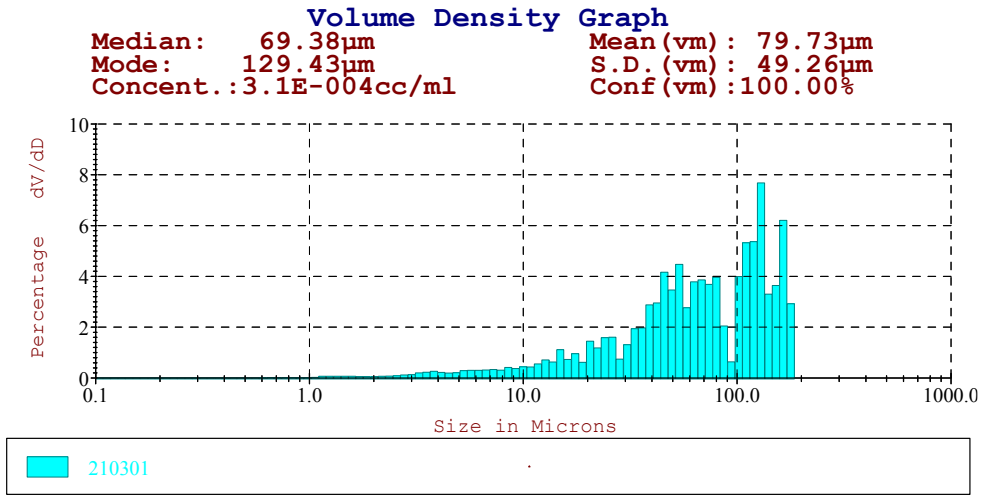


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	22.95	1.63
3.9-7.8	12.26	2.32
7.8-15.6	12.62	4.95
15.6-31.3	16.07	11.97
31.3-62.5	23.46	35.47
62.5-125.0	8.72	25.26
125.0-250.0	3.93	18.41
250.0-300.0	0.00	0.00

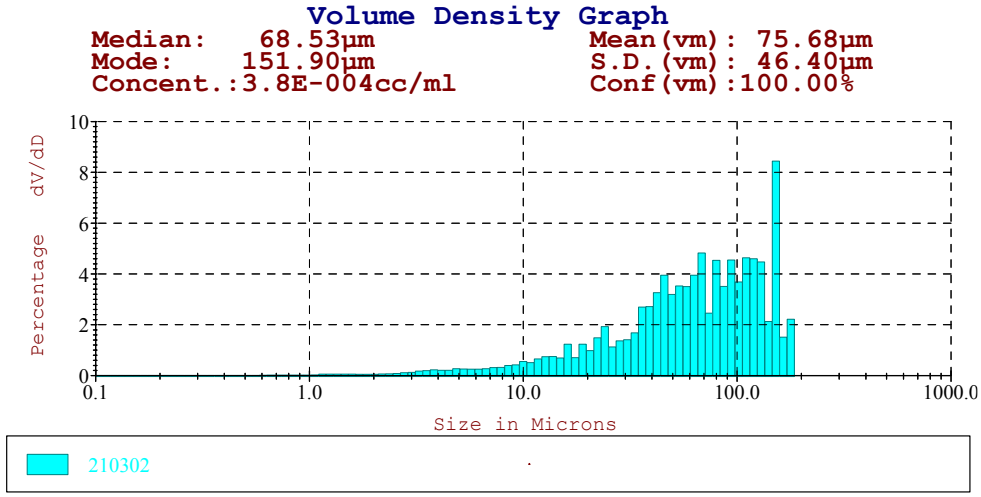
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	17.08	1.07
3.9-7.8	11.41	1.93
7.8-15.6	15.60	5.37
15.6-31.3	16.43	11.21
31.3-62.5	23.03	31.59
62.5-125.0	13.13	33.97
125.0-250.0	3.34	14.86
250.0-300.0	0.00	0.00

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	21.79	1.53
3.9-7.8	13.04	2.36
7.8-15.6	13.50	5.05
15.6-31.3	16.65	12.38
31.3-62.5	21.35	31.62
62.5-125.0	9.63	27.58
125.0-250.0	4.03	19.48
250.0-300.0	0.00	0.00

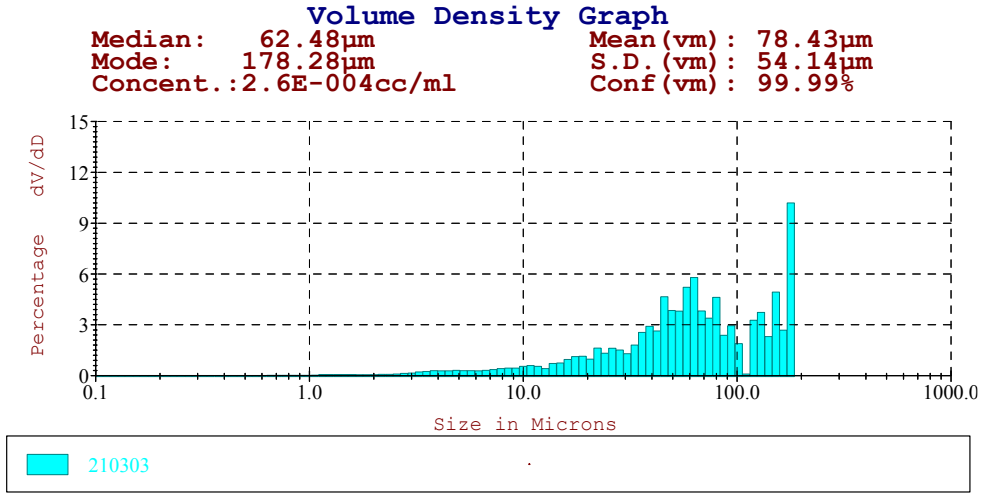
Puhinui - REP 1



REP 2



REP 3

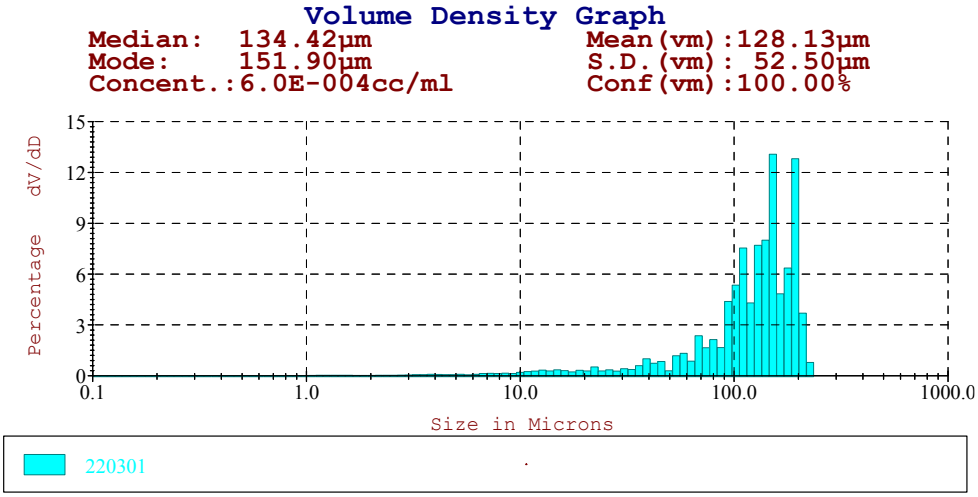


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	24.29	1.56
3.9-7.8	12.68	2.20
7.8-15.6	13.45	4.84
15.6-31.3	14.13	9.81
31.3-62.5	18.37	25.68
62.5-125.0	12.01	32.66
125.0-250.0	5.08	23.24
250.0-300.0	0.00	0.00

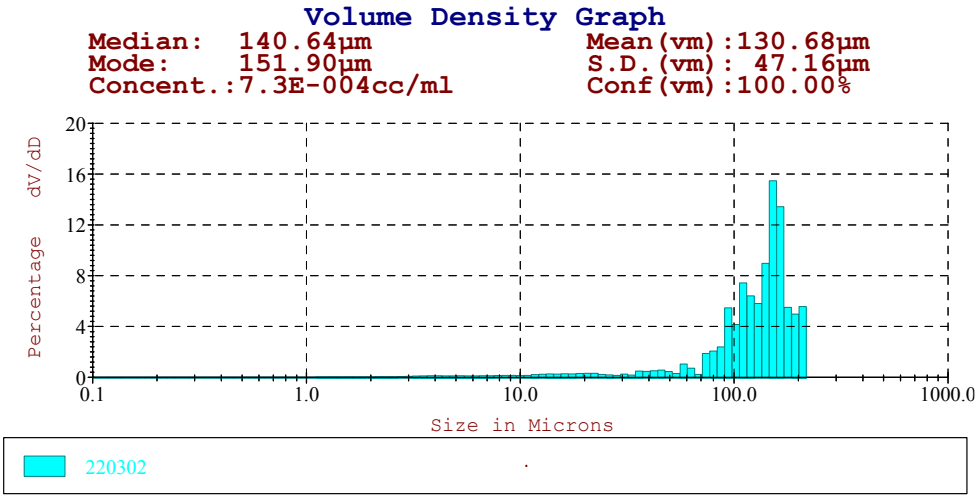
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	21.25	1.36
3.9-7.8	12.19	2.08
7.8-15.6	14.06	4.92
15.6-31.3	16.07	10.98
31.3-62.5	18.91	26.14
62.5-125.0	13.33	35.64
125.0-250.0	4.19	18.89
250.0-300.0	0.00	0.00

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	23.30	1.63
3.9-7.8	13.96	2.49
7.8-15.6	12.91	4.70
15.6-31.3	15.20	10.97
31.3-62.5	20.12	30.23
62.5-125.0	9.88	25.97
125.0-250.0	4.64	24.02
250.0-300.0	0.00	0.00

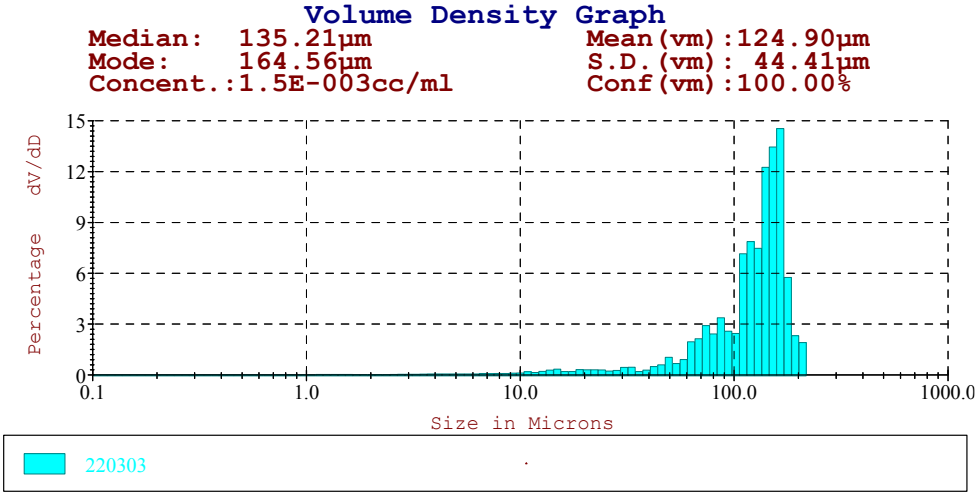
Pahurehure - REP 1



REP 2



REP 3

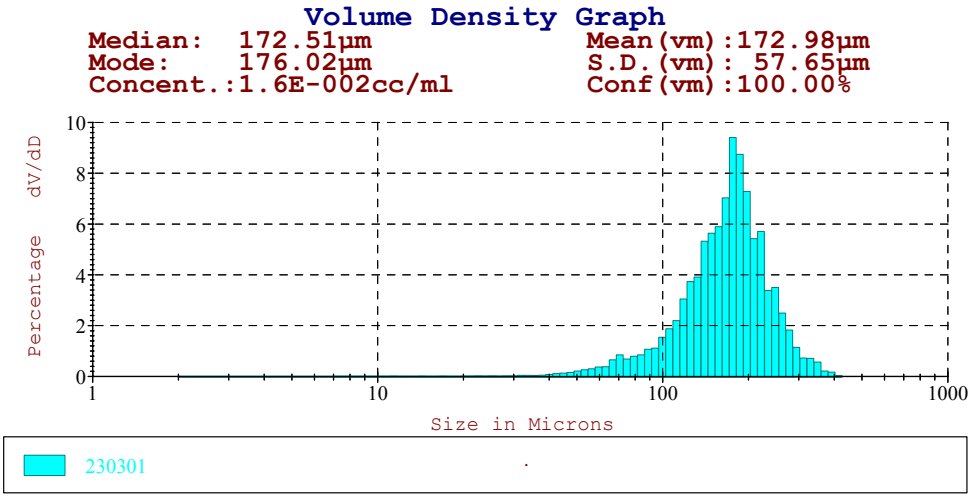


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	17.83	0.51
3.9-7.8	8.20	0.71
7.8-15.6	11.47	2.00
15.6-31.3	8.32	2.78
31.3-62.5	9.69	6.70
62.5-125.0	21.16	30.43
125.0-250.0	23.33	56.87
250.0-300.0	0.00	0.00

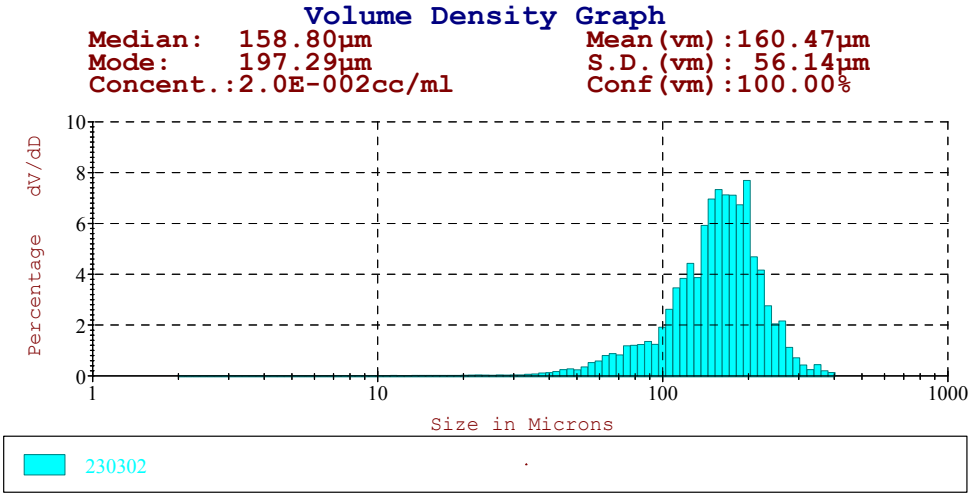
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	0.41	0.01
3.9-7.8	1.08	0.05
7.8-15.6	1.65	0.14
15.6-31.3	1.80	0.31
31.3-62.5	7.94	2.99
62.5-125.0	31.36	22.81
125.0-250.0	52.91	67.67
250.0-300.0	2.84	6.02

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	14.23	0.37
3.9-7.8	6.63	0.50
7.8-15.6	9.24	1.47
15.6-31.3	7.85	2.34
31.3-62.5	8.13	5.11
62.5-125.0	26.11	32.89
125.0-250.0	27.82	57.33
250.0-300.0	0.00	0.00

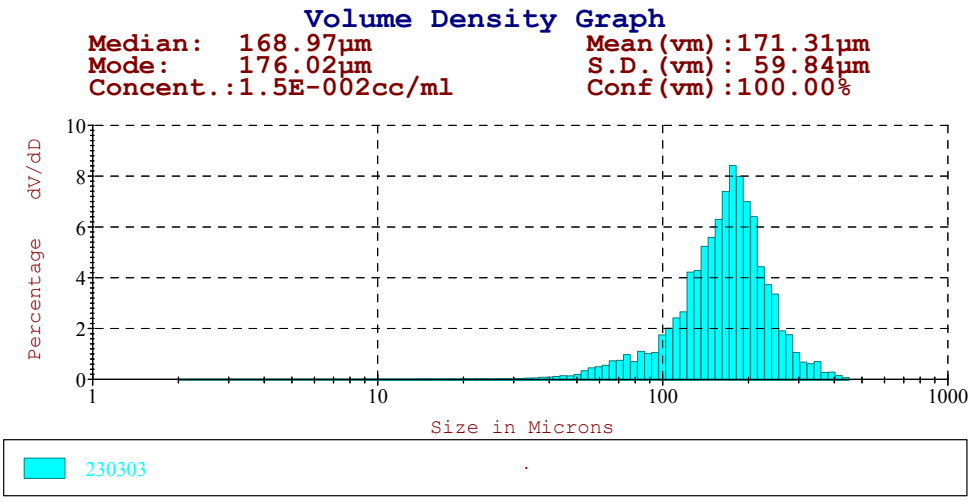
Te Matuku - REP 1



REP 2



REP 3

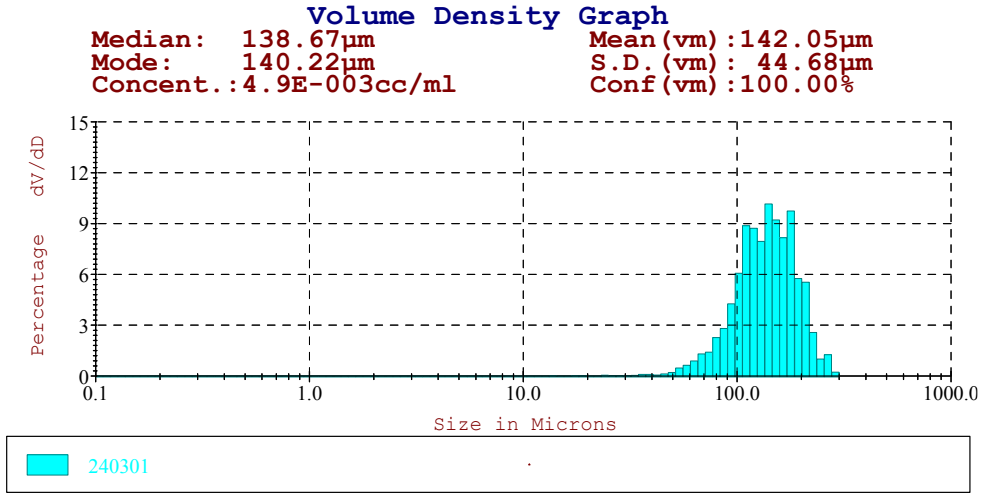


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	0.49	0.01
3.9-7.8	1.20	0.05
7.8-15.6	1.53	0.12
15.6-31.3	1.22	0.19
31.3-62.5	5.52	1.89
62.5-125.0	25.25	16.85
125.0-250.0	59.99	71.57
250.0-300.0	4.81	9.32

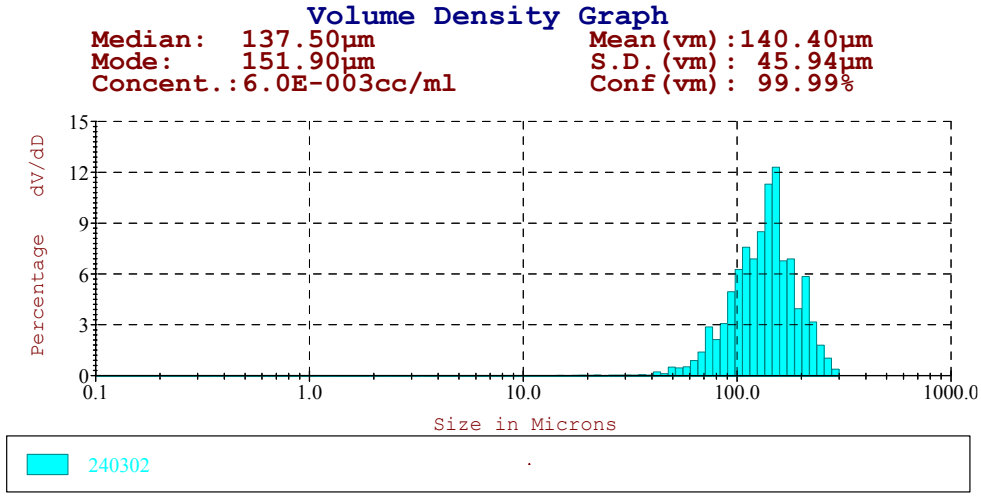
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	0.41	0.01
3.9-7.8	1.08	0.05
7.8-15.6	1.65	0.14
15.6-31.3	1.80	0.31
31.3-62.5	7.94	2.99
62.5-125.0	31.36	22.81
125.0-250.0	52.91	67.67
250.0-300.0	2.84	6.02

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	0.43	0.01
3.9-7.8	1.02	0.04
7.8-15.6	1.36	0.11
15.6-31.3	1.42	0.22
31.3-62.5	6.58	2.34
62.5-125.0	26.08	17.54
125.0-250.0	58.89	71.17
250.0-300.0	4.23	8.57

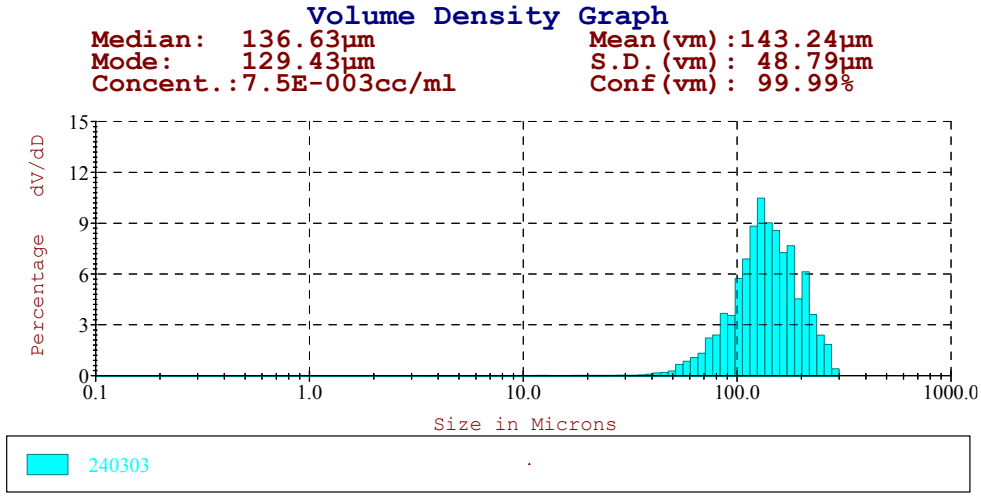
Cheltenham - REP 1



REP 2



REP 3

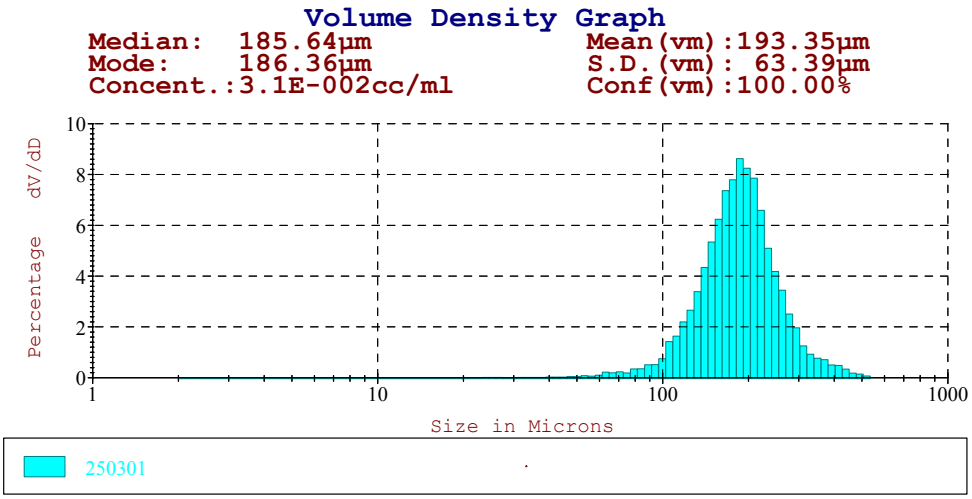


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	1.04	0.02
3.9-7.8	0.48	0.02
7.8-15.6	0.53	0.05
15.6-31.3	0.78	0.15
31.3-62.5	5.18	2.19
62.5-125.0	45.86	36.77
125.0-250.0	45.29	59.01
250.0-300.0	0.84	1.80

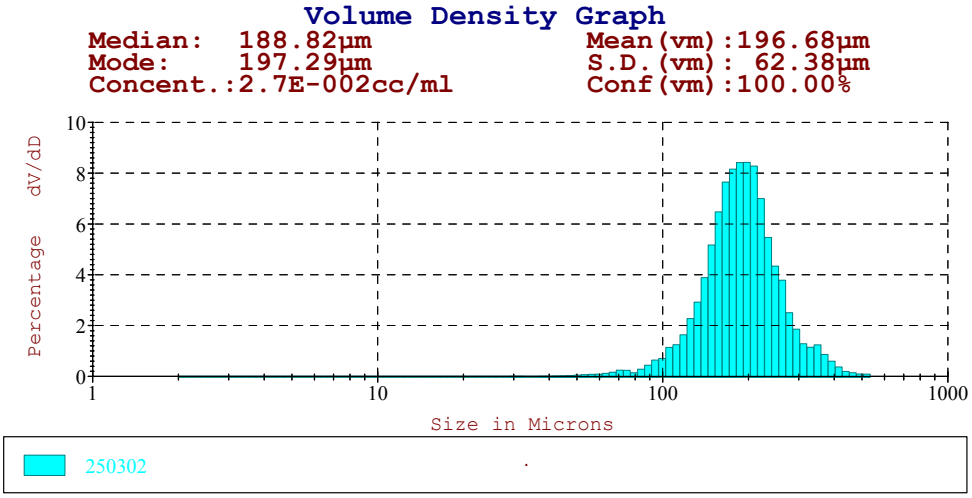
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	0.94	0.02
3.9-7.8	0.45	0.02
7.8-15.6	0.44	0.04
15.6-31.3	0.86	0.16
31.3-62.5	5.08	2.13
62.5-125.0	46.35	36.64
125.0-250.0	45.05	59.19
250.0-300.0	0.84	1.81

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	0.77	0.01
3.9-7.8	0.38	0.02
7.8-15.6	0.55	0.05
15.6-31.3	0.62	0.12
31.3-62.5	6.42	2.75
62.5-125.0	45.57	36.07
125.0-250.0	44.40	58.21
250.0-300.0	1.29	2.77

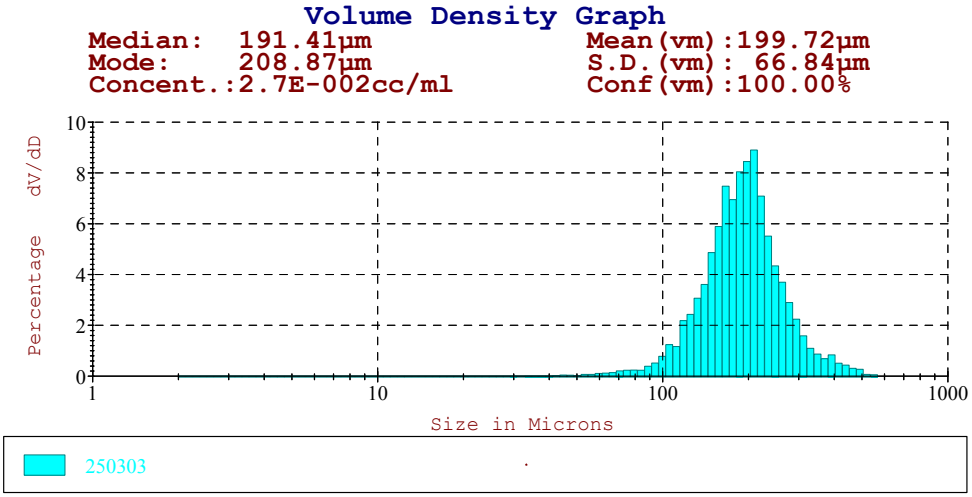
Browns Bay – REP 1



REP 2



REP 3

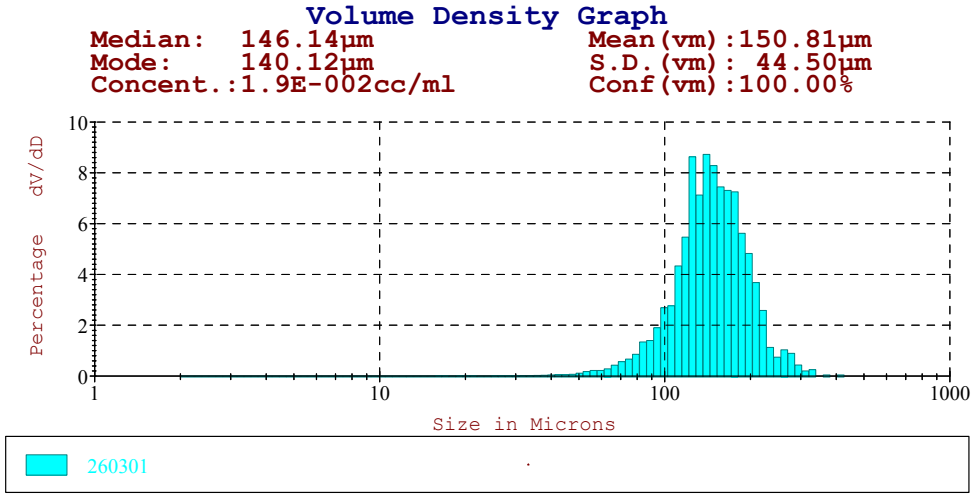


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	0.10	0.00
3.9-7.8	0.26	0.01
7.8-15.6	0.30	0.02
15.6-31.3	0.45	0.06
31.3-62.5	1.57	0.47
62.5-125.0	16.63	9.90
125.0-250.0	72.09	74.72
250.0-300.0	8.58	14.72

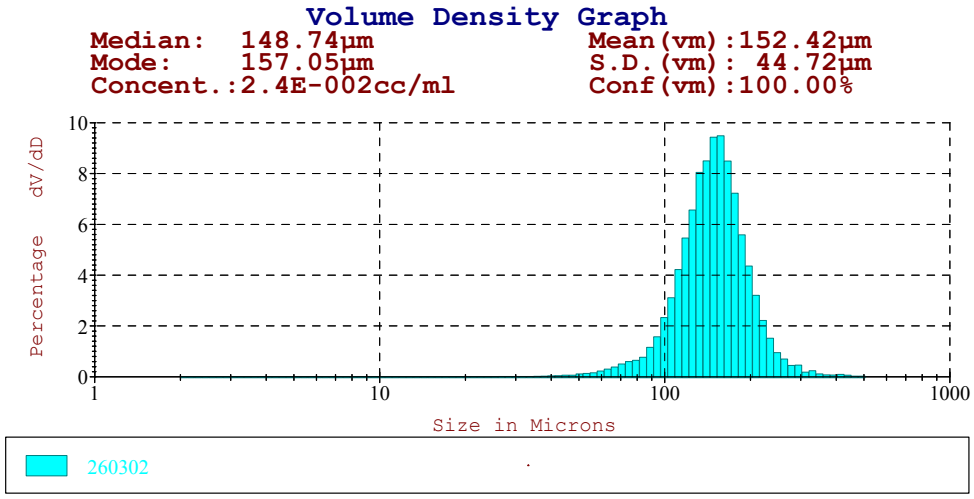
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	0.11	0.00
3.9-7.8	0.28	0.01
7.8-15.6	0.28	0.02
15.6-31.3	0.33	0.04
31.3-62.5	1.41	0.42
62.5-125.0	13.82	7.98
125.0-250.0	74.62	76.10
250.0-300.0	9.11	15.33

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	0.11	0.00
3.9-7.8	0.33	0.01
7.8-15.6	0.31	0.02
15.6-31.3	0.33	0.04
31.3-62.5	1.56	0.45
62.5-125.0	14.71	8.57
125.0-250.0	72.62	73.90
250.0-300.0	9.95	16.76

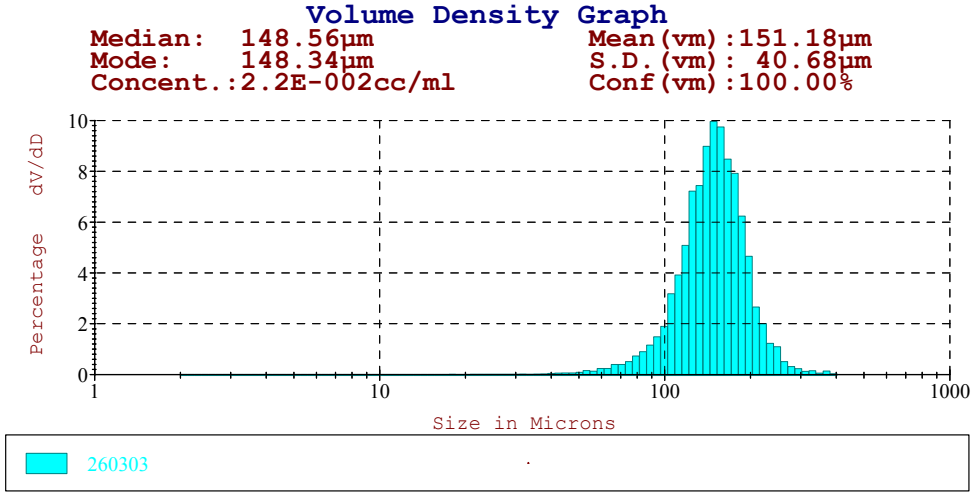
Awaruku – REP 1



REP 2



REP 3

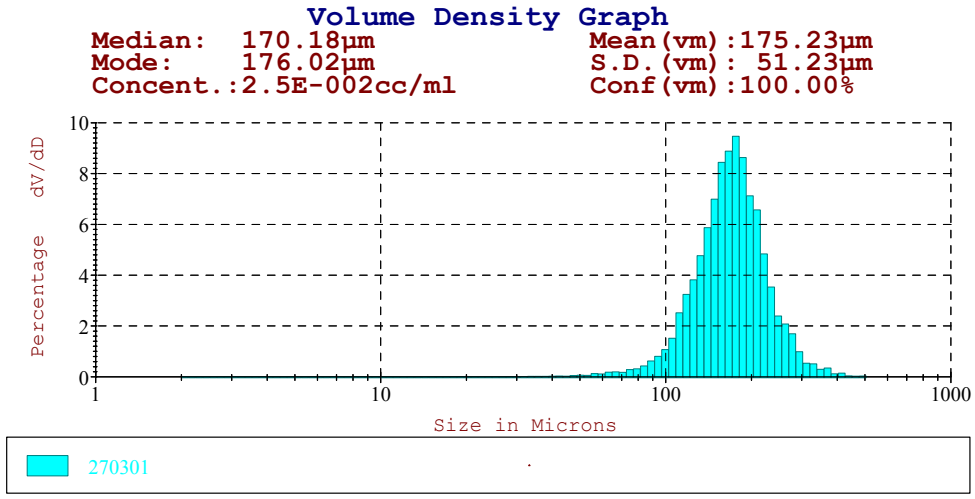


1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	0.15	0.00
3.9-7.8	0.39	0.02
7.8-15.6	0.40	0.03
15.6-31.3	0.54	0.09
31.3-62.5	2.95	1.11
62.5-125.0	35.33	26.61
125.0-250.0	58.68	68.95
250.0-500.0	1.56	3.19

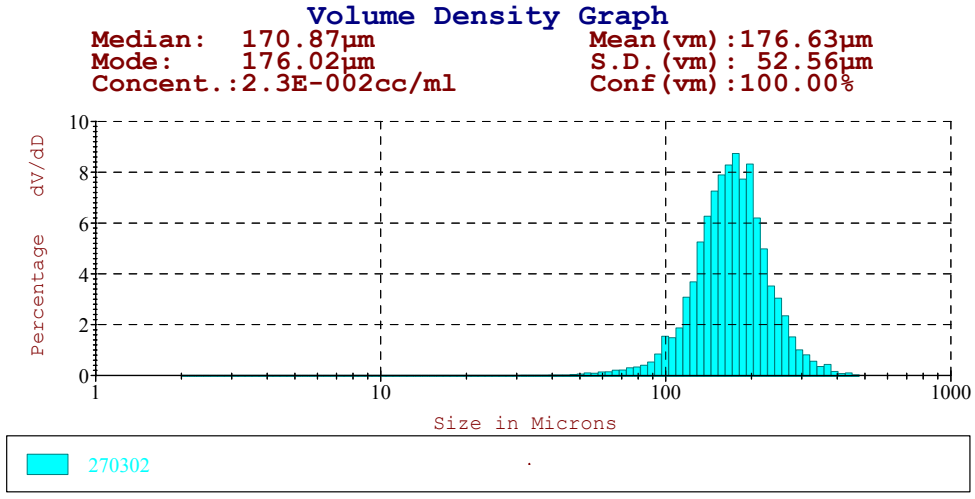
2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	0.13	0.00
3.9-7.8	0.33	0.01
7.8-15.6	0.37	0.03
15.6-31.3	0.41	0.07
31.3-62.5	2.63	0.98
62.5-125.0	32.42	24.16
125.0-250.0	62.43	72.02
250.0-500.0	1.30	2.74

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	0.13	0.00
3.9-7.8	0.30	0.01
7.8-15.6	0.33	0.03
15.6-31.3	0.53	0.09
31.3-62.5	2.67	0.99
62.5-125.0	31.06	23.21
125.0-250.0	64.13	73.90
250.0-500.0	0.87	1.78

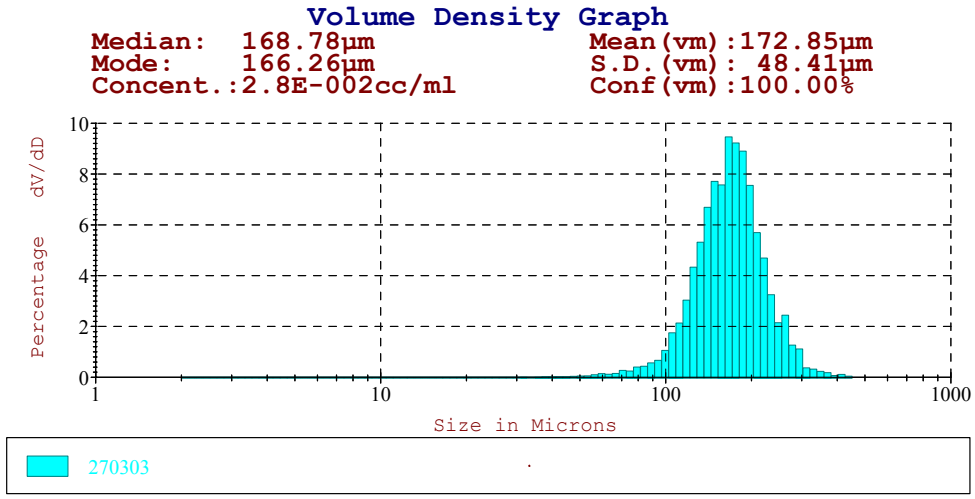
Vaughans – REP 1



REP 2



REP 3



1	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	0.09	0.00
3.9-7.8	0.22	0.01
7.8-15.6	0.23	0.02
15.6-31.3	0.28	0.04
31.3-62.5	1.79	0.58
62.5-125.0	19.76	12.92
125.0-250.0	73.43	78.87
250.0-500.0	4.20	7.56

2	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	0.12	0.00
3.9-7.8	0.24	0.01
7.8-15.6	0.23	0.02
15.6-31.3	0.26	0.04
31.3-62.5	1.70	0.56
62.5-125.0	19.45	12.59
125.0-250.0	73.44	78.59
250.0-500.0	4.56	8.20

3	Area	Volume
0 – 300 µm	Ranges	Ranges
Size fraction (µm)	Local(%)	Local(%)
0.0-3.9	0.08	0.00
3.9-7.8	0.23	0.01
7.8-15.6	0.24	0.02
15.6-31.3	0.26	0.04
31.3-62.5	1.66	0.54
62.5-125.0	19.41	12.82
125.0-250.0	74.30	79.77
250.0-500.0	3.83	6.81