

# **Appendix 1**

## **Single Site Reports**

### **Part 1**

#### **Central Waitemata Harbour**

# Explanatory notes

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This appendix provides a summary of the sediment chemistry and particle size distribution data for each monitoring site. The appendix has been divided according to “Marine Reporting Areas” (MRAs):

- Part 1: Central Waitemata Harbour
- Part 2: Upper Waitemata Harbour
- Part 3: East Coast Bays
- Part 4: Hibiscus Coast
- Part 5: Tamaki Estuary
- Part 6: Tamaki Strait
- Part 7: Manukau Harbour

The summaries are given as “Single Site Reports” (SSRs), in which the key physical and chemistry data are provided in 2 pages:

1. The first page provides a brief description of the site: its location; classification in terms of sediment and contaminant transport/accumulation – “Settling Zone” (SZ) or “Outer Zone” (OZ), as described in ARC Technical Publication TP 170 (ARC 2002); key physical characteristics; notable features and relevant monitoring information (e.g. location of nearby sites).
2. The second page gives a summary of the sediment contaminant and sediment texture data: results from each year of monitoring for Cu, Pb, Zn, “high molecular weight” PAH (HWPAAH), total organic carbon (TOC), and “mud content” (defined below). The contaminant results have been compared with sediment quality guidelines (the ARC “Environmental Response Criteria”, ERC). Indicative trends over time (see below), and a brief interpretative summary on key features of the data, have also been given.

Plots and summary statistics include all data reported to end of 2010, unless otherwise stated (e.g. occasional clear outlier removed before plotting & analysis). Where replicate analyses have been performed, data have been summarised as medians.

Trend data given in the SSRs have been determined by linear regression. The trend plots have been fitted with a quadratic curve “line of best fit” as an aid for visually assessing the nature of changes over time in the data series. Trend indicators, using “arrow” symbols, have been used to show the magnitude and direction of trends. No statistical significance associated with these trends is given (this is discussed in detail in the body of the Status and Trends Report). The trend indicators should be interpreted as follows:

- $<\pm 1\%$  per annum change probably indicates no (or very little) trend;
- $\pm 1\text{--}2\%$  per annum indicates a small, or emerging, trend. Changes of this magnitude could be largely associated with analytical and/or sampling variation, so trends in this range may not have any “real world” significance; and
- $>\pm 2\%$  indicates a stronger trend, equivalent to  $> \pm 20\%$  per decade, which is probably worth investigating further to better understand possible causes.

Mud content is given as the % of the  $<500\ \mu\text{m}$  fraction of the sediment that is  $<63\ \mu\text{m}$ . Where this has been determined by more than one method in any year, the average of the values has been used.

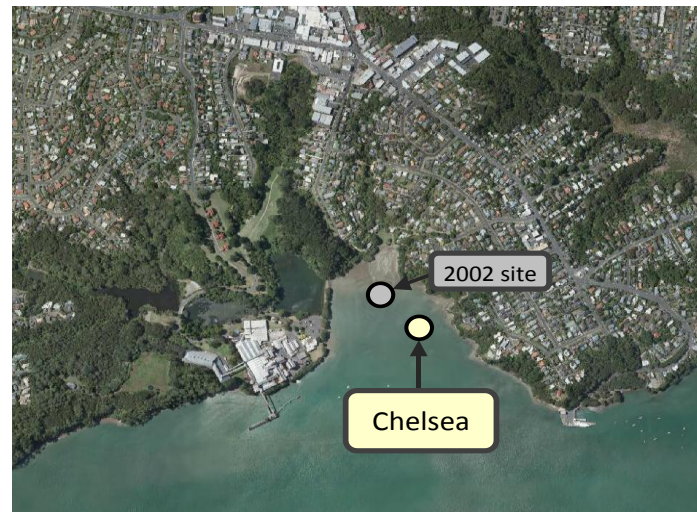
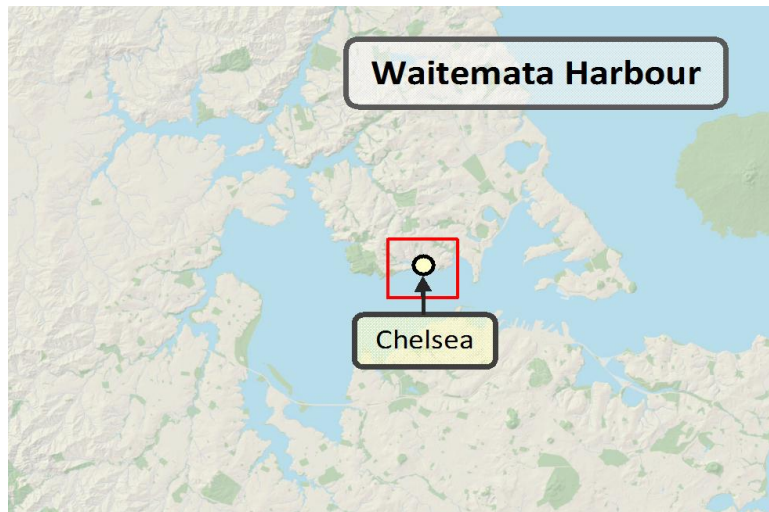
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## 1.1 Chelsea Bay

Site	Type	Description & Notes
Chelsea	Sandy OZ	
Reporting Area	Land Use	The catchment is urban (residential & commercial) and includes Chelsea Sugar Refinery (on western point). Possible historical industry inputs. The sediment here is sandy.
Central Waitemata Harbour	Urban	

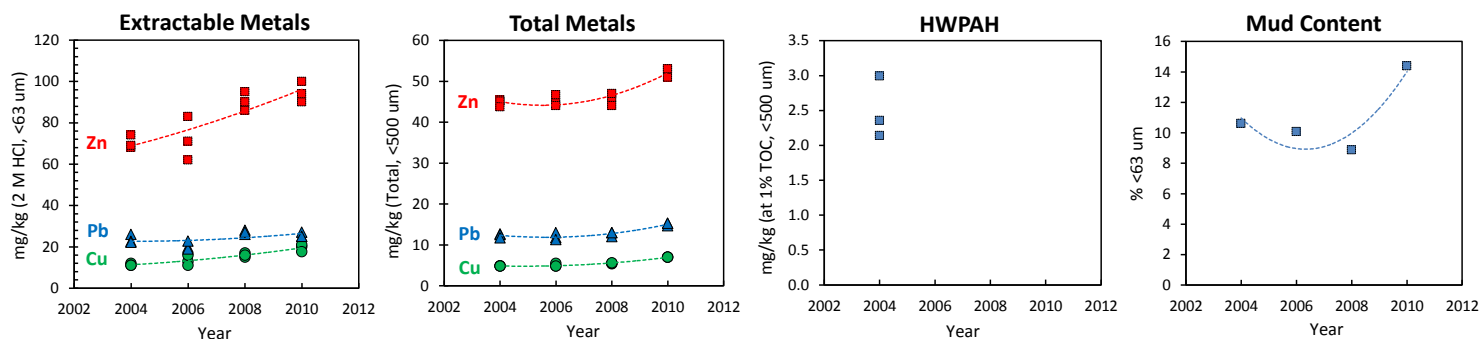


### Additional Notes

Aerial shows location of RDP (2004 to 2010) monitoring site and approximate location of 2002 monitoring site ca. 150 m further inside bay than the 2004-2010 RDP site.

Site	Description	ERC Status	Trends & Comments
Chelsea	Sandy OZ site. Urban catchment. Possible historical industrial inputs (PAH high).	<div style="display: flex; flex-wrap: wrap;"> <div style="background-color: #FFD700; padding: 5px; margin: 2px;">Cu</div> <div style="background-color: #90EE90; padding: 5px; margin: 2px;">Pb</div> <div style="background-color: #90EE90; padding: 5px; margin: 2px;">Zn</div> <div style="background-color: #FF0000; padding: 5px; margin: 2px;">PAH</div> </div>	6 year monitoring period. 2002 data not included as comparability uncertain. Current contaminant status - ERC Green/Amber (metals). PAH ERC-Red due to moderate levels & low TOC content of sandy sediment. Metals trending up over time? Muddier in 2010?
Reporting Area			
Central Waitemata Harbour			

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% , <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2004	10.6	0.27	11.0	22.6	69	4.8	12.5	45	0.578	2.356
2006	10.1	no data	13.0	19.8	71	4.8	11.8	45	no data	no data
2008	8.9	no data	16.0	27.0	90	5.5	13.0	46	no data	no data
2010	14.4	no data	20.0	25.0	94	7.0	15.3	53	no data	no data
Median	10.3	0.27	15.5	25.0	85	5.5	12.9	46	0.578	2.356
Trend (absolute units per year)	0.5	no value	1.4	0.6	4.6	0.3	0.5	1.2	no value	no value
Trend (% of median per year)	↑ 4.9	no value	↑ 8.8	↑ 2.6	↑ 5.4	↑ 6.4	↑ 3.5	↑ 2.6	no value	no value

**Environmental Response Criteria (ERC)**

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction data .

**Trend Indicators**

⇒ < ±1%

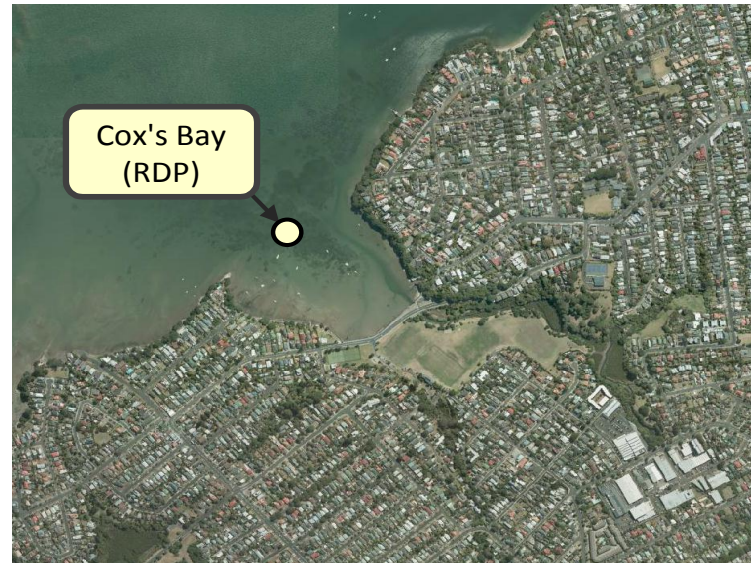
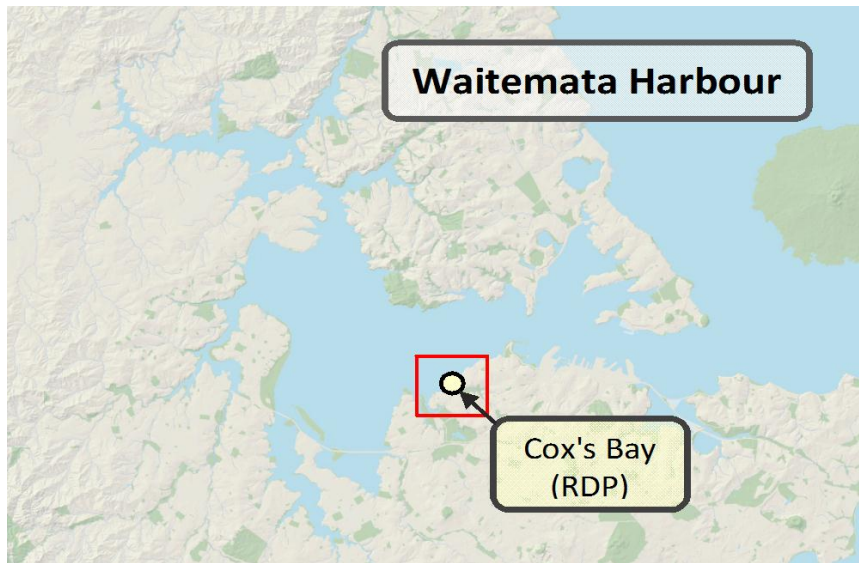
↗ ↘ ±1 - 2%

↑ ↓ > ±2%

Average annual rate of change, as % of median per year

## 1.2 Cox's Bay

Site	Type	Description & Notes
Cox's Bay	Sandy OZ	
Reporting Area	Land Use	The catchment is mature urban. Historical sewage overflow issues. The sediment here is sandy, with extensive (and increasing?) sea grass patches.
Central Waitemata Harbour	Urban	

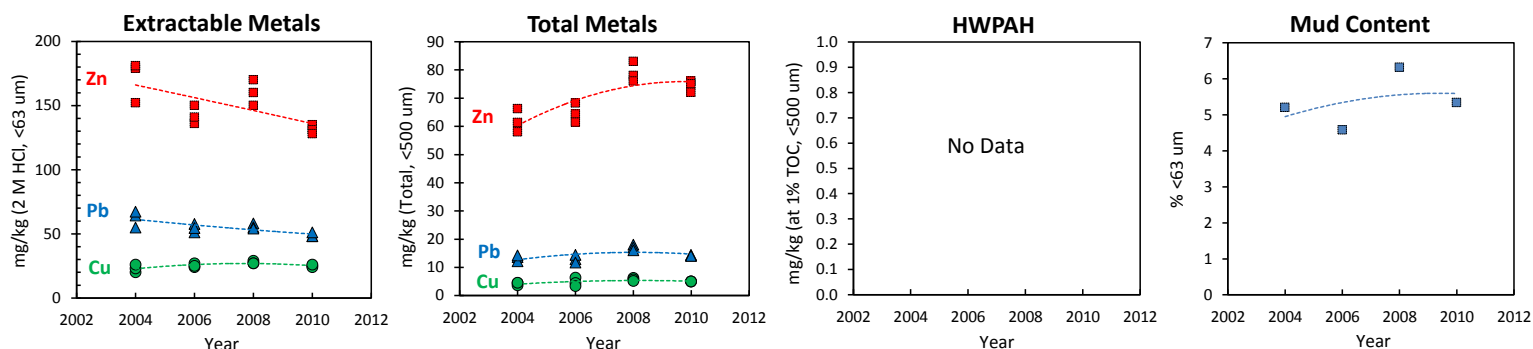


### Additional Notes

Also sampled in 2002 (NIWA for ACC/Metrowater) at a site approximately 100 m west of the RDP site. "Cox's Inner", approximately 250 m upstream towards the road, was also sampled once in 2005.

Site	Description	ERC Status	Trends & Comments
Cox's Bay	Sandy OZ site. Old residential catchment. Sea grass patches increasing?	<div style="display: flex; flex-wrap: wrap;"> <div style="background-color: #FFD700; padding: 5px; margin: 2px;">Cu</div> <div style="background-color: #FFD700; padding: 5px; margin: 2px;">Pb</div> <div style="background-color: #FFD700; padding: 5px; margin: 2px;">Zn</div> <div style="background-color: #D3D3D3; padding: 5px; margin: 2px;">PAH</div> </div>	6 year monitoring period. Current contaminant status - ERC Amber. No PAH data to date. Metals (extractable Pb & Zn) may be trending down over time. Total metals' variations may be due to changes in texture (sea grass trapping fine sediment?).
Reporting Area			
Central Waitemata Harbour			

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2004	5.2	no data	23.0	64.3	179	4.4	13.6	61	no data	no data
2006	4.6	no data	25.0	54.4	141	4.4	12.9	64	no data	no data
2008	6.3	no data	27.0	55.0	160	5.7	17.0	78	no data	no data
2010	5.3	no data	25.0	48.0	131	5.0	14.1	75	no data	no data
Median	5.3	no data	25.5	54.6	150	5.0	14.2	70	no data	no data
Trend (absolute units per year)	0.1	no value	0.4	-1.9	-5.0	0.2	0.3	2.6	no value	no value
Trend (% of median per year)	↑ 2.0	no value	↔ 1.6	↓ -3.5	↓ -3.3	↑ 3.5	↑ 2.3	↑ 3.7	no value	no value

**Environmental Response Criteria (ERC)**

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19-34 Pb 30-50 Zn 124-150 PAH 0.66-1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction data.

**Trend Indicators**

↔ < ±1%

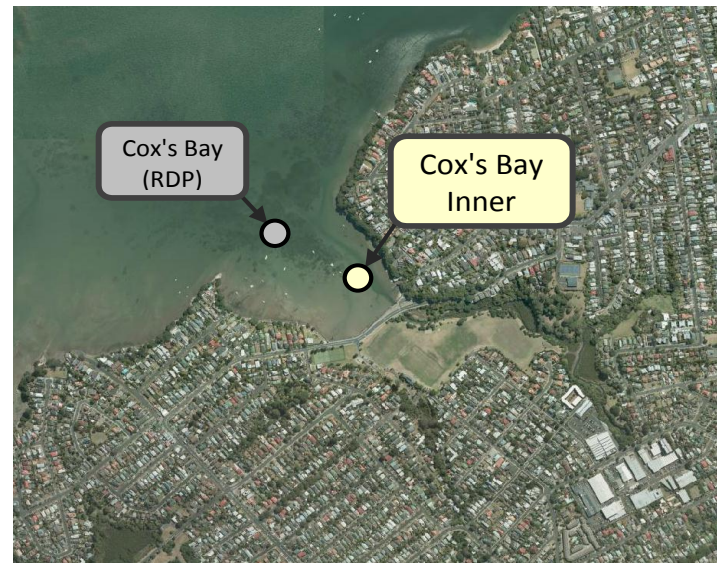
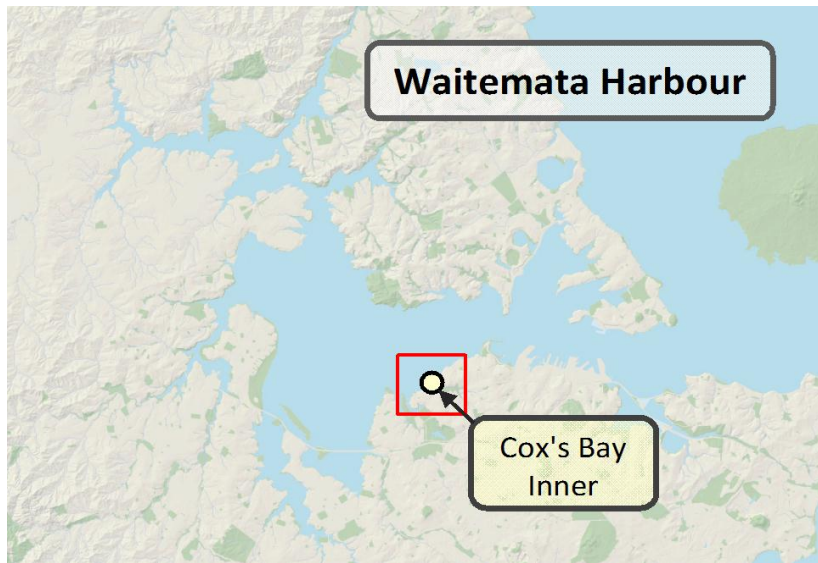
↕ ± 1 - 2%

↕ > ±2%

Average annual rate of change, as % of median per year

### 1.3 Cox's Bay Inner

Site	Type	Description & Notes
Cox's Bay Inner	Sandy OZ (?)	
Reporting Area	Land Use	The catchment is mature urban. Historical sewage overflow issues. The sediment here is sandy, with extensive (and increasing?) sea grass patches.
Central Waitemata Harbour	Urban	



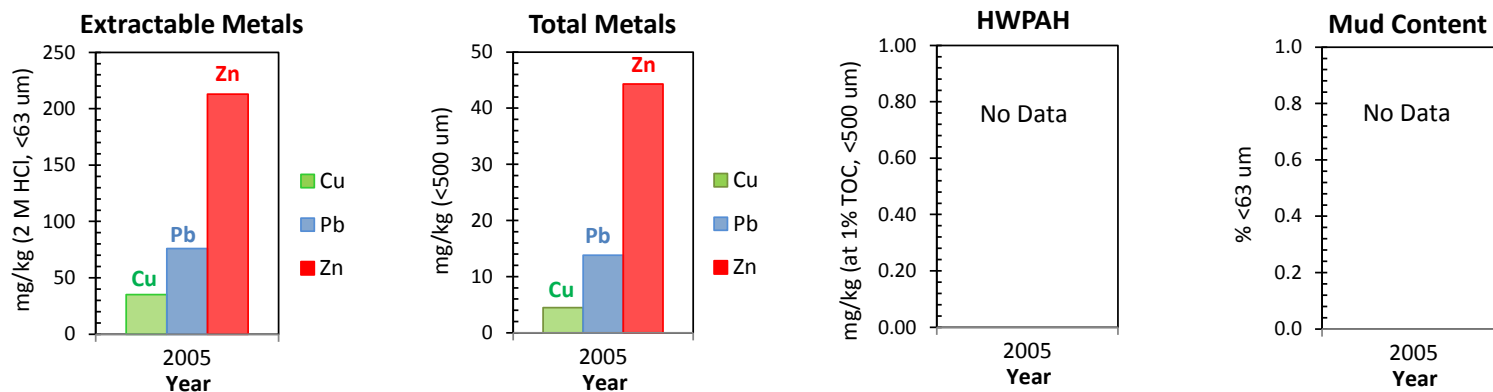
#### Additional Notes

Cox's Bay also sampled in 2002 (NIWA for ACC/Metrowater) at a site approximately 100 m west of the RDP site. "Cox's Inner", approximately 250 m upstream towards the road, was also sampled once in 2005.



Site	Description	ERC Status	Trends & Comments
Coxs Bay Inner	Sandy site, inshore from Coxs Bay RDP site. Mature urban catchment.	<div style="display: flex; flex-wrap: wrap;"> <div style="border: 1px solid red; padding: 2px; margin: 2px;">Cu</div> <div style="border: 1px solid red; padding: 2px; margin: 2px;">Pb</div> <div style="border: 1px solid red; padding: 2px; margin: 2px;">Zn</div> <div style="border: 1px solid gray; padding: 2px; margin: 2px;">PAH</div> </div>	1 year of monitoring only. Not sampled since 2005. No trends can therefore be assessed. Current contaminant status ERC-Red. High metal's concentrations in mud fraction, but low in total sediment because of sandy texture. Assess status from mud fraction data.
Reporting Area			
Central Waitemata Harbour			

### Sediment chemistry summary



### Annual median concentrations. Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2005	no data	no data	35.0	76.1	213	4.5	13.8	44	no data	no data
Trend (absolute units per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value
Trend (% of median per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value

### Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

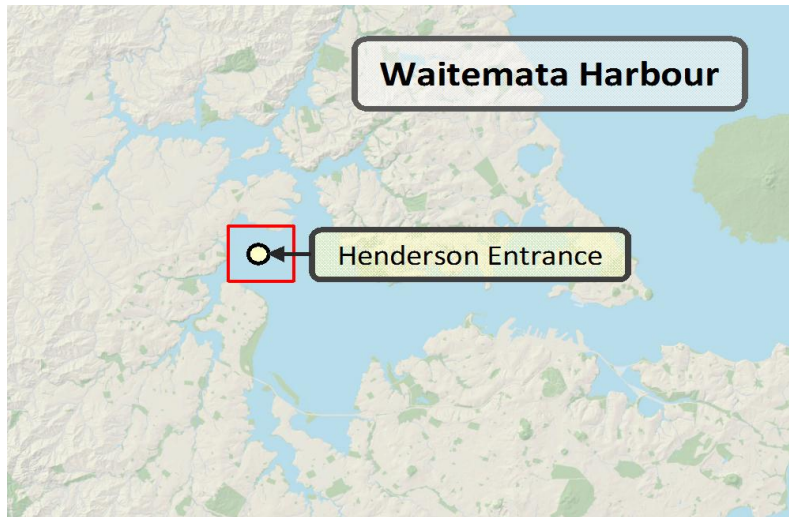
Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fractions. Settling Zones - the <500 µm fraction data

### 1.4 Henderson Entrance

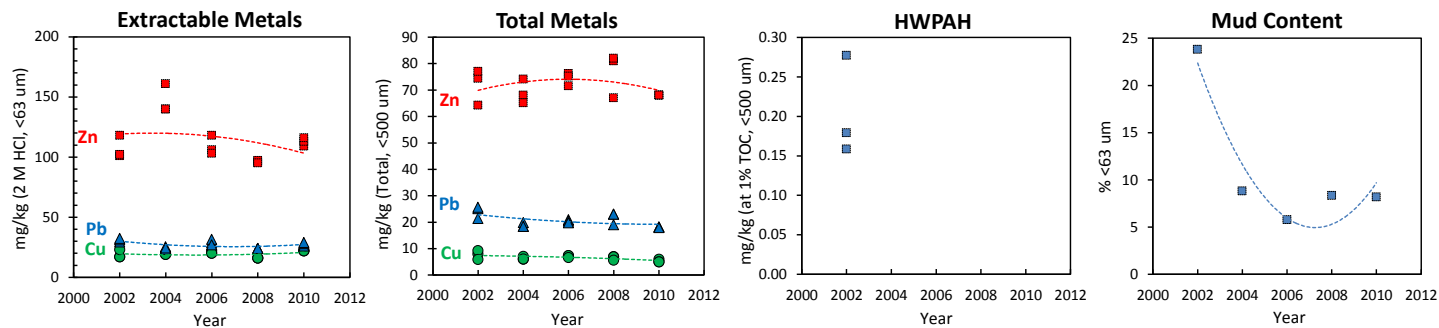
Site	Type	Description & Notes
Henderson Entrance	Sandy OZ	
Reporting Area	Land Use	Large mixed land use catchment with long history of intensive horticulture & mixed residential/commercial urbanisation. Historical horticultural pesticide inputs likely. The monitoring site is a large exposed sand flat.
Central Waitemata Harbour	Urban	



**Additional Notes**

Site	Description	ERC Status	Trends & Comments
Henderson Entrance	Sandy OZ site. Extensive exposed sand flat in central harbour. Large mixed land use catchment.	<div style="display: flex; flex-wrap: wrap;"> <div style="margin: 2px;">Cu</div> <div style="margin: 2px;">Pb</div> <div style="margin: 2px;">Zn</div> <div style="margin: 2px;">PAH</div> </div>	8 year monitoring period. Current contaminant status - ERC Amber/Green. No major change in metals over time (extractable Zn in 2004 unusually high - reason unknown). High mud content value in 2002 seems far too high compared with 2004-2010.
Reporting Area			
Central Waitemata Harbour			

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2002	23.8	0.67	17.0	31.1	102	8.0	25.1	74	0.120	0.179
2004	8.8	no data	19.0	24.3	140	6.1	18.4	68	no data	no data
2006	5.8	no data	20.0	28.9	106	7.3	20.4	75	no data	no data
2008	8.4	no data	16.0	24.0	96	6.9	23.0	81	no data	no data
2010	8.2	no data	22.0	28.0	113	5.0	18.1	68	no data	no data
Median	8.4	0.67	20.0	27.0	109	6.6	19.8	72	0.120	0.179
Trend (absolute units per year)	-1.6	no value	0.1	-0.3	-2.0	-0.2	-0.5	0.0	no value	no value
Trend (% of median per year)	↓ -19.0	no value	→ 0.7	↘ -1.3	↘ -1.8	↓ -3.5	↓ -2.3	→ 0.0	no value	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66      Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7      Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction data.

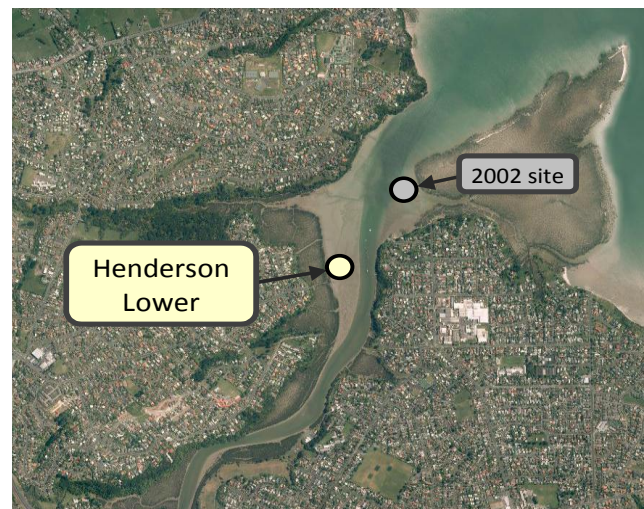
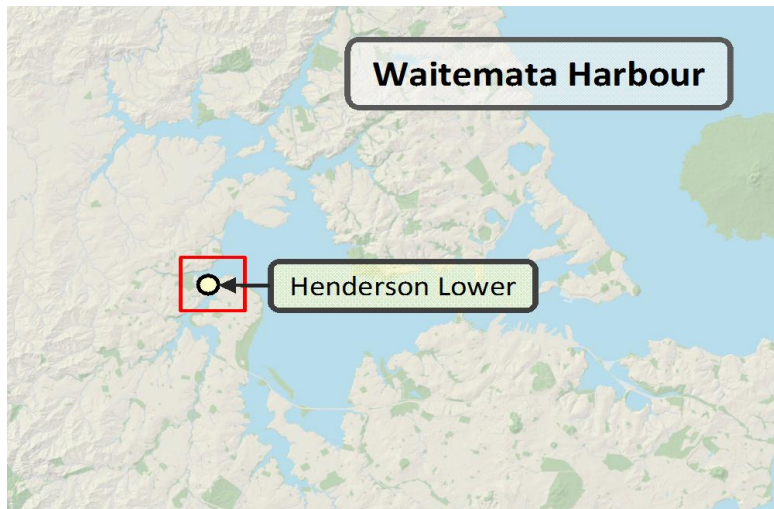
Trend Indicators

⇒ < ±1%      ↘ ↗ ±1 - 2%      ↑ ↓ > ±2%

Average annual rate of change, as % of median per year

## 1.5 Henderson Lower

Site	Type	Description & Notes
Henderson Lower	Muddy SZ	
Reporting Area	Land Use	Large mixed land use catchment with long history of intensive horticulture & mixed residential/commercial urbanisation. Historical horticultural pesticide inputs likely. The monitoring site is deep mud.
Central Waitemata Harbour	Urban	

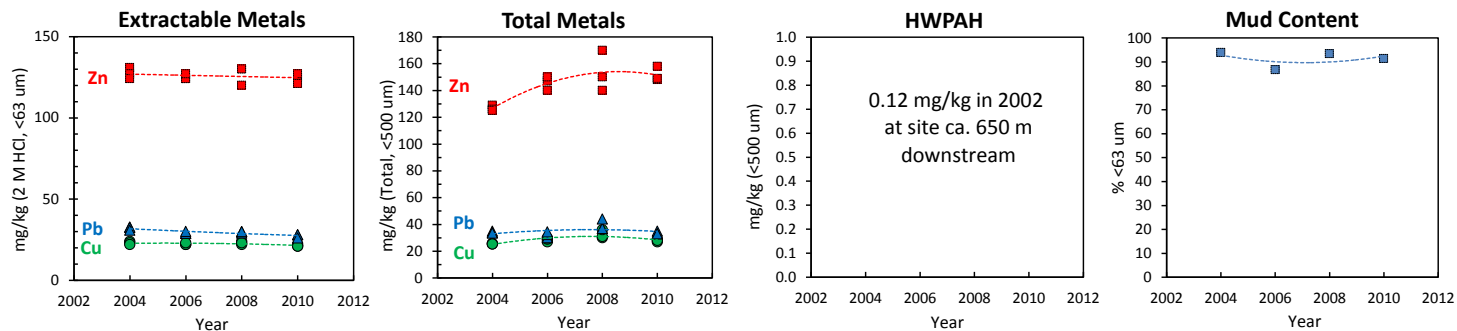


### Additional Notes

Approximate location of 2002 monitoring site shown above - about 650 m downstream of later (2004 onwards) RDP site.

Site	Description	ERC Status	Trends & Comments
Henderson Lower Reporting Area Central Waitemata Harbour	Muddy SZ site. Large mixed land use catchment.	<div style="display: flex; flex-wrap: wrap;"> <div style="background-color: #FFD700; padding: 5px; margin: 2px;">Cu</div> <div style="background-color: #FFD700; padding: 5px; margin: 2px;">Pb</div> <div style="background-color: #FFD700; padding: 5px; margin: 2px;">Zn</div> <div style="background-color: #90EE90; padding: 5px; margin: 2px;">PAH</div> </div>	6 year monitoring period (2002 data not included because site location different). Current contaminant status - ERC Amber. PAH measured in 2002 from site 650 m downstream (ERC-Green). No major changes in metals (extractable) over time. Slow decline in Pb?

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWP/PAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2004	93.9	no data	23.0	32.5	127	25.4	33.9	126	no data	no data
2006	86.7	no data	22.0	28.9	124	28.9	32.4	147	no data	no data
2008	93.4	no data	23.0	30.0	130	31.0	37.0	150	no data	no data
2010	91.3	no data	21.0	28.0	125	28.0	33.0	149	no data	no data
Median	92.4	no data	22.0	29.5	126	28.5	34.2	148	no data	no data
Trend (absolute units per year)	-0.1	no value	-0.2	-0.7	-0.4	0.6	0.3	4.1	no value	no value
Trend (% of median per year)	⇒ -0.1	no value	⇒ -1.0	⇓ -2.3	⇒ -0.3	⇧ 2.0	⇒ 0.8	⇧ 2.8	no value	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction data.

Trend Indicators

⇒ < ±1%

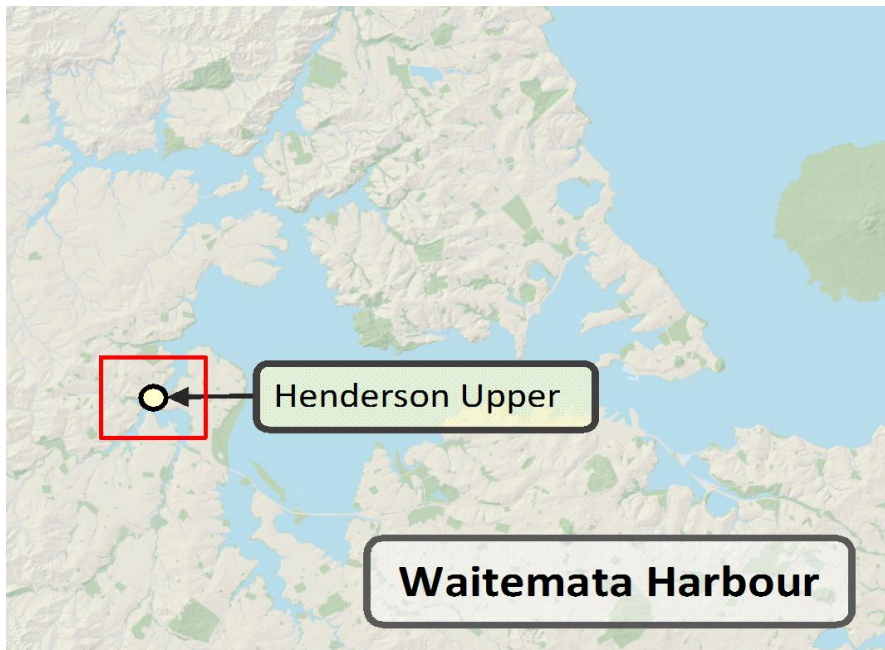
⇧⇩ ±1 - 2%

⇧⇩ > ±2%

Average annual rate of change, as % of median per year

## 1.6 Henderson Upper (SoE)

Site	Type	Description & Notes
Henderson Upper (SoE)	Muddy SZ	
Reporting Area	Land Use	Site is located in the middle reaches of Henderson Creek estuary. Catchment is large, with a mixture of land uses - residential, commercial, industrial, and rural. Historical contaminant sources include horticulture, and a disused landfill immediately adjacent to the site. Sediment texture is muddy. Mangroves encroaching on the monitoring site.
Central Waitemata Harbour	Mixed (mostly urban)	

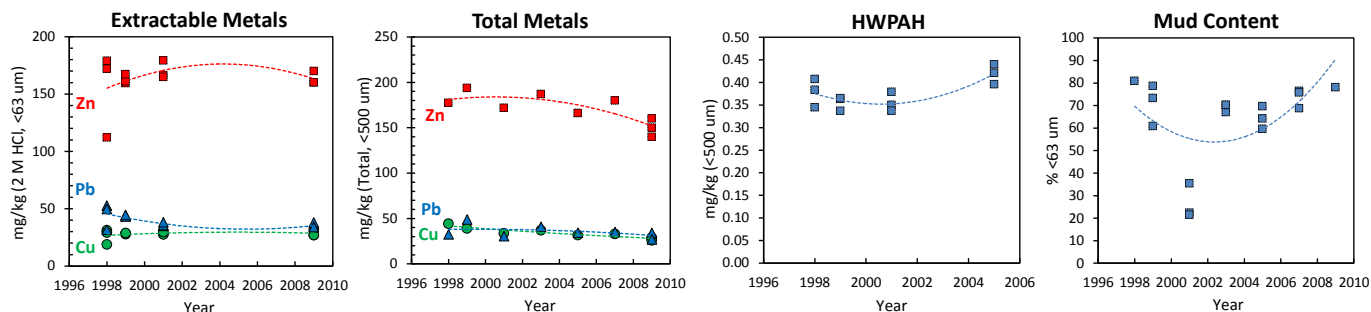


**Additional Notes**

SoE site.

Site	Description	ERC Status	Trends & Comments
Henderson Upper (SoE site)	Muddy SZ site . Large urban catchment. Old landfill adjacent to site. Unstable site - erosion & mangroves encroaching.	<div style="display: flex; flex-wrap: wrap;"> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Cu</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Pb</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Zn</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">PAH</div> </div>	11 year monitoring period. Extractable metals' data for 2003-2007 considered unreliable, therefore not shown. Assess metals' trends from Total Metals. Current contaminant status - ERC Amber. Overall, no major changes over time. Low mud content in 2001 may be an analytical problem.
Reporting Area			
Upper Waitemata Harbour			

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% , <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
1998	80.9	no data	29.1	49.6	172	44.3	32.5	178	0.384	no data
1999	73.4	no data	28.2	43.8	161	38.9	48.7	194	0.363	no data
2001	22.4	no data	28.0	35.7	166	33.6	30.5	172	0.350	no data
2003	70.2	2.77	no data	no data	no data	37.0	40.8	187	no data	no data
2005	64.2	2.49	no data	no data	no data	31.7	34.3	166	0.421	0.169
2007	75.8	2.80	no data	no data	no data	33.0	35.0	180	no data	no data
2009	78.1	no data	27.0	34.0	160	28.0	33.0	150	no data	no data
Median	69.6	2.77	28.1	38.0	166	33.0	34.0	172	0.372	0.169
Trend (absolute units per year)	1.4	0.01	0.1	-0.8	0.4	-1.2	-0.7	-3.0	0.007	no value
Trend (% of median per year)	↑ 2.1	→ 0.5	→ 0.5	↓ -2.1	→ 0.2	↓ -3.7	↔ -1.9	↔ -1.7	↔ 1.9	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66
Cu 19-34 Pb 30-50 Zn 124-150 PAH 0.66-1.7
Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction data .

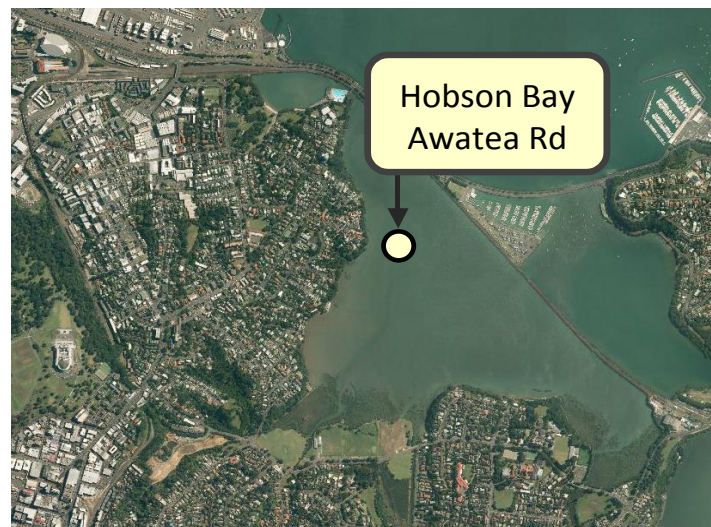
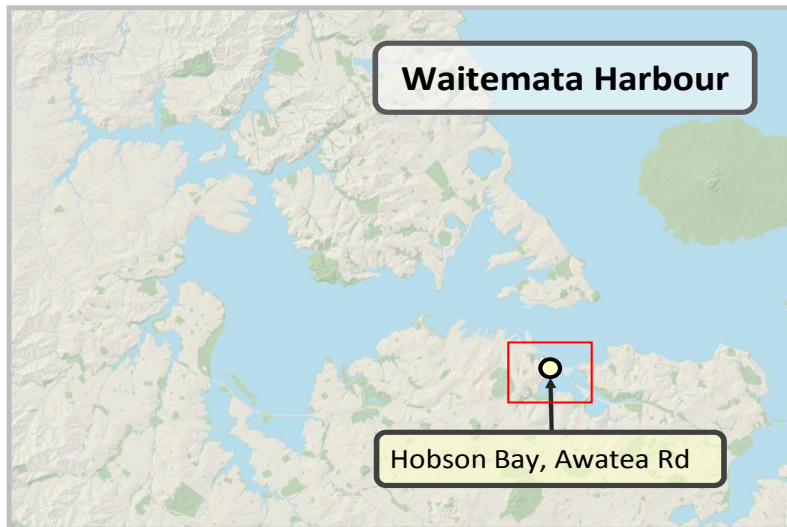
Trend Indicators

↔ < ±1%
↕ ±1 - 2%
↕ > ±2%

Average annual rate of change, as % of median per year

## 1.7 Hobson Bay, Awatea Road

Site	Type	Description & Notes
Hobson Bay, Awatea Rd	Muddy OZ	
Reporting Area	Land Use	Site is located in a large muddy embayment in the northern central basin of Hobson Bay. Site is on uniform mudflat. The sediment here is ankle-deep sandy mud. No mangroves or other notable site disturbances.
Central Waitemata Harbour	Mature urban	



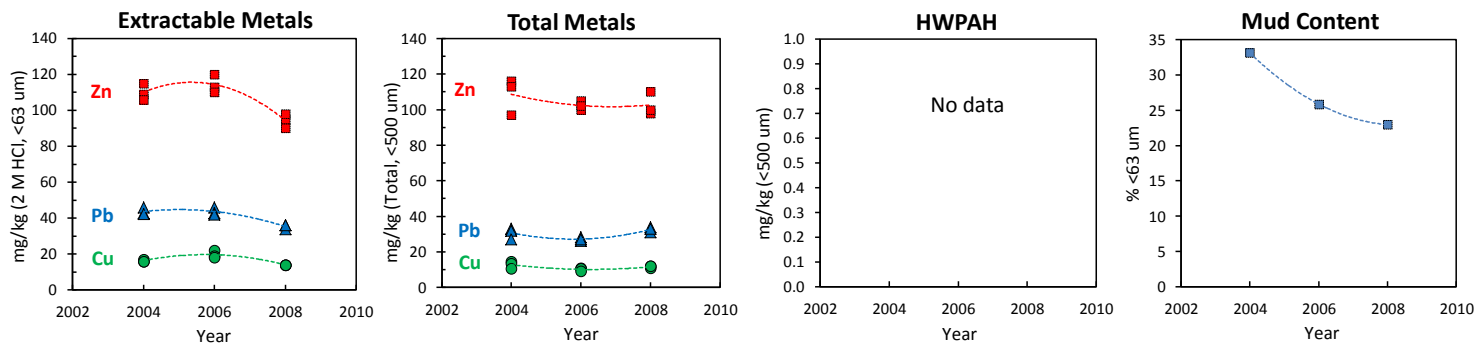
### Additional Notes

Site first sampled in 2002 from site ca. 150 m NW of RDP site (NIWA for ACC-Metrowater). Routine RDP sampling 2004, 2006, and 2008 (see RDP annual reports). Not sampled in 2010 due to major works for Hobson sewer pipeline removal project.



Site	Description	ERC Status	Trends & Comments
Hobson Bay, Awatea Road	Muddy OZ site. Large mudflat.	<div style="display: flex; flex-wrap: wrap;"> <div style="margin: 2px;">Cu</div> <div style="margin: 2px;">Pb</div> <div style="margin: 2px;">Zn</div> <div style="margin: 2px;">PAH</div> </div>	4 year monitoring period only (2002 data not included because data comparability uncertain). Current contaminant status - ERC Amber. PAH not measured to date. No major changes in metals (extractable or total) over time. Mud content higher in 2004.
Reporting Area			
Central Waitemata Harbour			

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% , <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2004	33.1	no data	16.0	43.0	109	13.4	31.9	113	no data	no data
2006	25.9	no data	19.0	43.0	113	10.7	27.2	102	no data	no data
2008	23.0	no data	14.0	36.0	95	12.0	33.0	100	no data	no data
Median	25.9	no data	16.0	42.3	109	11.0	31.0	102	no data	no data
Trend (absolute units per year)	-2.5	no value	-0.6	-2.1	-3.9	-0.3	0.5	-1.5	no value	no value
Trend (% of median per year)	↓ -9.8	no value	↓ -3.6	↓ -5.0	↓ -3.6	↓ -2.6	↗ 1.6	↘ -1.5	no value	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction data

Trend Indicators

↔ < ±1%

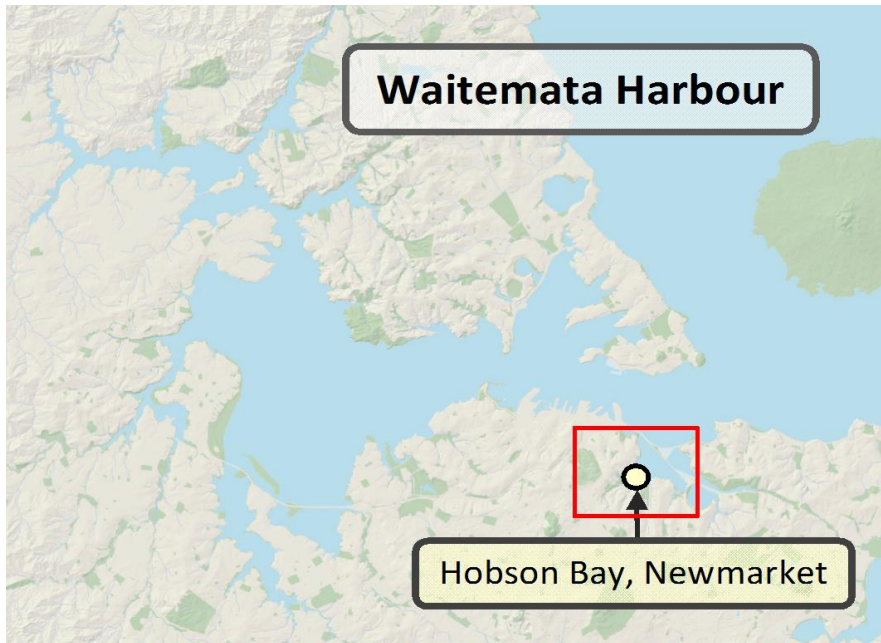
↗ ↘ ±1 - 2%

↑ ↓ > ±2%

Average annual rate of change, as % of median per year

### 1.8 Hobson Bay, Newmarket (SoE)

Site	Type	Description & Notes
Hobson Newmarket (SoE)	Sandy OZ	
Reporting Area	Land Use	Site is located on the southern shore of Hobson Bay, immediately east of the Newmarket Stream mouth. Catchment predominantly mature urban. Site is firm sand, with a thin muddier layer on the surface.
Central Waitemata Harbour	Mature urban	

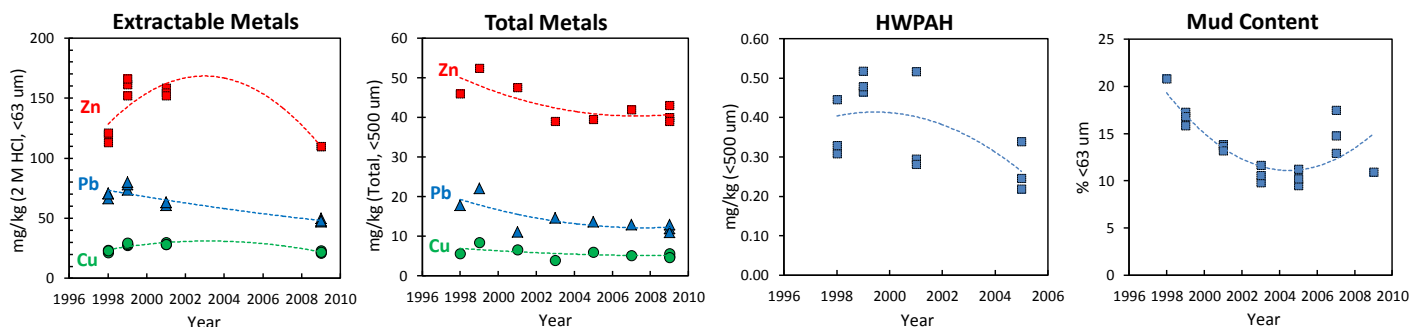


**Additional Notes**

SoE site. Mangrove encroachment.

Site	Description	ERC Status	Trends & Comments
Hobson Bay, Newmarket (SoE)	Sandy OZ site. Old urban catchment. Hard sand with mangroves encroaching.	<div style="display: flex; flex-wrap: wrap;"> <div style="background-color: #FFD700; padding: 5px; margin: 2px;">Cu</div> <div style="background-color: #FFD700; padding: 5px; margin: 2px;">Pb</div> <div style="background-color: #90EE90; padding: 5px; margin: 2px;">Zn</div> <div style="background-color: #FFD700; padding: 5px; margin: 2px;">PAH</div> </div>	11 year monitoring period. Extractable metals' data for 2003-2007 considered unreliable, therefore not shown. Assess metals' trends from Total Metals. Current contaminant status - ERC Amber. Pb & muddiness decreasing? PAH amber due to low TOC.
Reporting Area	Central Waitemata Harbour		

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 um	Organic Carbon TOC (% <500 um)	Extractable Metals (mg/kg, <63 um)			Total Metals (mg/kg, <500 um)			HWPAH (mg/kg, <500 um)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
1998	20.8	no data	22.9	70.3	120	5.6	17.8	46	0.329	no data
1999	16.8	no data	28.5	78.0	161	8.4	22.1	52	0.479	no data
2001	13.7	no data	28.5	63.1	154	6.6	11.1	48	0.295	no data
2003	10.6	0.16	no data	no data	no data	4.0	14.6	39	no data	no data
2005	10.2	0.19	no data	no data	no data	6.0	13.7	40	0.246	1.366
2007	14.8	0.22	no data	no data	no data	5.2	13.0	42	no data	no data
2009	11.0	no data	22.0	48.0	110	4.9	12.0	40	no data	no data
Median	13.2	0.19	25.4	64.8	136	5.6	13.0	42	0.334	1.366
Trend (absolute units per year)	-0.5	0.02	-0.3	-2.3	-2.7	-0.2	-0.6	-0.8	-0.021	no value
Trend (% of median per year)	↓ -3.8	↑ 7.9	↔ -1.3	↓ -3.5	↔ -2.0	↓ -2.8	↓ -4.5	↔ -1.8	↓ -6.4	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19-34 Pb 30-50 Zn 124-150 PAH 0.66-1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 um and <500 um fraction data. Settling Zones - the <500 um fraction data

Trend Indicators

⇒ < ±1%

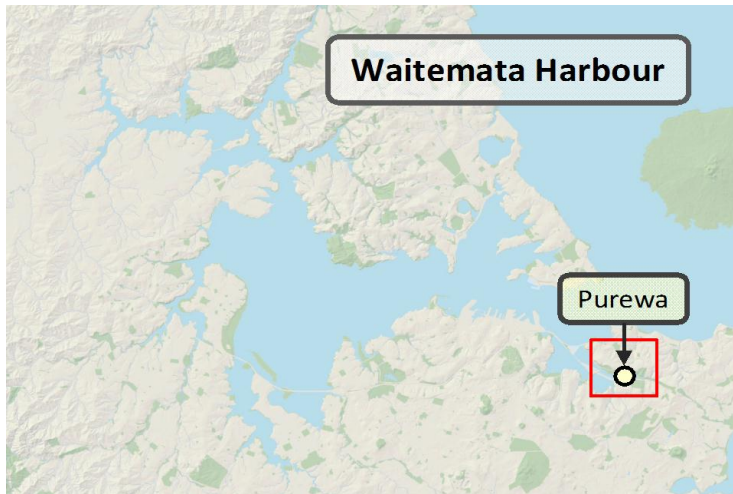
↔ ±1 - 2%

↕ > ±2%

Average annual rate of change, as % of median per year

## 1.9 Purewa

Site	Type	Description & Notes
Purewa	Muddy SZ	
Reporting Area	Land Use	Site is located on a mud flat in the mid-to-upper reaches of Purewa Estuary. The texture here is sandy mud. Catchment is mature urban.
Central Waitemata Harbour	Mature urban	

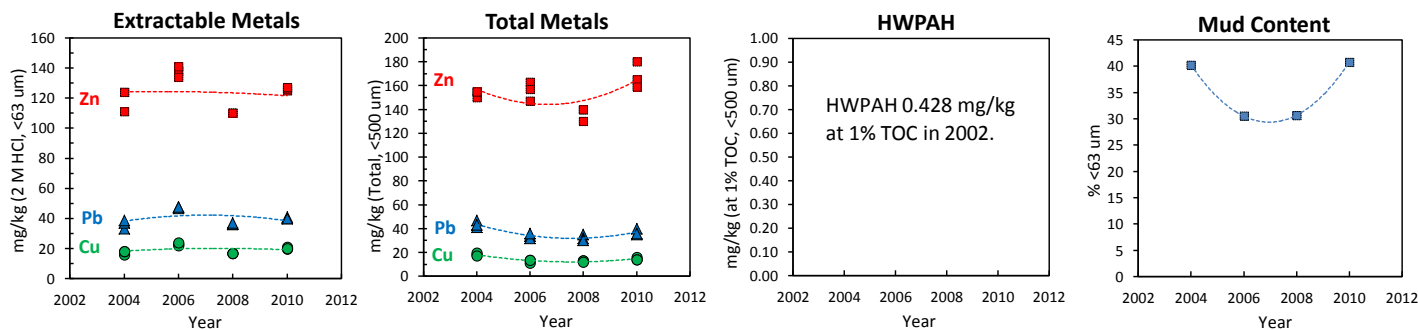


### Additional Notes

2002 monitoring site approximately 100 m downstream from the RDP site (2004 to 2010).

Site	Description	ERC Status	Trends & Comments
Purewa	Muddy SZ site. Urban catchment.	<div style="display: flex; flex-wrap: wrap; gap: 5px;"> <div style="background-color: #90EE90; padding: 2px;">Cu</div> <div style="background-color: #FFD700; padding: 2px;">Pb</div> <div style="background-color: #FF0000; padding: 2px;">Zn</div> <div style="background-color: #90EE90; padding: 2px;">PAH</div> </div>	6 year monitoring period. 2002 site (KML for ARC) ca. 100 m d/s of 2004-2010 site. Current contaminant status ERC-Red. PAH ERC-Green in 2002. No major trends.
Reporting Area			
Central Waitemata Harbour			

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% , <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2004	40.2	no data	18.0	37.1	124	17.9	43.2	155	no data	no data
2006	30.5	no data	23.0	47.6	138	13.4	34.0	157	no data	no data
2008	30.6	no data	17.0	36.0	110	13.0	32.0	140	no data	no data
2010	40.7	no data	20.0	40.0	126	14.0	36.0	165	no data	no data
Median	35.4	no data	18.9	39.4	125	13.8	35.4	155	no data	no data
Trend (absolute units per year)	0.1	no value	0.1	0.0	-0.4	-0.5	-1.1	1.3	no value	no value
Trend (% of median per year)	⇒ 0.2	no value	⇒ 0.7	⇒ 0.1	⇒ -0.3	⇓ -3.9	⇓ -3.1	⇒ 0.8	no value	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66
Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7
Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction data

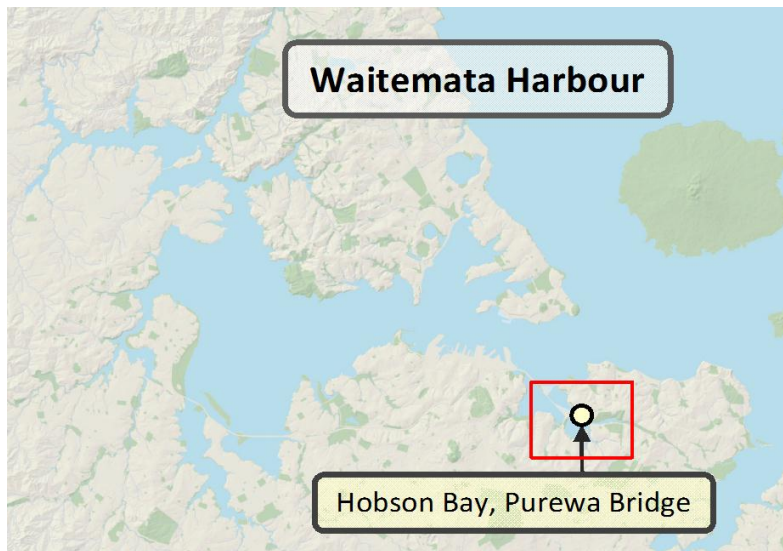
Trend Indicators

⇐ < ±1%
↔ ±1 - 2%
⇕ > ±2%

Average annual rate of change, as % of median per year

### 1.10 Hobson Bay, Purewa Bridge

Site	Type	Description & Notes
Hobson Bay, Purewa Bridge	Muddy OZ (?)	Site details unknown, but likely to be muddy. Mature urban catchment.
Reporting Area	Land Use	
Central Waitemata Harbour	Mature urban	

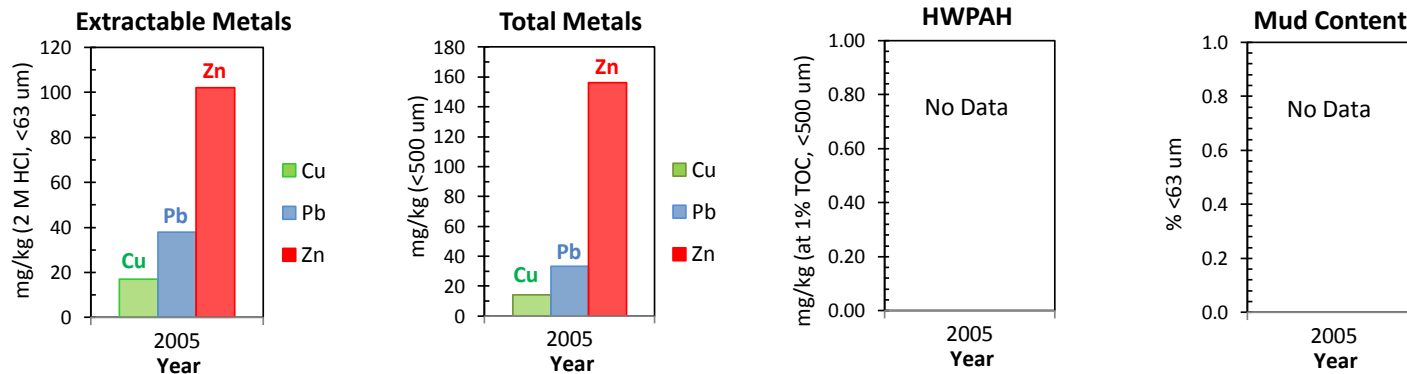


**Additional Notes**

Site sampled only in 2005.

Site	Description	ERC Status	Trends & Comments
Hobson Bay, Purewa Bridge  Reporting Area  Central Waitemata Harbour	Muddy site, just outside Orakei Basin. Mature urban catchment influences.	Cu Pb Zn PAH	1 year of monitoring only. Not sampled since 2005. No trends can therefore be assessed. Current contaminant status ERC-Red (zinc). Extractable Zn in <63 um fraction considerably lower than total Zn in <500 um fraction. Cu & Pb comparable. Seems unusual.

### Sediment chemistry summary



Annual median concentrations. Colours refer to ERC (see footnotes).

Year	Mud Content % <63 um	Organic Carbon TOC (% , <500 um)	Extractable Metals (mg/kg, <63 um)			Total Metals (mg/kg, <500 um)			HWPAAH (mg/kg, <500 um)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2005	no data	no data	17.0	37.9	102	14.0	33.3	156	no data	no data
Trend (absolute units per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value
Trend (% of median per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value

### Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

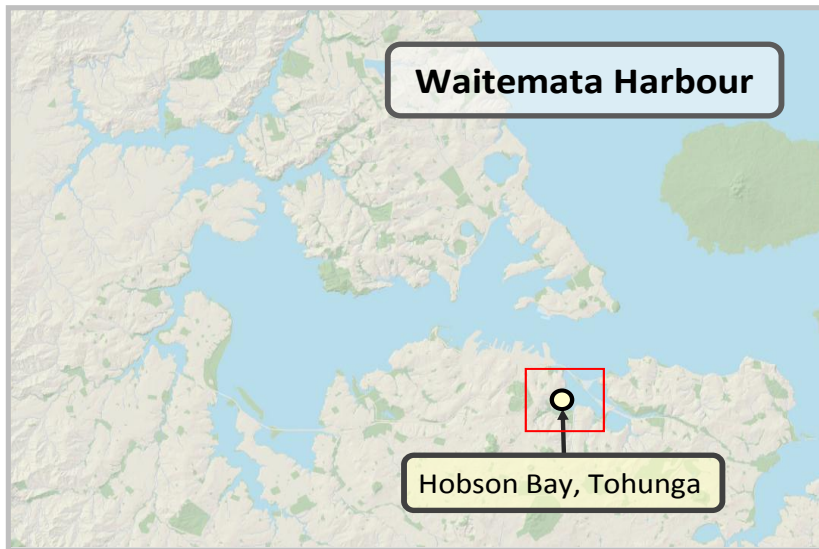
Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 um and <500 um fractions. Settling Zones - the <500 um fraction

### 1.11 Hobson Bay, Tohunga

Site	Type	Description & Notes
Hobson Bay, Tohunga	Sandy mud (?) OZ	Site details unknown. Urban catchment (Parnell & Newmarket) influences.
Reporting Area	Land Use	
Central Waitemata Harbour	Mature urban	



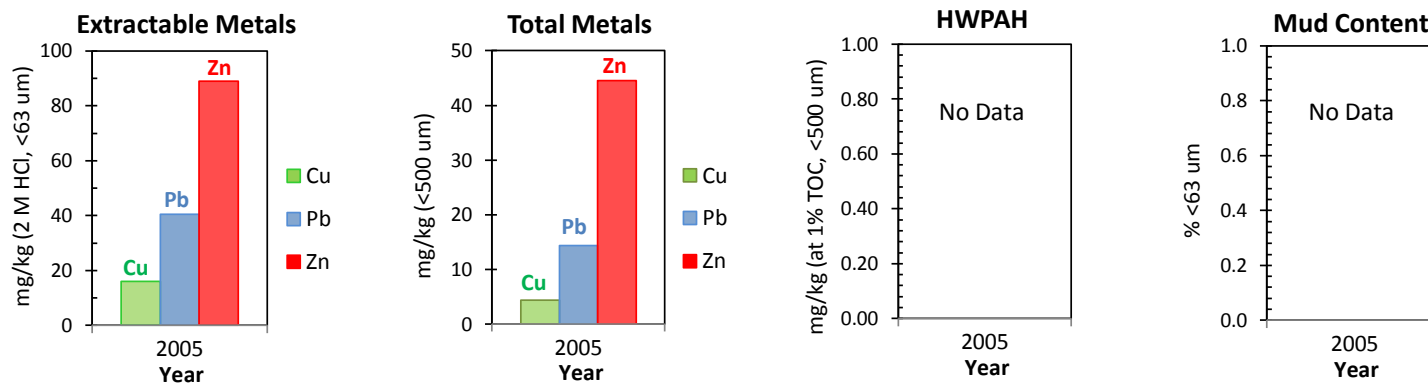
**Additional Notes**

Site sampled only in 2005 (for BHM ?).



Site	Description	ERC Status	Trends & Comments
Hobson Bay, Tohunga	Muddy sand OZ site, south western Hobson Bay. Mature urban catchment influences.	<div style="display: flex; flex-wrap: wrap;"> <div style="border: 1px solid black; padding: 5px; margin: 2px;">Cu</div> <div style="border: 1px solid black; padding: 5px; margin: 2px;">Pb</div> <div style="border: 1px solid black; padding: 5px; margin: 2px;">Zn</div> <div style="border: 1px solid black; padding: 5px; margin: 2px;">PAH</div> </div>	1 year of monitoring only. Not sampled since 2005. No trends can therefore be assessed. Current contaminant status ERC-Amber (lead). No textural data, but metals indicate significant sand component.
Reporting Area			
Central Waitemata Harbour			

### Sediment chemistry summary



### Annual median concentrations. Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% , <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2005	no data	no data	16.0	40.4	89	4.4	14.3	45	no data	no data
Trend (absolute units per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value
Trend (% of median per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value

### Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

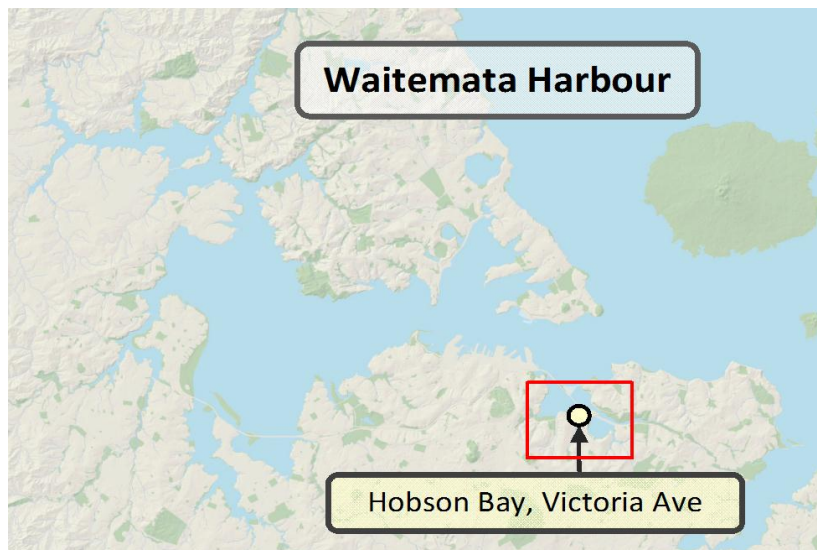
Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fractions. Settling Zones - the <500 µm fraction

### 1.12 Hobson Bay, Victoria Ave

Site	Type	Description & Notes
Hobson Bay, Victoria Ave	Muddy sand OZ	
Reporting Area	Land Use	Site is located is on slightly muddy sandflat in the south eastern area of Hobson Bay. This embayment receives runoff from mature urban catchment, including Remuera Stream. The sediment here is shallow muddy sand over firm base.
Central Waitemata Harbour	Mature urban	

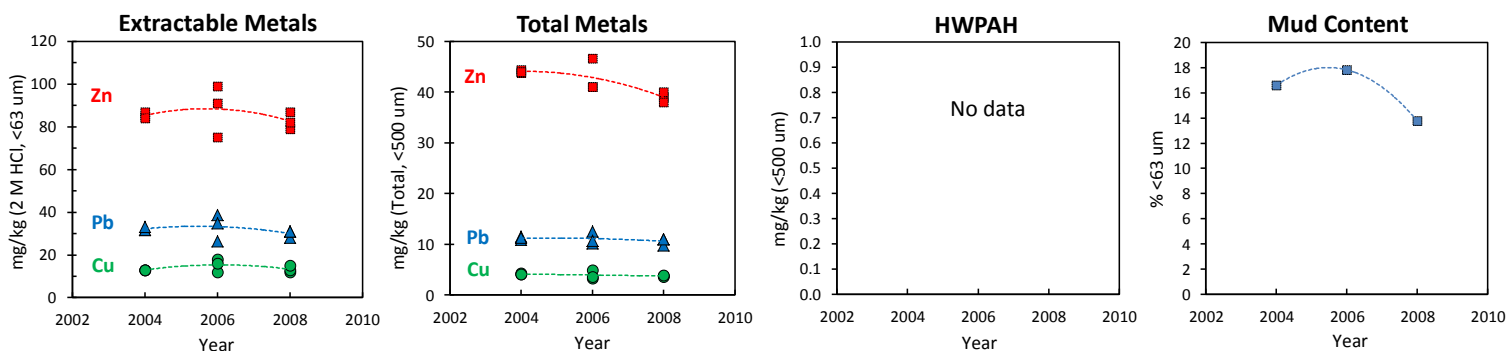


**Additional Notes**

Site sampled in 2002 (NIWA for ACC/Metrowater), then for RDP in 2004, 2006, and 2008. Not sampled in 2010 because of disturbance from Hobson Bay sewer removal project.

Site	Description	ERC Status	Trends & Comments
Hobson Bay, Victoria Ave	Firm muddy sand OZ site. Mainly residential catchment.	<div style="display: flex; flex-wrap: wrap;"> <div style="margin: 2px;">Cu</div> <div style="margin: 2px;">Pb</div> <div style="margin: 2px;">Zn</div> <div style="margin: 2px;">PAH</div> </div>	4 year monitoring period only (2002 data not included because data comparability uncertain). Current contaminant status - ERC Amber. PAH not measured to date. No major changes in metals (extractable or total) over time.
Reporting Area			
Central Waitemata Harbour			

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2004	16.6	no data	13.0	31.8	85	4.1	11.3	44	no data	no data
2006	17.8	no data	16.0	34.8	91	3.6	10.7	41	no data	no data
2008	13.8	no data	13.0	31.0	82	3.8	11.0	39	no data	no data
Median	16.6	no data	13.0	31.8	85	3.9	11.0	41	no data	no data
Trend (absolute units per year)	-0.7	no value	0.1	-0.6	-0.7	-0.1	-0.2	-1.3	no value	no value
Trend (% of median per year)	↓ -4.2	no value	→ 0.6	↘ -1.8	↘ -0.8	↓ -2.6	↘ -1.4	↓ -3.1	no value	no value

**Environmental Response Criteria (ERC)**

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction data

**Trend Indicators**

→ < ±1%

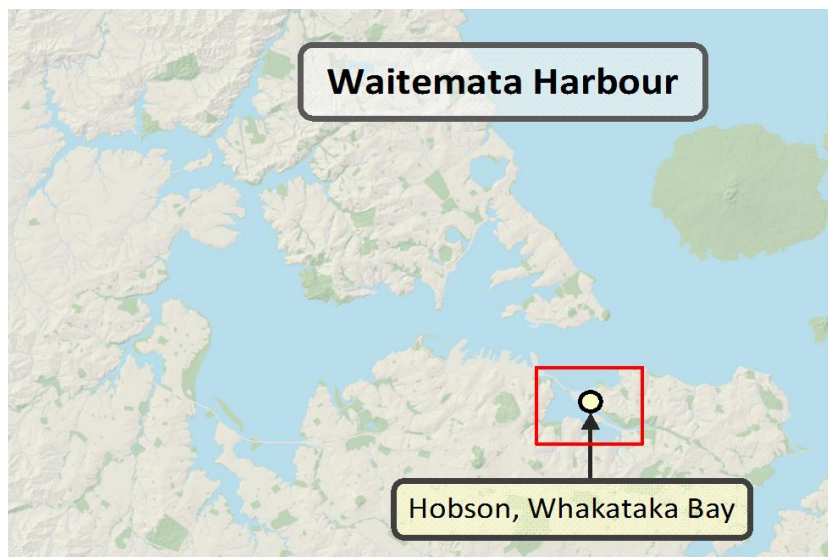
↘ ↗ ±1 - 2%

↑ ↓ > ±2%

Average annual rate of change, as % of median per year

### 1.13 Hobson Bay, Whakataka Bay

Site	Type	Description & Notes
Hobson Bay, Whakataka Bay	Muddy sand OZ	
Reporting Area	Land Use	Site is located in Whakataka Bay, on the north eastern shores of Hobson Bay. This embayment receives runoff from mature urban catchment. The sediment here is variable muddy sand/gravel/shell hash (closer to shore) and a more uniform shelly sandy mud flat further towards low tide channel (2009 site).
Central Waitemata Harbour	Urban	

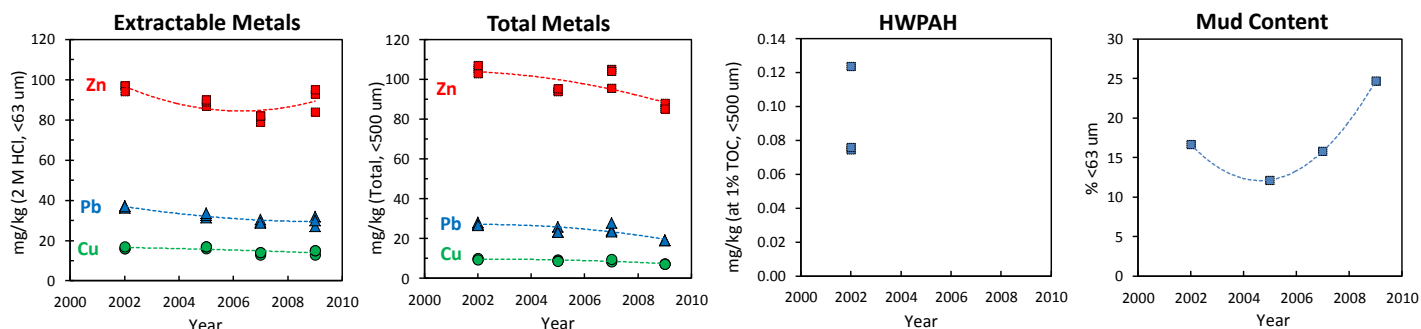


#### Additional Notes

Site sampled in 2002 (KML for ARC), then in RDP in 2005, 2007, and 2009. Site moved further off shore towards the low tide channel in 2009, as the 2005 & 2007 ecology data indicated textural gradient across the site.

Site	Description	ERC Status	Trends & Comments
Hobson Bay, Whakataka Bay	OZ site. Variable texture. In 2009, site moved further offshore to improve textural consistency.	<div style="display: flex; flex-wrap: wrap; justify-content: space-around;"> <div style="border: 1px solid green; padding: 2px; margin: 2px;">Cu</div> <div style="border: 1px solid orange; padding: 2px; margin: 2px;">Pb</div> <div style="border: 1px solid green; padding: 2px; margin: 2px;">Zn</div> <div style="border: 1px solid green; padding: 2px; margin: 2px;">PAH</div> </div>	7 year monitoring period (2002 data included from KML "Meadowbank" site). Current contaminant status - ERC Green/Amber (just - Pb). No major changes in metals over time. Mud content higher in 2009 (new site, closer to LT channel, less variable texture).
Reporting Area			
Central Waitemata Harbour			

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% , <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2002	16.7	0.94	16.0	37.0	97	9.6	27.3	105	0.070	0.076
2005	12.2	no data	17.0	32.6	89	8.9	23.5	94	no data	no data
2007	15.8	no data	14.0	29.2	82	8.6	24.3	104	no data	no data
2009	24.7	no data	15.0	30.0	93	7.2	19.0	85	no data	no data
Median	16.3	0.94	15.5	31.8	90	8.8	23.9	95	0.070	0.076
Trend (absolute units per year)	1.1	no value	-0.4	-1.1	-1.1	-0.3	-1.0	-2.2	no value	no value
Trend (% of median per year)	↑ 6.5	no value	↓ -2.4	↓ -3.4	↓ -1.3	↓ -3.6	↓ -4.3	↓ -2.3	no value	no value

**Environmental Response Criteria (ERC)**

Cu <19 Pb <30 Zn <124 PAH <0.66	Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7	Cu >34 Pb >50 Zn >150 PAH >1.7
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ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction data

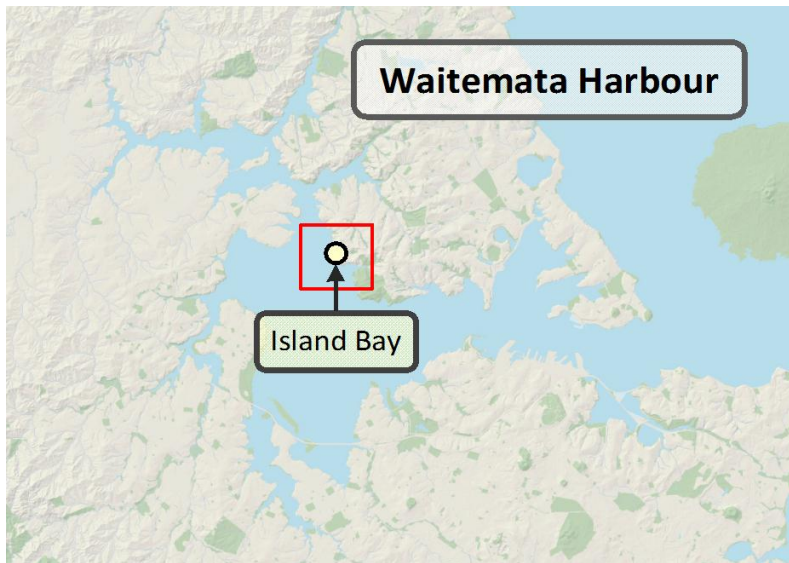
**Trend Indicators**

⇐ < ±1%	↔ ±1 - 2%	⇑ > ±2%
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Average annual rate of change, as % of median per year

### 1.14 Island Bay

Site	Type	Description & Notes
Island Bay	Sandy OZ	
Reporting Area	Land Use	Site is located is on a sandflat in the middle of Island Bay. This embayment receives runoff from a primarily urban catchment. The sediment here is sand over firm basement. Some urban debris (tires, metal etc) evident in places.
Central Waitemata Harbour	Mature urban	

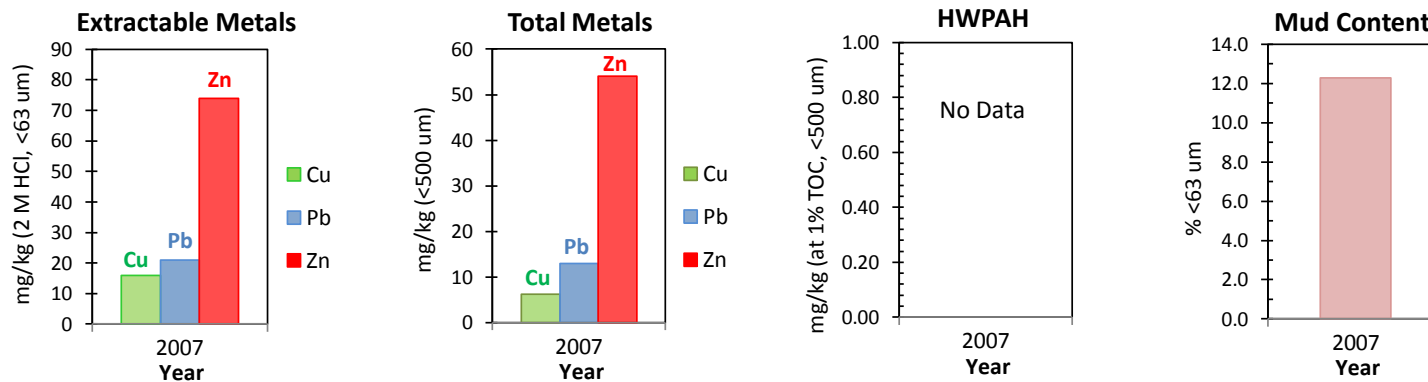


#### Additional Notes

Site sampled in 2007 in RDP. Two sites have been sampled: "Site 1" gave quite variable metals' results, so a new site nearby (site 2) was sampled. Results for both sites are given in the 2007 RDP monitoring report (DSL 2007). Site 2 has been chosen as the preferred site for any future monitoring.

Site	Description	ERC Status	Trends & Comments
Island Bay Reporting Area Central Waitemata Harbour	Sandy OZ site. Mature urban catchment & wider harbour influences.	Cu Pb Zn PAH	1 year of monitoring only (2007). No trends can therefore be assessed. Current contaminant status ERC-Green. Note that two sites were sampled in 2007 due to high variability in metals' data. Data used is from "Site 2", which is to be used for on-going monitoring.

### Sediment chemistry summary



### Annual median concentrations. Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% , <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2007	12.3	no data	16.0	21.0	74	6.2	13.0	54	no data	no data
Trend (absolute units per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value
Trend (% of median per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value

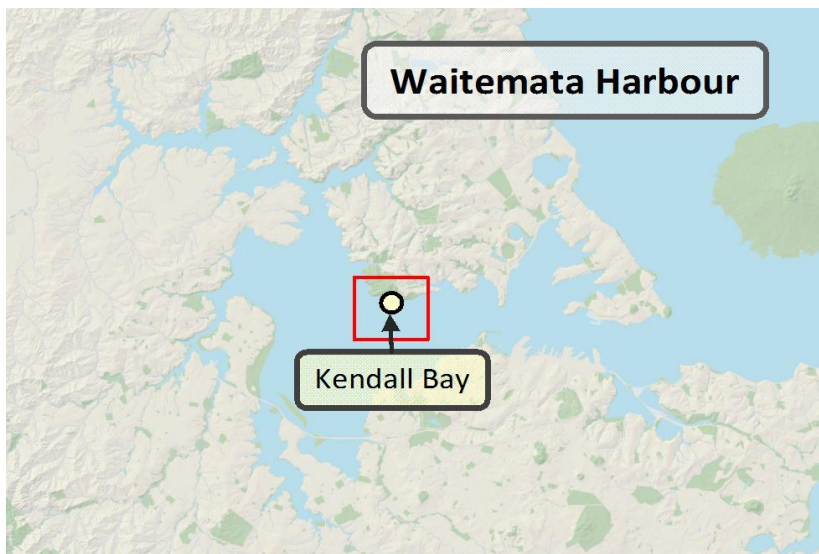
**Environmental Response Criteria (ERC)**

Cu <19 Pb <30 Zn <124 PAH <0.66	Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7	Cu >34 Pb >50 Zn >150 PAH >1.7
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ERC: For Outer Zones - the greater of the <63 µm and <500 µm fractions. Settling Zones - the <500 µm fraction

### 1.15 Kendall Bay

Site	Type	Description & Notes
Kendall Bay	Sandy OZ	
Reporting Area	Land Use	Kendall Bay is a beach on the northern shore of the Middle Waitemata Harbour. The surrounding land use is largely regenerating bush (Kauri Point Centennial Park). The sediment here is sand over softish clay.
Central Waitemata Harbour	Bush reserve	



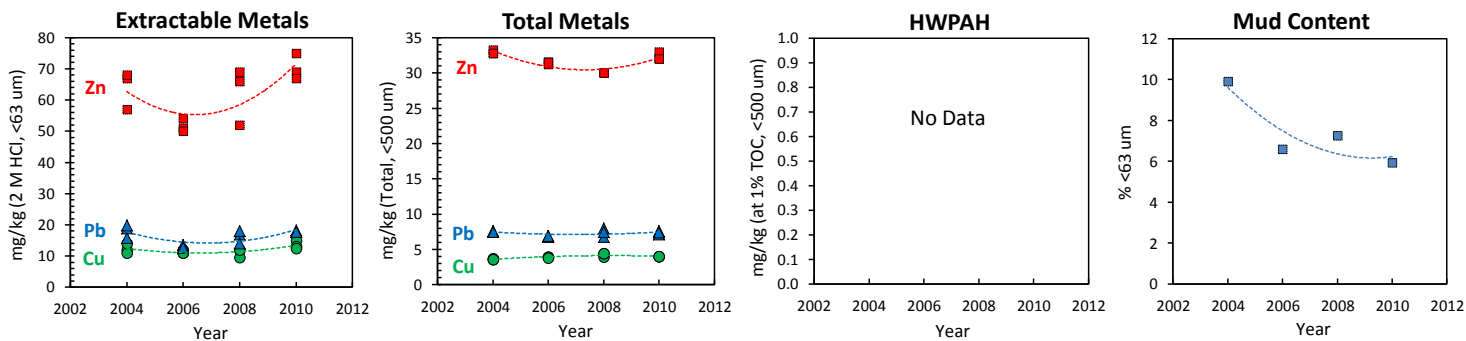
#### Additional Notes

Kendall Bay sampled in 2002 (URS for NSCC) but site location uncertain. Monitoring site location shown above is that sampled in the RDP from 2004 to 2010. The site used in 2004 was ca. 20 m closer to the low tide channel than that sampled in 2006, 2008, and 2010. The site was moved upshore slightly because site exposure is sensitive to tide level and wind direction.



Site	Description	ERC Status	Trends & Comments
Kendall Bay	Sandy OZ site. Sand over soft clay. Bush catchment, but likely to be influenced by main body of Waitemata Hbr.	<div style="display: flex; flex-wrap: wrap;"> <div style="border: 1px solid green; padding: 2px; margin: 2px;">Cu</div> <div style="border: 1px solid green; padding: 2px; margin: 2px;">Pb</div> <div style="border: 1px solid green; padding: 2px; margin: 2px;">Zn</div> <div style="border: 1px solid grey; padding: 2px; margin: 2px;">PAH</div> </div>	6 year monitoring period (2002 data not included as comparability uncertain). Current contaminant status - ERC Green. No major trends. Higher mud content in 2004 may reflect site location closer (ca. 20 m) to LT channel. Site moved in 2006 as original site not well exposed at LT.
Reporting Area			
Central Waitemata Harbour			

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2004	9.9	no data	12.0	18.9	67	3.6	7.5	33	no data	no data
2006	6.6	no data	11.0	12.7	51	3.9	6.9	32	no data	no data
2008	7.3	no data	12.0	17.0	66	4.4	7.5	30	no data	no data
2010	5.9	no data	13.1	17.8	69	4.0	7.4	32	no data	no data
Median	6.9	no data	12.0	17.4	67	3.9	7.4	32	no data	no data
Trend (absolute units per year)	-0.6	no value	0.2	0.1	1.5	0.1	0.0	-0.2	no value	no value
Trend (% of median per year)	↓ -8.1	no value	↔ 1.4	↔ 0.7	↑ 2.2	↔ 1.9	↔ 0.0	↔ -0.5	no value	no value

**Environmental Response Criteria (ERC)**

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction data

**Trend Indicators**

↔ < ±1%

↔ ↕ ±1 - 2%

↕ > ±2%

Average annual rate of change, as % of median per year

### 1.16 Little Shoal Bay

Site	Type	Description & Notes
Little Shoal Bay	Sandy OZ	
Reporting Area	Land Use	Little Shoal Bay lies on the northern shore of the Middle Waitemata Harbour, adjacent to the Harbour Bridge. The surrounding land use is largely urban. Possible contamination sources include historical gas works. The sediment texture has not been recorded, but metals' data suggest a significant proportion of sand.
Central Waitemata Harbour	Bush reserve	

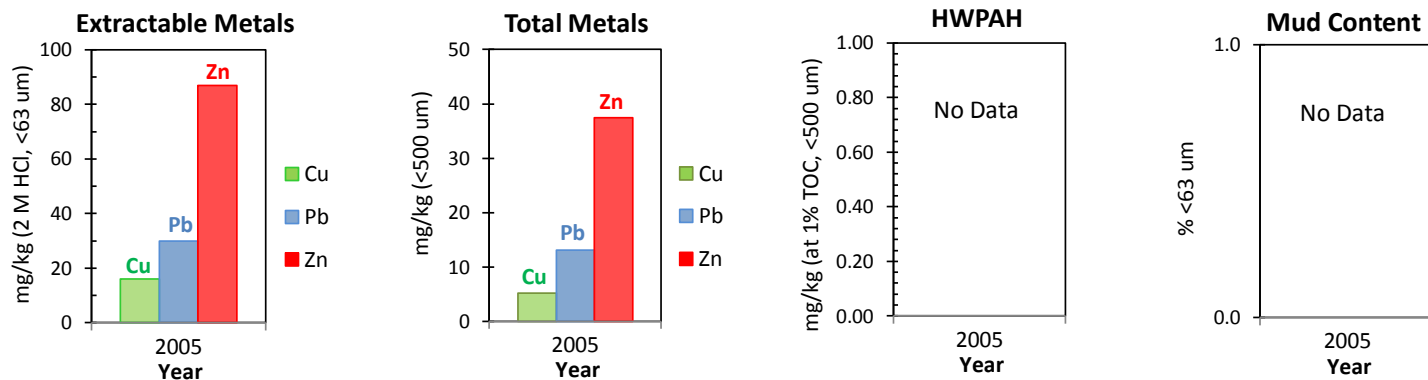


#### Additional Notes

Little Shoal Bay sampled only once, in 2005 (for BHM?).

Site	Description	ERC Status	Trends & Comments				
Little Shoal Bay  Reporting Area Central Waitemata Harbour	Sandy (?) OZ site. Mature urban catchment. Possible contamination from historical gas works?	<table border="1"> <tr> <td>Cu</td> <td>Pb</td> </tr> <tr> <td>Zn</td> <td>PAH</td> </tr> </table>	Cu	Pb	Zn	PAH	1 year of monitoring only (2005). No trends can therefore be assessed. Current contaminant status ERC-Amber (lead).
Cu	Pb						
Zn	PAH						

### Sediment chemistry summary



Annual median concentrations. Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2005	no data	no data	16.0	30.0	87.0	5.2	13.1	37.0	no data	no data
Trend (absolute units per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value
Trend (% of median per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value

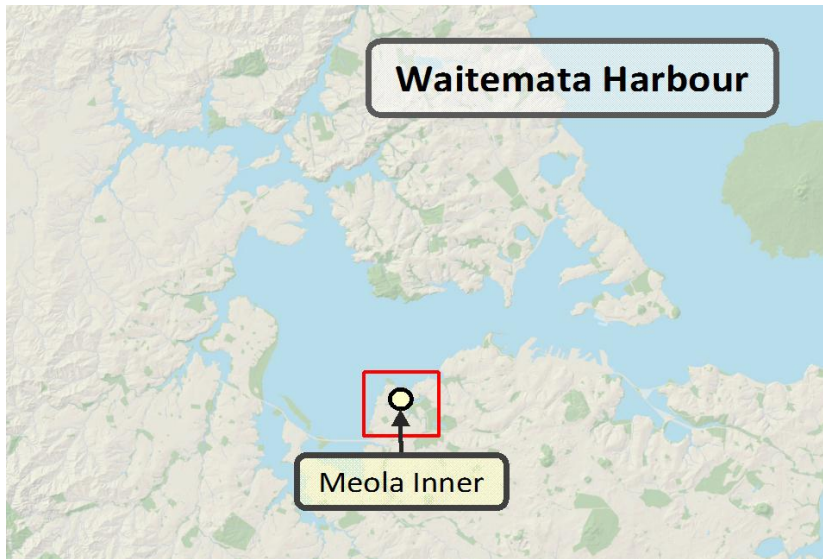
**Environmental Response Criteria (ERC)**

Cu <19 Pb <30 Zn <124 PAH <0.66	Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7	Cu >34 Pb >50 Zn >150 PAH >1.7
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ERC: For Outer Zones - the greater of the <63 µm and <500 µm fractions. Settling Zones - the <500 µm fraction

### 1.17 Meola Inner (SoE)

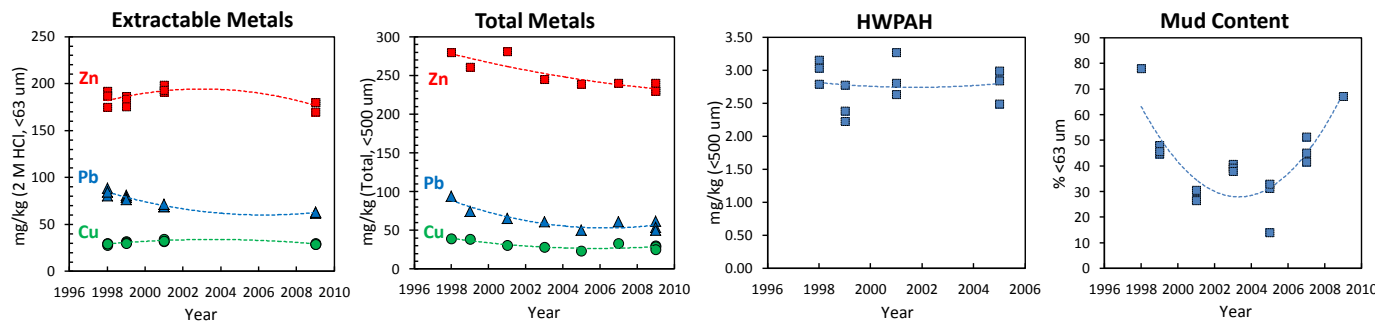
Site	Type	Description & Notes
Meola Inner (SoE site)	Muddy SZ	
Reporting Area	Land Use	Site is located on a narrow mud flat in the middle reaches of the estuary. Catchment is mature urban. Historical landfill is potential contamination source. The sediment here is mud.
Central Waitemata Harbour	Mature urban	



**Additional Notes**

Site	Description	ERC Status	Trends & Comments
Meola Inner (SoE site)	Muddy SZ site. Urban catchment, motorway & historical landfill potential contaminant sources.	<div style="display: flex; flex-wrap: wrap; justify-content: space-around;"> <div style="border: 1px solid red; padding: 2px; margin: 2px;">Cu</div> <div style="border: 1px solid red; padding: 2px; margin: 2px;">Pb</div> <div style="border: 1px solid red; padding: 2px; margin: 2px;">Zn</div> <div style="border: 1px solid red; padding: 2px; margin: 2px;">PAH</div> </div>	11 year monitoring period. Extractable metals' data for 2003-2007 considered unreliable, therefore not shown. Assess metals' trends from Total Metals. Current contaminant status - ERC Red. PAH high. Metals may be slowly decreasing? Mud content variable (analysis issues?).
Reporting Area			
Central Waitemata Harbour			

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 μm	Organic Carbon TOC (% <500 μm)	Extractable Metals (mg/kg, <63 μm)			Total Metals (mg/kg, <500 μm)			HWPAAH (mg/kg, <500 μm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
1998	78.0	no data	29.3	84.5	187	38.9	94.0	280	3.037	no data
1999	45.6	no data	30.7	79.0	183	38.3	74.4	261	2.386	no data
2001	26.9	no data	32.1	69.2	193	30.6	65.3	281	2.807	no data
2003	39.3	1.72	no data	no data	no data	28.0	61.2	245	no data	no data
2005	31.2	1.22	no data	no data	no data	23.2	49.9	239	2.842	2.330
2007	45.0	2.20	no data	no data	no data	33.0	61.0	240	no data	no data
2009	67.2	no data	29.0	63.0	180	29.0	54.0	230	no data	no data
Median	40.6	1.72	30.1	74.2	185	30.0	61.2	240	2.798	2.330
Trend (absolute units per year)	-0.2	0.12	-0.1	-1.8	-0.8	-0.8	-2.5	-4.0	-0.001	no value
Trend (% of median per year)	⇒ -0.6	↑ 7.0	⇒ -0.3	↓ -2.4	⇒ -0.4	↓ -2.7	↓ -4.1	⇒ -1.7	⇒ 0.0	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19-34 Pb 30-50 Zn 124-150 PAH 0.66-1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 μm and <500 μm fraction data. Settling Zones - the <500 μm fraction data

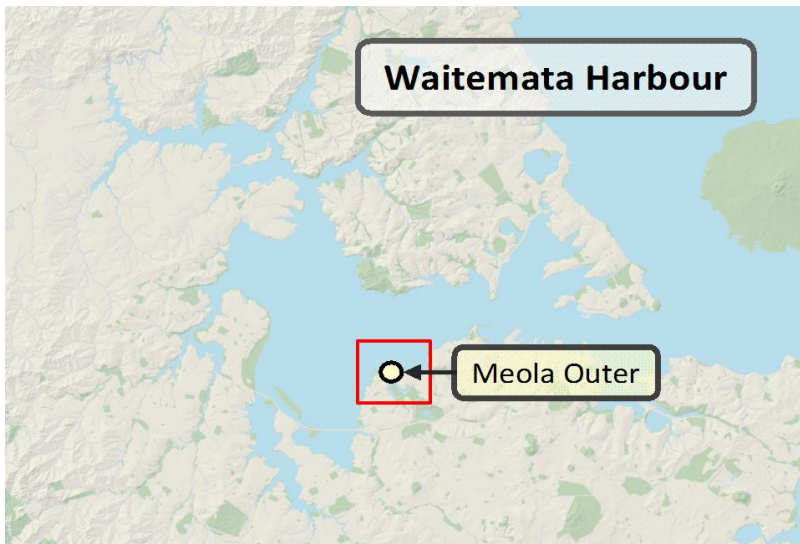
Trend Indicators

⇒ < ±1%    ↗ ↘ ±1 - 2%    ↑ ↓ > ±2%

Average annual rate of change, as % of median per year

### 1.18 Meola Outer Zone

Site	Type	Description & Notes
Meola Outer	Sandy OZ	
Reporting Area	Land Use	Site is located on a broad exposed sand flat in the outer reaches of the estuary. Catchment is mature urban. Inner estuary is highly contaminated. Historical landfill is potential contamination source. The sediment here is firm sand.
Central Waitemata Harbour	Mature urban	

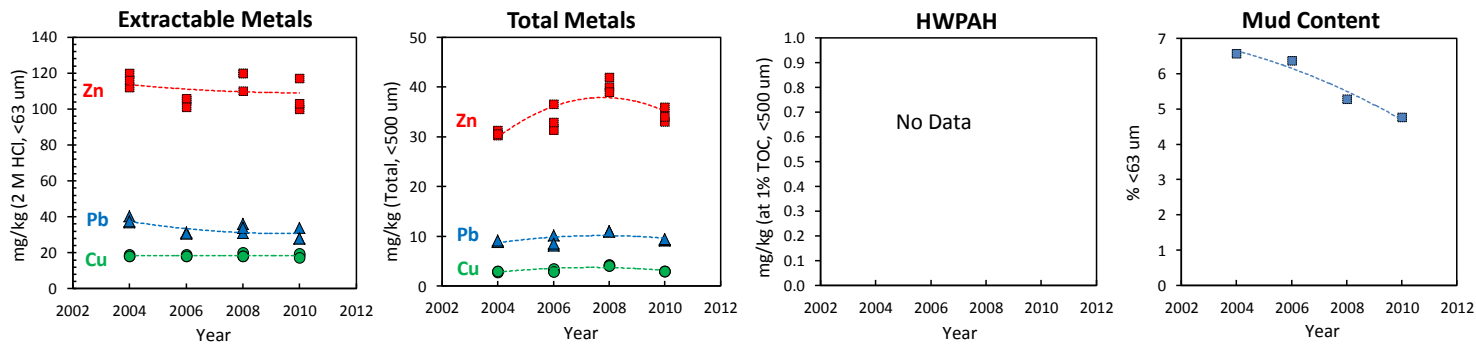


#### Additional Notes

Sampling undertaken in 2002 (NIWA for ACC/Metrowater) and 2004 to 2010 in RDP. Site locations similar.

Site	Description	ERC Status	Trends & Comments
Meola Outer	Sandy OZ site. Urban catchment. Highly contaminated inner estuary.	<div style="display: flex; flex-wrap: wrap;"> <div style="margin: 2px;">Cu</div> <div style="margin: 2px;">Pb</div> <div style="margin: 2px;">Zn</div> <div style="margin: 2px;">PAH</div> </div>	6 year monitoring period. 2002 data not included as comparability uncertain. Current contaminant status - ERC Green. No major trends over time, although Pb may be decreasing. Mud content may be dropping (however, proportions are low).
Reporting Area			
Central Waitemata Harbour			

**Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.**



**Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).**

Year	Mud Content % <63 µm	Organic Carbon TOC (% <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2004	6.6	no data	18.0	37.5	116	3.0	9.0	31	no data	no data
2006	6.4	no data	18.0	30.9	105	3.0	8.6	33	no data	no data
2008	5.3	no data	18.0	34.0	120	4.1	11.0	40	no data	no data
2010	4.8	no data	18.6	28.0	103	3.0	9.3	34	no data	no data
Median	5.8	no data	18.0	32.7	111	3.0	9.3	34	no data	no data
Trend (absolute units per year)	-0.3	no value	0.0	-1.1	-0.8	0.1	0.2	0.9	no value	no value
Trend (% of median per year)	↓ -5.6	no value	→ 0.2	↓ -3.4	→ -0.7	↑ 2.1	↗ 1.7	↑ 2.6	no value	no value

**Environmental Response Criteria (ERC)**

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction data

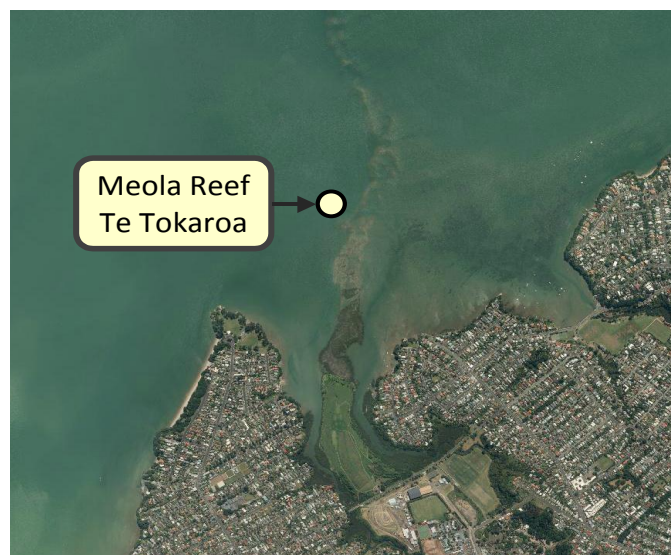
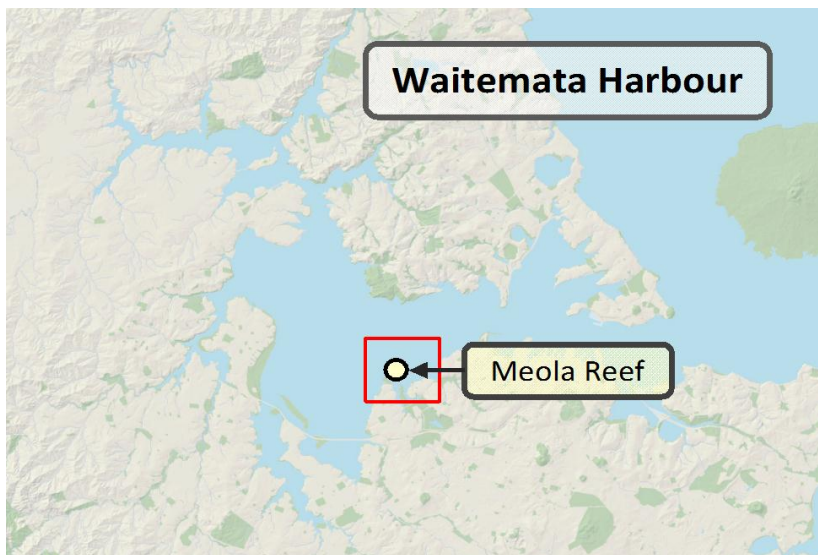
**Trend Indicators**

↔ < ±1%   ↗ ↘ ±1 - 2%   ↕ > ±2%

Average annual rate of change, as % of median per year

### 1.19 Meola Reef, Te Tokaroa (SoE)

Site	Type	Description & Notes
Meola Reef (Te Tokaroa)	Muddy OZ	
Reporting Area	Land Use	Site is located in a small muddy embayment, between the low tide channel and a rocky reef. Catchment is mature urban. Inner estuary is highly contaminated. Historical landfill is potential contamination source. The sediment here is sandy mud.
Central Waitemata Harbour	Mature urban	



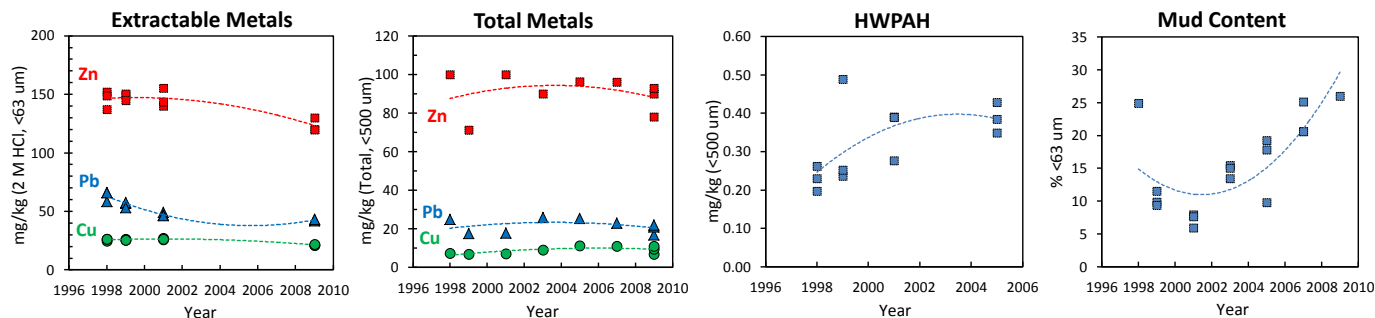
#### Additional Notes

Site was moved in the past - previous location (closer to shore on opposite side of LT channel?) and shift date uncertain.



Site	Description	ERC Status	Trends & Comments
Meola Reef (SoE)	Muddy OZ site. Small pocket of mud captured in reef embayment.	<div style="display: flex; flex-wrap: wrap;"> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Cu</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Pb</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Zn</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">PAH</div> </div>	11 year monitoring period. Extractable metals' data for 2003-2007 considered unreliable, therefore not shown. Assess metals' trends from Total Metals. Current contaminant status - ERC Amber. Overall, no major changes over time. Mud content may be increasing?
Reporting Area			
Central Waitemata Harbour			

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 μm	Organic Carbon TOC (% <500 μm)	Extractable Metals (mg/kg, <63 μm)			Total Metals (mg/kg, <500 μm)			HWPAAH (mg/kg, <500 μm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
1998	24.9	no data	26.4	66.1	149	7.3	24.9	100	0.230	no data
1999	9.9	no data	25.6	56.9	149	6.9	17.6	71	0.253	no data
2001	7.6	no data	26.4	46.8	144	7.1	18.0	100	0.390	no data
2003	15.0	0.50	no data	no data	no data	9.0	25.8	90	no data	no data
2005	17.8	0.76	no data	no data	no data	11.2	25.5	96	0.384	0.463
2007	20.6	0.74	no data	no data	no data	11.0	23.0	96	no data	no data
2009	25.9	no data	21.0	43.0	120	9.6	21.0	90	no data	no data
Median	15.0	0.74	25.8	51.2	144	9.0	22.0	93	0.313	0.463
Trend (absolute units per year)	1.2	0.06	-0.4	-1.6	-2.3	0.2	-0.1	-0.1	0.019	no value
Trend (% of median per year)	↑ 7.7	↑ 8.1	↔ -1.7	↓ -3.1	↔ -1.6	↑ 2.7	↔ -0.3	↔ -0.1	↑ 5.9	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19-34 Pb 30-50 Zn 124-150 PAH 0.66-1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 μm and <500 μm fraction data. Settling Zones - the <500 μm fraction data

Trend Indicators

↔ < ±1%

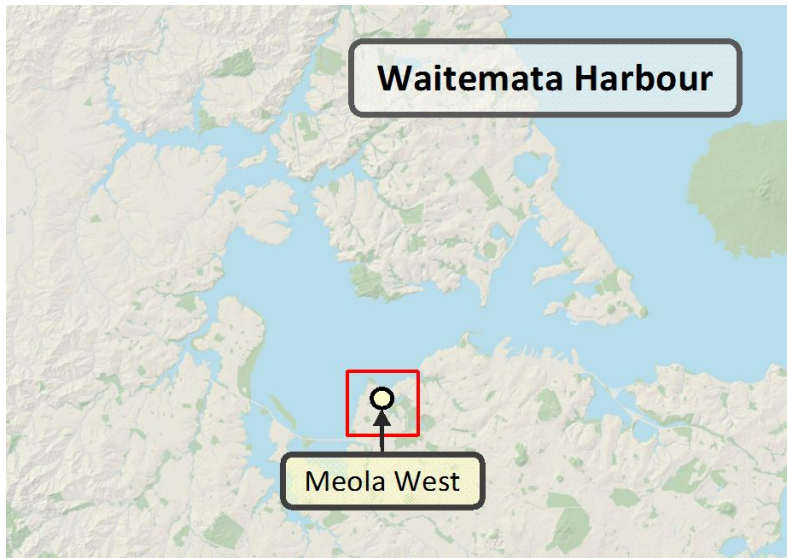
↔ ±1 - 2%

↕ > ±2%

Average annual rate of change, as % of median per year

## 1.20 Meola West

Site	Type	Description & Notes
Meola West	Muddy SZ	
Reporting Area	Land Use	Site is located in the lower reaches of the Meola Creek estuary. Catchment is mature urban. Inner estuary is highly contaminated. Historical landfill is potential contamination source. The sediment texture is not documented, but likely to be muddy.
Central Waitemata Harbour	Mature urban	

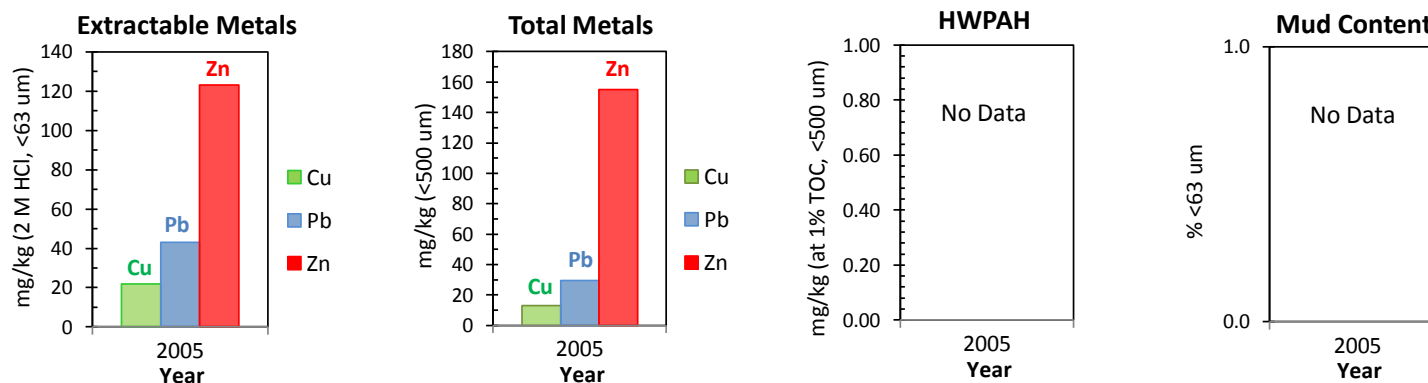


### Additional Notes

Sampling undertaken in 2005 only (BHM?).

Site	Description	ERC Status	Trends & Comments
Meola West	Muddy SZ site, at entrance to inner Meola Creek estuary. Mature urban catchment.	<div style="display: flex; flex-wrap: wrap;"> <div style="border: 1px solid black; padding: 5px; margin: 2px;">Cu</div> <div style="border: 1px solid black; padding: 5px; margin: 2px;">Pb</div> <div style="border: 1px solid black; padding: 5px; margin: 2px;">Zn</div> <div style="border: 1px solid black; padding: 5px; margin: 2px;">PAH</div> </div>	1 year of monitoring only (2005). No trends can therefore be assessed. Current contaminant status ERC-Red (zinc). Total Cu & Pb seem relatively low (compared with Total Zn)? Metals' concentrations lower than at Meola Inner (SoE site) further up estuary.
Reporting Area			
Central Waitemata Harbour			

### Sediment chemistry summary



### Annual median concentrations. Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% , <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2005	no data	no data	22.0	43.1	123	13.0	29.4	155	no data	no data
Trend (absolute units per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value
Trend (% of median per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value

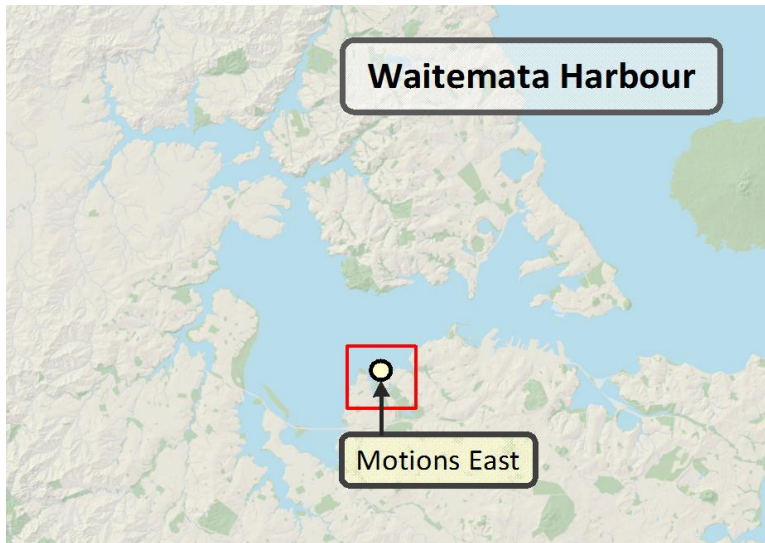
**Environmental Response Criteria (ERC)**

Cu <19 Pb <30 Zn <124 PAH <0.66	Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7	Cu >34 Pb >50 Zn >150 PAH >1.7
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ERC: For Outer Zones - the greater of the <63 µm and <500 µm fractions. Settling Zones - the <500 µm fraction

### 1.21 Motions East

Site	Type	Description & Notes
Motions East	Sandy (?) OZ	
Reporting Area	Land Use	Site is located in the lower reaches of the Motions Creek estuary. Catchment is mature urban. Inner estuary is highly contaminated. Historical landfill is potential contamination source. Sediment texture is not documented, but likely to be muddy alongside the low tide channel and sandy on the broader flats. Metals' results suggest significant mud content in the sample taken.
Central Waitemata Harbour	Mature urban	

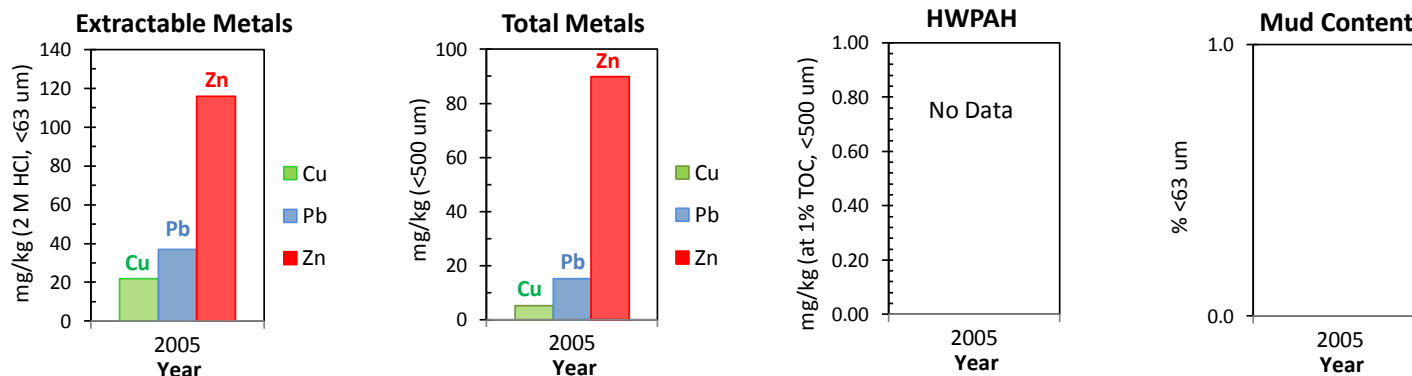


#### Additional Notes

Sampling undertaken in 2005 only (BHM?).

Site	Description	ERC Status	Trends & Comments
Motions East Reporting Area Central Waitemata Harbour	Sandy OZ site, outside the entrance to Motions Creek estuary. Urban catchment & wider harbour influences.	<div style="display: flex; flex-wrap: wrap; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Cu</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Pb</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Zn</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">PAH</div> </div>	1 year of monitoring only (2005). No trends can therefore be assessed. Current contaminant status ERC-Amber.

### Sediment chemistry summary



Annual median concentrations. Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2005	no data	no data	22.0	36.9	116	5.1	15.2	90	no data	no data
Trend (absolute units per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value
Trend (% of median per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value

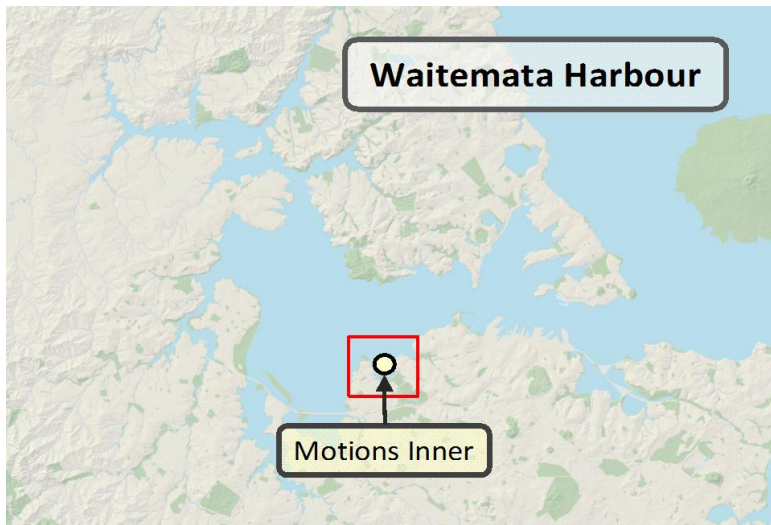
### Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66	Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7	Cu >34 Pb >50 Zn >150 PAH >1.7
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ERC: For Outer Zones - the greater of the <63 µm and <500 µm fractions. Settling Zones - the <500 µm fraction

## 1.22 Motions Inner (SoE)

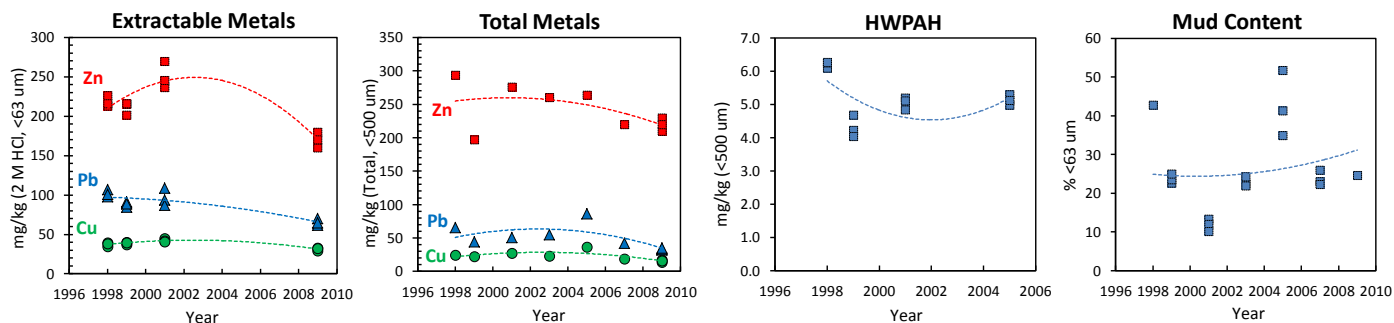
Site	Type	Description & Notes
Motions Inner (SoE site)	Muddy SZ	
Reporting Area	Land Use	Site is located on a narrow mud flat in the mid-to-lower reaches of the estuary. Catchment is mature urban. Historical landfill is potential contamination source. The sediment here is sandy mud.
Central Waitemata Harbour	Mature urban	



**Additional Notes**

Site	Description	ERC Status	Trends & Comments
Motions Inner (SoE site)	Muddy SZ site. Urban catchment, historical landfill a potential contaminant source.	<div style="display: flex; flex-wrap: wrap;"> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Cu</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Pb</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Zn</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">PAH</div> </div>	11 year monitoring period. Extractable metals' data for 2003-2007 considered unreliable, therefore not shown. Assess metals' trends from Total Metals. Current contaminant status - ERC red (Zn & PAH). PAH high. No major changes over time. Mud content variable (analysis issues, particularly 2001 ?).

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
1998	42.8	no data	38.4	101.2	216	24.4	65.5	294	6.263	no data
1999	23.6	no data	39.4	88.8	216	22.3	44.5	197	4.224	no data
2001	12.0	no data	41.6	93.8	245	26.9	50.7	276	5.109	no data
2003	22.5	1.07	no data	no data	no data	23.0	55.3	260	no data	no data
2005	41.3	2.54	no data	no data	no data	36.4	86.1	264	5.126	2.045
2007	23.0	0.98	no data	no data	no data	19.0	42.0	220	no data	no data
2009	24.7	no data	32.0	65.0	170	16.0	34.0	220	no data	no data
Median	23.6	1.10	38.9	90.0	216	22.3	44.5	230	5.117	2.045
Trend (absolute units per year)	0.5	-0.02	-0.7	-3.0	-4.7	-0.8	-2.0	-3.8	-0.054	no value
Trend (% of median per year)	↑ 2.2	↘ -1.4	↘ -1.8	↘ -3.3	↘ -2.2	↘ -3.5	↘ -4.4	↘ -1.6	↘ -1.1	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66      Cu 19-34 Pb 30-50 Zn 124-150 PAH 0.66-1.7      Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction data

Trend Indicators

↔ < ±1%    ↘ ↗ ±1 - 2%    ↕ > ±2%

Average annual rate of change, as % of median per year

### 1.23 Ngataringa Bay

Site	Type	Description & Notes
Ngataringa Bay	Muddy SZ	
Reporting Area	Land Use	Site is located in the upper reaches of Ngataringa Bay . The sediment here is muddy. The catchment is urban. Historical landfills on southern side (now Ngataringa Park) and on naval grounds approx. 750 m west of monitoring site.
Central Waitemata Harbour	Urban	



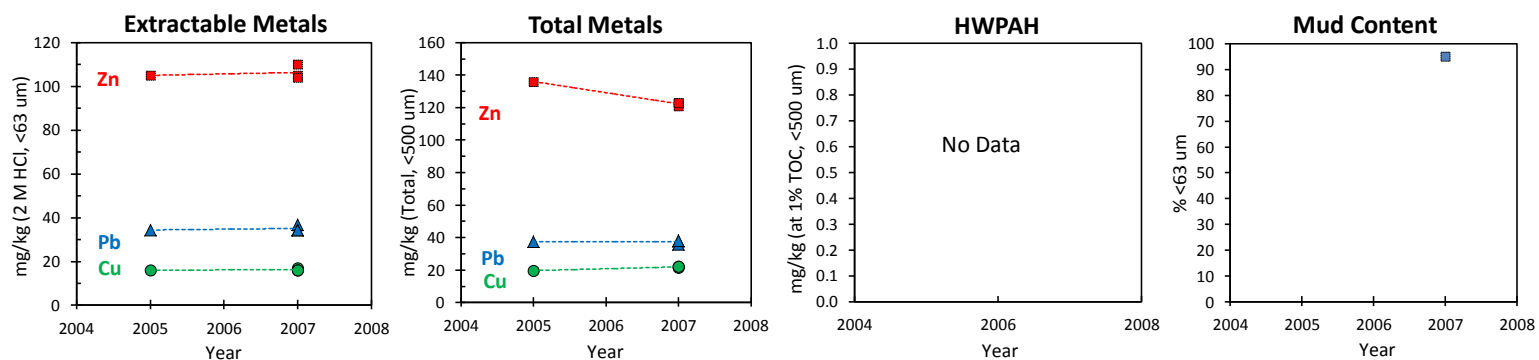
#### Additional Notes

Sampling also undertaken in 2002 (URS for NSCC) but site location is uncertain. Site sampled in 2005 was opposite the 2007 site (see aerial above).



Site	Description	ERC Status	Trends & Comments
Ngataringa	Muddy SZ site in head of estuary. Urban catchment. Historical contaminant sources (landfill, fuel leaks from USTs).	<div style="display: flex; flex-wrap: wrap;"> <div style="margin: 2px;">Cu</div> <div style="margin: 2px;">Pb</div> <div style="margin: 2px;">Zn</div> <div style="margin: 2px;">PAH</div> </div>	2 years of monitoring only. No trends can therefore be assessed. 2005 & 2007 results are similar. Current contaminant status ERC-Amber. Note that 2005 & 2007 sampling sites are approximately 100 m apart, on opposite sides of estuary. 2005 data from single composite sample.
Reporting Area			
Central Waitemata Harbour			

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2005	no data	no data	16.0	34.4	105	19.7	37.5	136	no data	no data
2007	95.1	no data	16.0	34.3	105	22.1	37.9	123	no data	no data
Median	95.1	no data	16.0	34.4	105	21.9	37.7	123	no data	no data
Trend (absolute units per year)	no value	no value	0.2	0.4	0.7	1.1	-0.1	-6.8	no value	no value
Trend (% of median per year)	no value	no value	↗ 1.0	↗ 1.0	↗ 0.6	↗ 5.2	↔ -0.2	↘ -5.6	no value	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction data

Trend Indicators

↔ < ±1%

↗↘ ±1 - 2%

↕ > ±2%

Average annual rate of change, as % of median per year

### 1.24 Oakley Creek (SoE)

Site	Type	Description & Notes
Oakley Creek (SoE site)	Muddy SZ	
Reporting Area	Land Use	Site is located on a deeply eroded, muddy zone near the mouth of Oakley Creek estuary. Mangroves have encroached on the site. Catchment is mature urban. The sediment here is mud - firm on the raised zones, and wet in the drainage channels.
Central Waitemata Harbour	Mature urban	

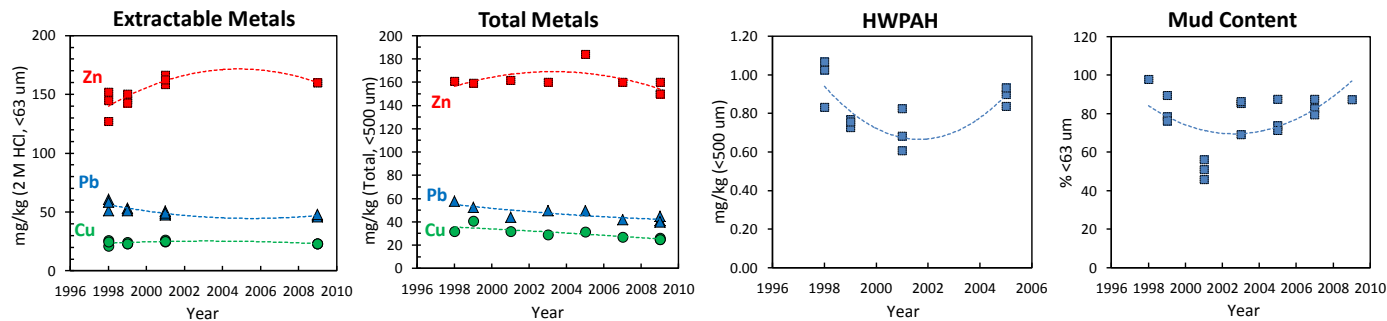


#### Additional Notes

Highly physically heterogeneous site - larger humps, hollows (drainage channels), mangroves. Limited future life as monitoring site?

Site	Description	ERC Status	Trends & Comments
Oakley Creek (SoE site)	Muddy SZ site. Fully urban catchment. Site highly eroded, substantial mangrove coverage.	<div style="display: flex; flex-wrap: wrap;"> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Cu</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Pb</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Zn</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">PAH</div> </div>	11 year monitoring period. Extractable metals' data for 2003-2007 considered unreliable, therefore not shown. Assess metals' trends from Total Metals. Current contaminant status - ERC amber (metals). No major changes over time. Mud content variable (analysis issues in 2001 ?).

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

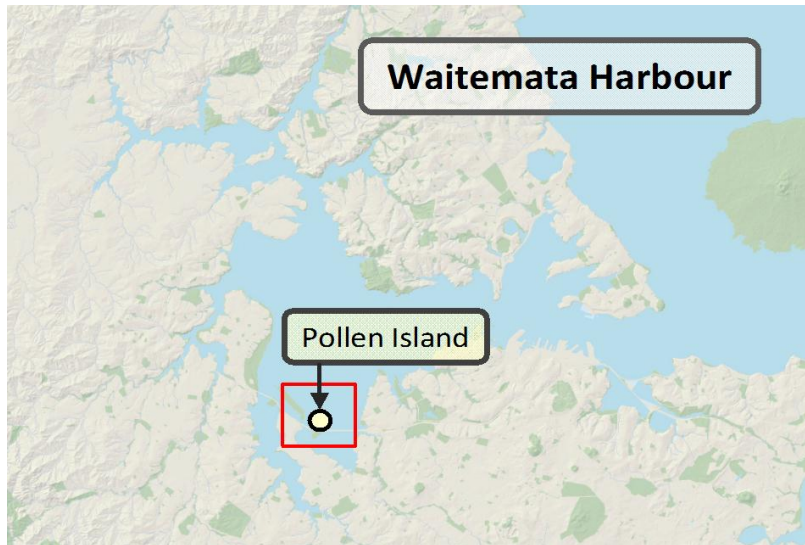
Year	Mud Content % <63 µm	Organic Carbon TOC (% <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
1998	98.0	no data	24.8	58.5	145	31.8	57.6	161	1.026	no data
1999	78.4	no data	23.1	53.0	146	40.7	52.5	159	0.757	no data
2001	50.9	no data	25.1	49.3	163	31.6	44.1	162	0.682	no data
2003	85.3	2.23	no data	no data	no data	29.0	49.6	160	no data	no data
2005	73.9	2.68	no data	no data	no data	31.3	49.6	184	0.898	0.335
2007	82.7	2.40	no data	no data	no data	27.0	42.0	160	no data	no data
2009	87.5	no data	23.0	47.0	160	25.0	41.0	150	no data	no data
Median	79.6	2.45	23.7	51.0	155	29.0	45.0	160	0.828	0.335
Trend (absolute units per year)	0.8	0.04	-0.1	-0.7	1.4	-0.9	-1.1	-0.6	-0.001	no value
Trend (% of median per year)	→ 1.0	↗ 1.8	→ -0.4	↘ -1.4	→ 0.9	↘ -3.2	↘ -2.5	→ -0.3	→ -0.2	no value

Environmental Response Criteria (ERC)	Trend Indicators
<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 2px; background-color: #e0ffe0;">Cu &lt;19 Pb &lt;30 Zn &lt;124 PAH &lt;0.66</div> <div style="border: 1px solid black; padding: 2px; background-color: #fff9c4;">Cu 19-34 Pb 30-50 Zn 124-150 PAH 0.66-1.7</div> <div style="border: 1px solid black; padding: 2px; background-color: #ffe0e0;">Cu &gt;34 Pb &gt;50 Zn &gt;150 PAH &gt;1.7</div> </div>	<div style="display: flex; justify-content: space-around;"> <div>↔ &lt; ±1%</div> <div>↔ ±1 - 2%</div> <div>↕ &gt; ±2%</div> </div> <p>Average annual rate of change, as % of median per year</p>

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction data

### 1.25 Pollen Island

Site	Type	Description & Notes
Pollen Island	Muddy OZ	
Reporting Area	Land Use	Site is located on a broad sand-to-mud flat just outside the outlet of Waterview Inlet into the Middle Waitemata Harbour. The texture here is coarse sand/shellhash close to shore, and mud nearer the low tide channel. Catchment is mature urban.
Central Waitemata Harbour	Mature urban	

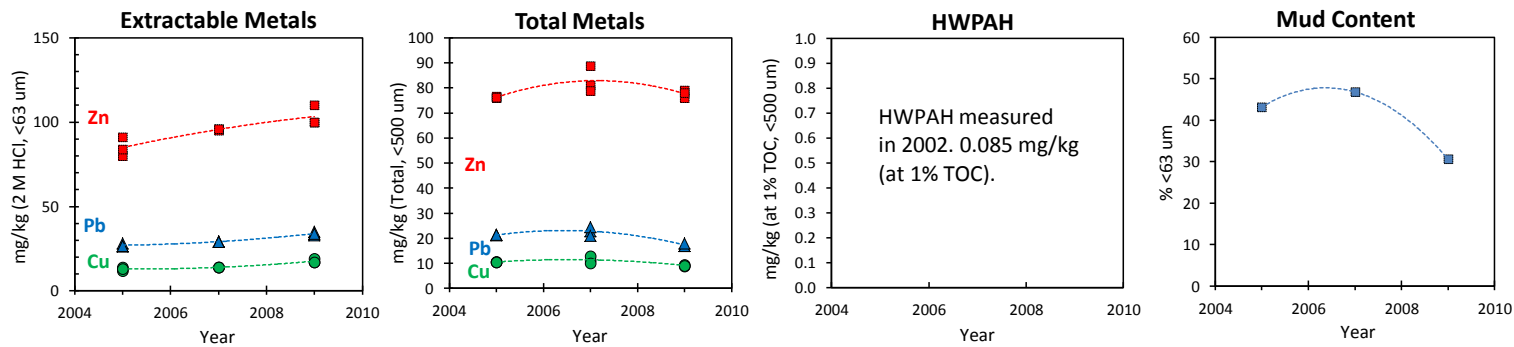


#### Additional Notes

Sampling conducted in 2002 from a site closer to shore than the RDP site sampled in 2005, 2007 & 2009 (shown above). Data indicates 2002 site was sandier than the muddy RDP site.

Site	Description	ERC Status	Trends & Comments
Pollen Island	Muddy OZ site. Texture ranges from sand/shell (near shore) to mud nearer the LT channel. 2002 site closer to shore.	<div style="display: flex; flex-wrap: wrap; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Cu</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Pb</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Zn</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">PAH</div> </div>	4 year monitoring period. Toolittle data for reliable trend assessment. 2002 data not included here (texture indicates site location in-shore where sediments are sandier). Current contaminant status - ERC Amber/Green. PAH green in 2002.
Reporting Area			
Central Waitemata Harbour			

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2005	43.2	no data	13.0	26.8	84	10.5	21.3	76	no data	no data
2007	46.8	no data	14.0	29.2	96	11.3	22.9	81	no data	no data
2009	30.6	no data	17.0	34.0	100	9.1	17.0	78	no data	no data
Median	43.2	no data	14.0	29.2	96	10.5	21.1	78	no data	no data
Trend (absolute units per year)	-3.1	no value	1.2	1.7	4.6	-0.4	-1.0	0.4	no value	no value
Trend (% of median per year)	↓ -7.3	no value	↑ 8.3	↑ 5.9	↑ 4.8	↓ -3.3	↓ -4.7	→ 0.5	no value	no value

**Environmental Response Criteria (ERC)**

Cu <19 Pb <30 Zn <124 PAH <0.66
Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7
Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction data

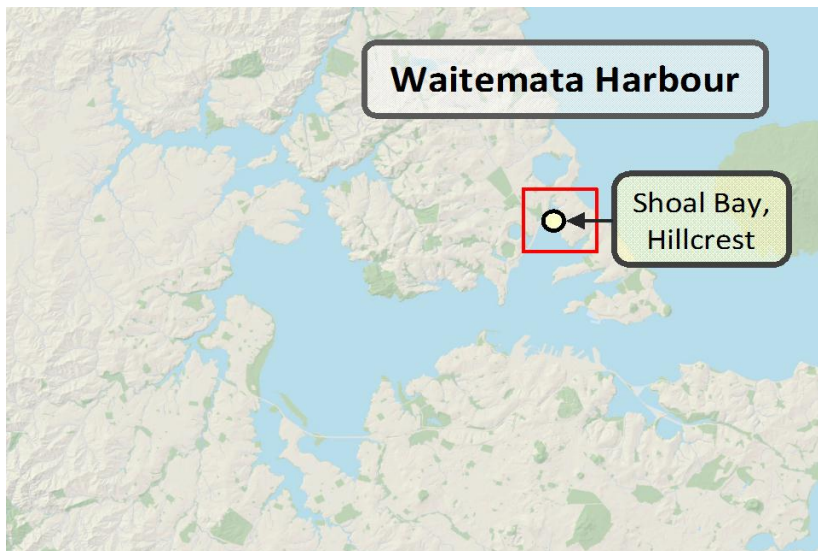
**Trend Indicators**

↔ < ±1%
↕ ±1 - 2%
↕ > ±2%

Average annual rate of change, as % of median per year

### 1.26 Shoal Bay, Hillcrest

Site	Type	Description & Notes
Shoal Bay, Hillcrest	Muddy SZ	
Reporting Area	Land Use	Site is located in the upper reaches of Shoal Bay . The texture here is deep mud. Catchment is mature urban, including commercial land uses and major roads (including motorway).
Central Waitemata Harbour	Mature urban	

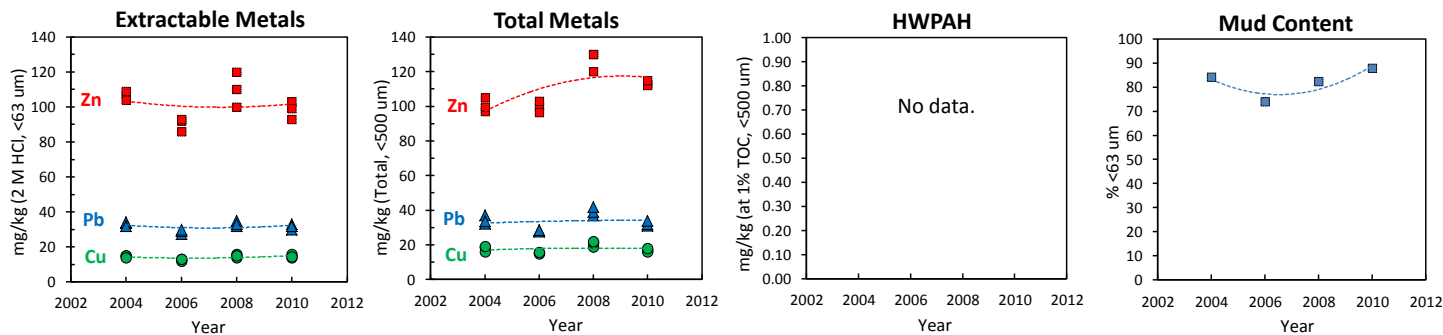


#### Additional Notes

"Hillcrest East" on the opposite (eastern) side of the low tide channel has been sampled on one occasion, in 2010, to check comparability of a location closer to the estuary access. Metals' concentrations were similar to those at the Hillcrest RDP site (see 2010 RDP report).

Site	Description	ERC Status	Trends & Comments
Shoal Bay, Hillcrest	Muddy SZ site in upper reaches of Shoal Bay. Urban catchment.	<div style="display: flex; flex-wrap: wrap;"> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Cu</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Pb</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Zn</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">PAH</div> </div>	6 year monitoring period. Current contaminant status ERC-Amber. No major trends.
Reporting Area			
Central Waitemata Harbour			

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAP (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2004	84.3	no data	15.0	33.5	107	18.6	33.6	100	no data	no data
2006	73.9	no data	13.0	29.0	92	15.4	28.3	100	no data	no data
2008	82.3	no data	15.0	33.0	110	21.0	39.0	130	no data	no data
2010	87.8	no data	14.5	32.0	99	17.0	32.0	113	no data	no data
Median	83.3	no data	14.3	32.0	102	17.5	32.9	109	no data	no data
Trend (absolute units per year)	0.9	no value	0.1	0.0	-0.3	0.1	0.3	3.3	no value	no value
Trend (% of median per year)	1.1	no value	0.9	0.0	-0.3	0.8	0.8	3.0	no value	no value

**Environmental Response Criteria (ERC)**

Cu <19 Pb <30 Zn <124 PAH <0.66	Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7	Cu >34 Pb >50 Zn >150 PAH >1.7
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ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction data

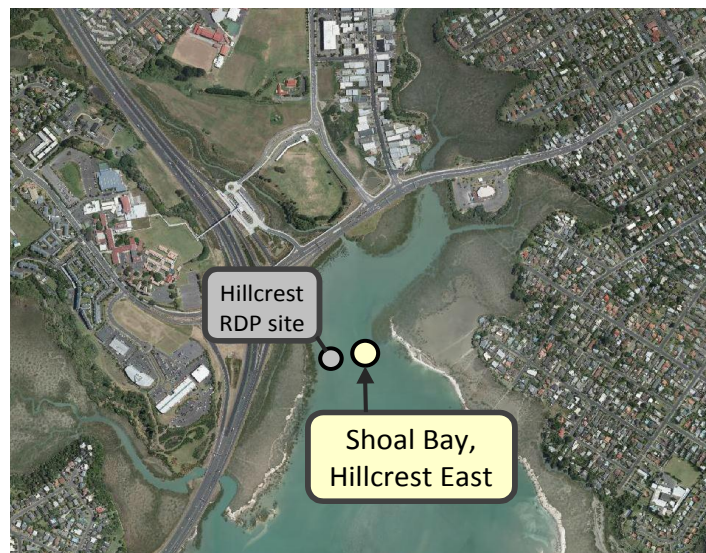
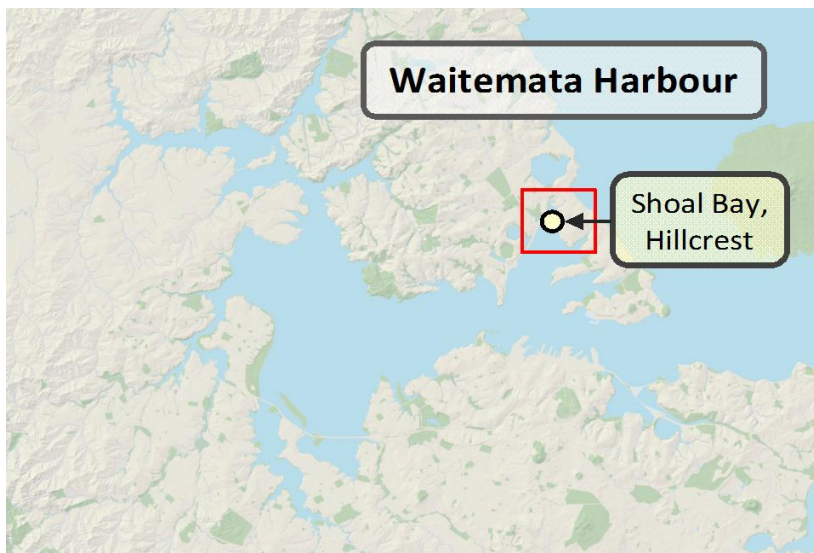
**Trend Indicators**

⇐ < ±1%	↔ ±1 - 2%	⇨ > ±2%
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Average annual rate of change, as % of median per year

### 1.27 Shoal Bay, Hillcrest East

Site	Type	Description & Notes
Shoal Bay, Hillcrest East	Muddy SZ	
Reporting Area	Land Use	Site is located in the upper reaches of Shoal Bay, opposite the Shoal Bay Hillcrest RDP site . The sediment here is very deep mud. Catchment is mature urban, including commercial land uses and major roads (including motorway). Site sampled in case access across the low tide channel to the RDP site becomes problematic.
Central Waitemata Harbour	Mature urban	



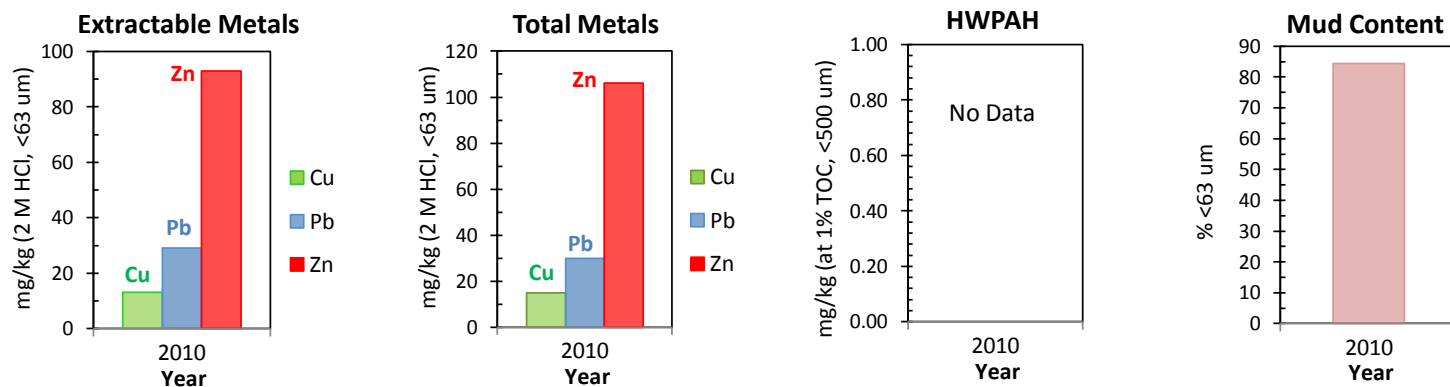
#### Additional Notes

Metals' concentrations and particle size distribution at Hillcrest East were found to be similar to those at the Hillcrest RDP site (see 2010 RDP report).



Site	Description	ERC Status	Trends & Comments
Shoal Bay, Hillcrest East	Muddy SZ site in upper reaches of Shoal Bay. Site located on opposite side of LT channel to RDP site. Urban catchment.	<div style="display: flex; flex-wrap: wrap;"> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Cu</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Pb</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Zn</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">PAH</div> </div>	1 year of monitoring only (2010). No trends can therefore be assessed. Current contaminant status ERC-Amber. This site sampled to check contaminant levels compared with Shoal Hillcrest RDP site, in case latter needed to be moved. Metals' levels very similar (see 2010)
Reporting Area			
Central Waitemata Harbour			

### Sediment chemistry summary



### Annual median concentrations. Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% , <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2010	84.4	no data	13.1	29.0	93	15.0	30.0	106	no data	no data
Trend (absolute units per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value
Trend (% of median per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value

### Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

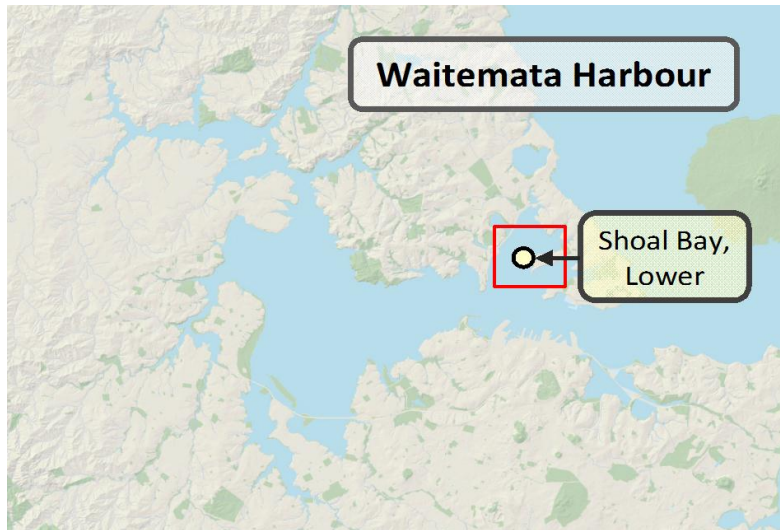
Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fractions. Settling Zones - the <500 µm fraction

### 1.28 Shoal Bay, Lower

Site	Type	Description & Notes
Shoal Bay Lower	Sandy OZ	
Reporting Area	Land Use	Site is located on an extensive exposed sand flat in the lower reaches of Shoal Bay. The texture here is slightly muddy sand. Shoal Bay catchment is mature urban, including commercial land uses and major roads (including motorway).
Central Waitemata Harbour	Mature urban	

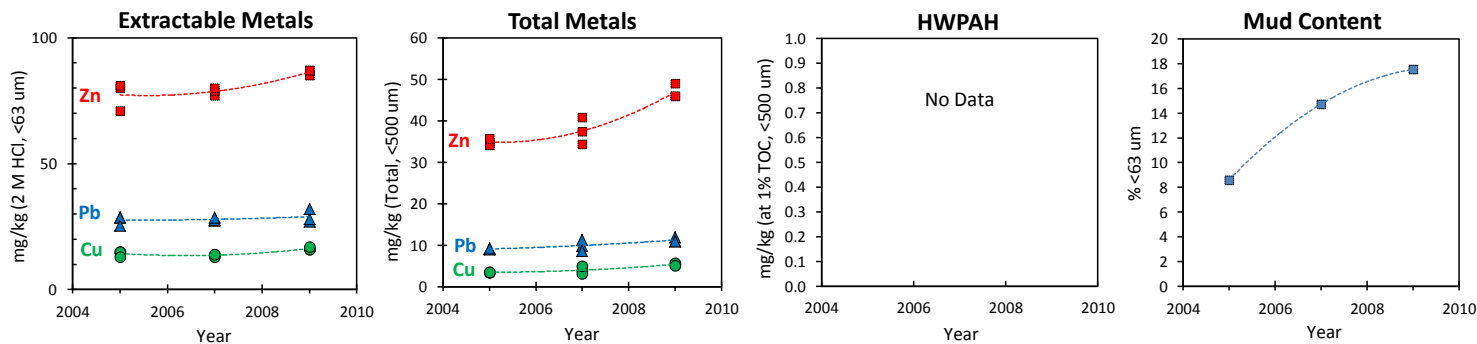


#### Additional Notes

Site may be affected by mud movement and temporary deposition in response to combined effects of storms, wind, tides etc. Markedly softer and muddier texture found along low tide channel (to east of site). Filamentous algal mats have been observed on the site. 2002 sampling (URS for NSCC) from similar location (but called "Mid-Shoal Bay"). PSD method used in 2002 was different from that used in 2005-2009 (in RDP).

Site	Description	ERC Status	Trends & Comments
Shoal Bay, Lower	Muddy-sand OZ site. Extensive sand flat in lower bay. Large urban catchment, inputs from Waitemata Harbour.	<div style="display: flex; flex-wrap: wrap;"> <div style="border: 1px solid gray; padding: 2px; margin: 2px;">Cu</div> <div style="border: 1px solid gray; padding: 2px; margin: 2px;">Pb</div> <div style="border: 1px solid gray; padding: 2px; margin: 2px;">Zn</div> <div style="border: 1px solid gray; padding: 2px; margin: 2px;">PAH</div> </div>	4 year monitoring period. Current contaminant status - ERC Green. Limited data for trends - Zn, Cu, and mud content appear to be increasing. Maintain watch on trends.
Reporting Area			
Central Waitemata Harbour			

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 μm	Organic Carbon TOC (% <500 μm)	Extractable Metals (mg/kg, <63 μm)			Total Metals (mg/kg, <500 μm)			HWPAAH (mg/kg, <500 μm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2005	8.6	no data	15.0	28.6	80	3.6	9.1	35	no data	no data
2007	14.7	no data	14.0	27.7	79	4.0	9.9	37	no data	no data
2009	17.5	no data	16.0	28.0	87	5.4	11.0	46	no data	no data
Median	14.7	no data	15.0	28.0	80	4.0	9.9	37	no data	no data
Trend (absolute units per year)	2.2	no value	0.5	0.4	2.3	0.5	0.5	3.0	no value	no value
Trend (% of median per year)	↑ 15.2	no value	↑ 3.3	↔ 1.3	↑ 2.8	↑ 11.9	↑ 5.5	↑ 8.1	no value	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 μm and <500 μm fraction data. Settling Zones - the <500 μm fraction data

Trend Indicators

↔ < ±1%

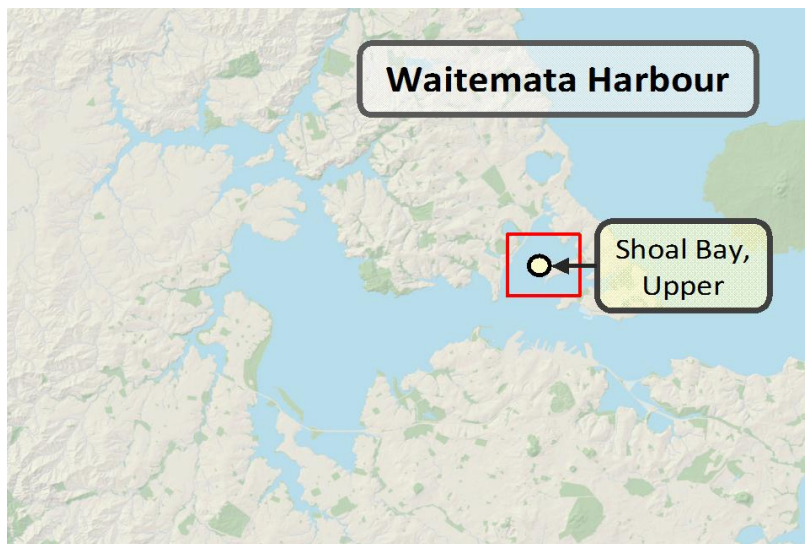
↔ ±1 - 2%

↑↓ > ±2%

Average annual rate of change, as % of median per year

### 1.29 Shoal Bay, Upper

Site	Type	Description & Notes
Shoal Bay Upper	Sandy OZ	
Reporting Area	Land Use	Site is located on a sand flat in the middle reaches of Shoal Bay. The texture here is sand. Shoal Bay catchment is mature urban, including commercial land uses and major roads (including motorway).
Central Waitemata Harbour	Mature urban	

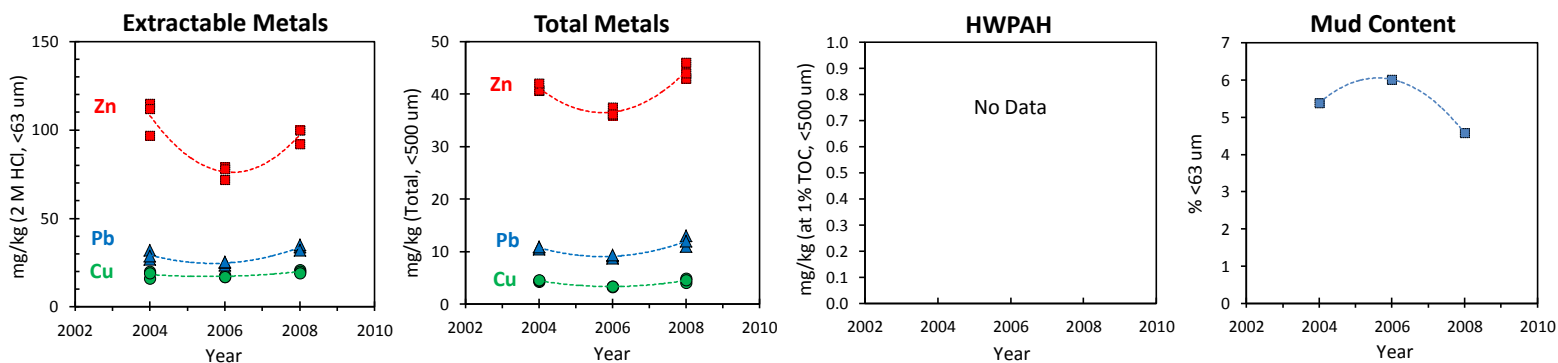


#### Additional Notes

Site may be affected by textural variation (spatially and over time) as it lies between a sand/shell spit (to the east) and a muddier low tide channel (to the north/west).

Site	Description	ERC Status	Trends & Comments
Shoal Bay, Upper	Sandy OZ site located between sand/shell bank and muddy LT channel. Large urban catchment.		4 year monitoring period. Current contaminant status - ERC Amber. Limited data for trends - no major changes to date. Site location not ideal for monitoring - textural variation, unstable zone between sand bar and muddy LT channel.
Reporting Area			
Central Waitemata Harbour			

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 um	Organic Carbon TOC (% , <500 um)	Extractable Metals (mg/kg, <63 um)			Total Metals (mg/kg, <500 um)			HWPAH (mg/kg, <500 um)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2004	5.4	no data	19.0	28.7	112	4.5	10.9	41	no data	no data
2006	6.0	no data	17.0	25.3	78	3.4	9.2	36	no data	no data
2008	4.6	no data	20.0	34.0	100	4.6	12.0	44	no data	no data
Median	5.4	no data	19.0	28.7	97	4.3	10.9	41	no data	no data
Trend (absolute units per year)	-0.2	no value	0.4	1.1	-2.7	0.0	0.3	0.8	no value	no value
Trend (% of median per year)	↓ -3.8	no value	↑ 2.2	↑ 3.8	↓ -2.7	→ 0.4	↑ 2.8	↗ 2.0	no value	no value

**Environmental Response Criteria (ERC)**

Cu <19 Pb <30 Zn <124 PAH <0.66
Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7
Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 um and <500 um fraction data. Settling Zones - the <500 um fraction data

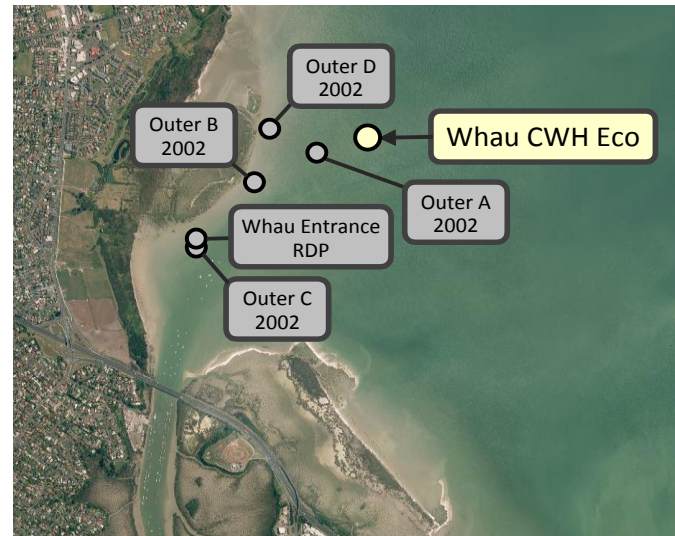
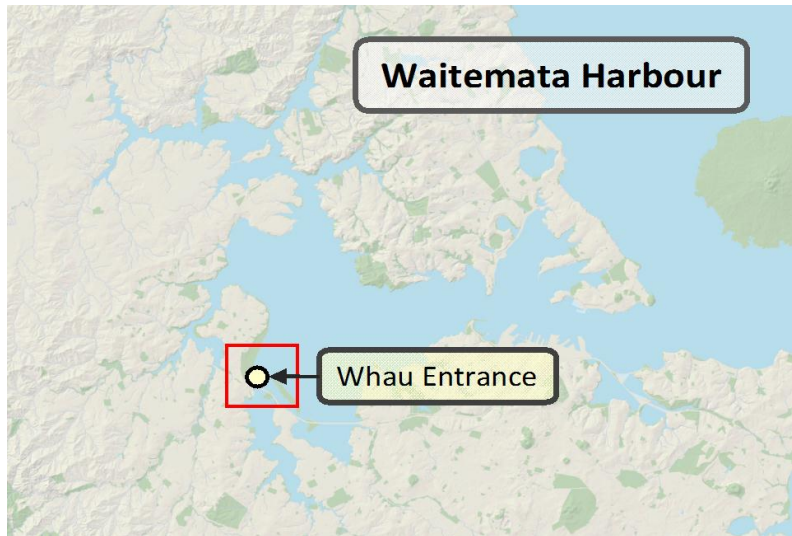
**Trend Indicators**

↔ < ±1%
↗ ↘ ±1 - 2%
↑ ↓ > ±2%

Average annual rate of change, as % of median per year

### 1.30 Whau CWH Ecology site

Site	Type	Description & Notes
Whau CHW Ecology site	Sandy OZ	
Reporting Area	Land Use	Site is located at the mouth of the Whau estuary. Central Waitemata Harbour (CWH) benthic ecology monitoring is conducted at this site. Catchment is high density mature urban. Estuary is highly contaminated. The sediment texture is sand.
Central Waitemata Harbour	Mature urban	

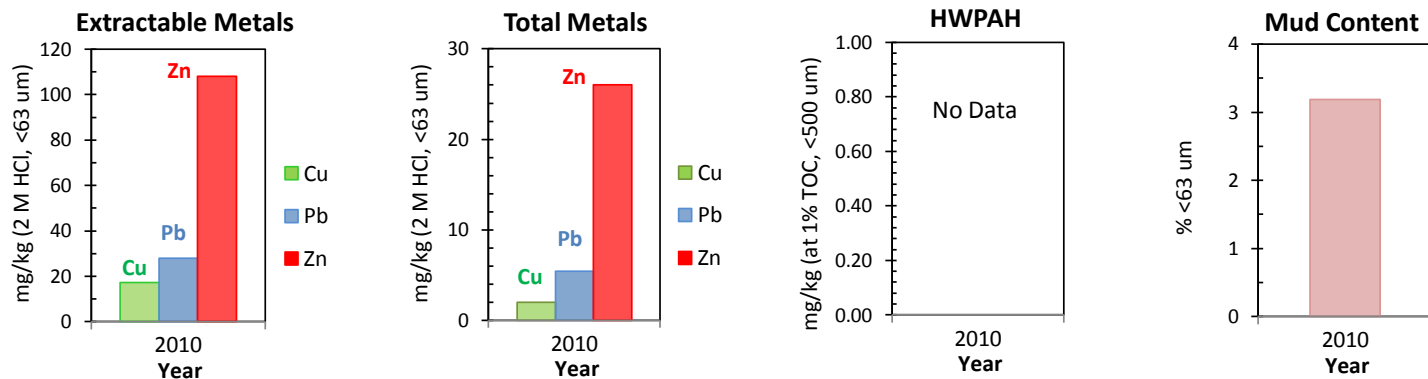


#### Additional Notes

Sediment chemistry sampling undertaken in 2010 only. Other sites sampled nearby are shown in aerial above. Whau Entrance RDP site has been sampled 2004 to 2010, others (Outer A to D) sampled once, in 2002.

Site	Description	ERC Status	Trends & Comments
Whau CWH Ecology site	Sandy OZ site at the entrance to Whau Estuary.	Cu	1 year of monitoring only (2010). No trends can therefore be assessed. Current contaminant status ERC-Green. Mud fraction metals' levels moderate. Total Cu concentrations are <2 mg/kg (below detection limits).
Reporting Area		Pb	
Central Waitemata Harbour		Zn	
		PAH	

### Sediment chemistry summary



Annual median concentrations. Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% , <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2010	3.2	no data	17.2	28.0	108	2.0	5.4	26	no data	no data
Trend (absolute units per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value
Trend (% of median per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value

### Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

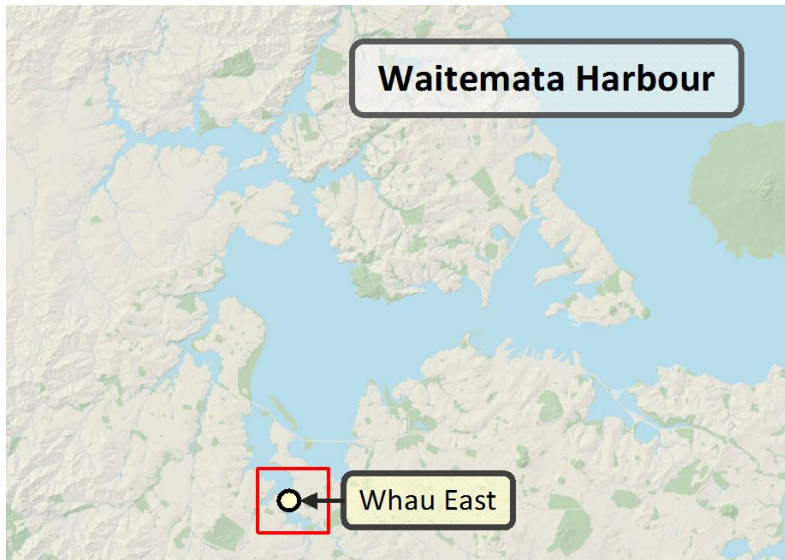
Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fractions. Settling Zones - the <500 µm fraction

### 1.31 Whau East

Site	Type	Description & Notes
Whau East	Muddy SZ	
Reporting Area	Land Use	Site is located in the middle-to-upper reaches of the Whau estuary. Catchment is high density mature urban. Estuary is highly contaminated. The sediment texture is not documented, but likely to be muddy.
Central Waitemata Harbour	Mature urban	



#### Additional Notes

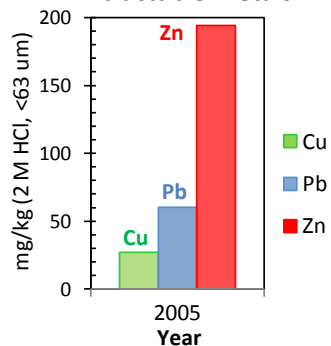
Sampling undertaken in 2005 only (BHM?).



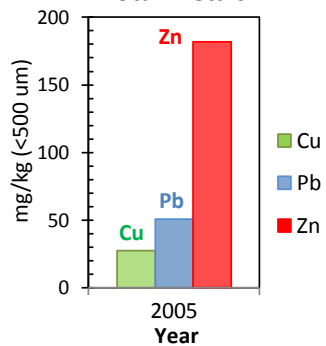
Site	Description	ERC Status	Trends & Comments
Whau East	Muddy SZ site in main stem of Whau Estuary, between Whau Upper & Wairau (SoE sites). Urban catchment influences.	<div style="display: flex; flex-wrap: wrap; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Cu</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Pb</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Zn</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">PAH</div> </div>	1 year of monitoring only (2005). No trends can therefore be assessed. Current contaminant status ERC-Red.
Reporting Area			
Central Waitemata Harbour			

### Sediment chemistry summary

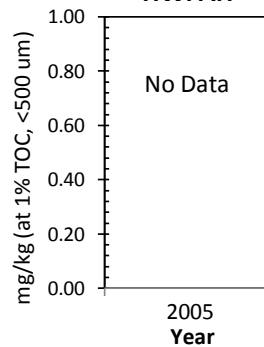
**Extractable Metals**



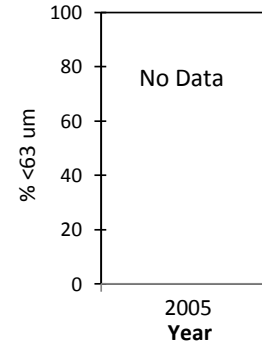
**Total Metals**



**HWPAH**



**Mud Content**



### Annual median concentrations. Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% , <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2005	no data	no data	27.0	60.3	194	27.3	50.6	182	no data	no data
Trend (absolute units per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value
Trend (% of median per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value

### Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66	Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7	Cu >34 Pb >50 Zn >150 PAH >1.7
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ERC: For Outer Zones - the greater of the <63 µm and <500 µm fractions. Settling Zones - the <500 µm fraction

### 1.32 Whau Entrance

Site	Type	Description & Notes
Whau Entrance	Sandy OZ	
Reporting Area	Land Use	Site is located at the mouth of the Whau estuary. Catchment is high density mature urban. Estuary is highly contaminated. The sediment texture is firm sand.
Central Waitemata Harbour	Mature urban	

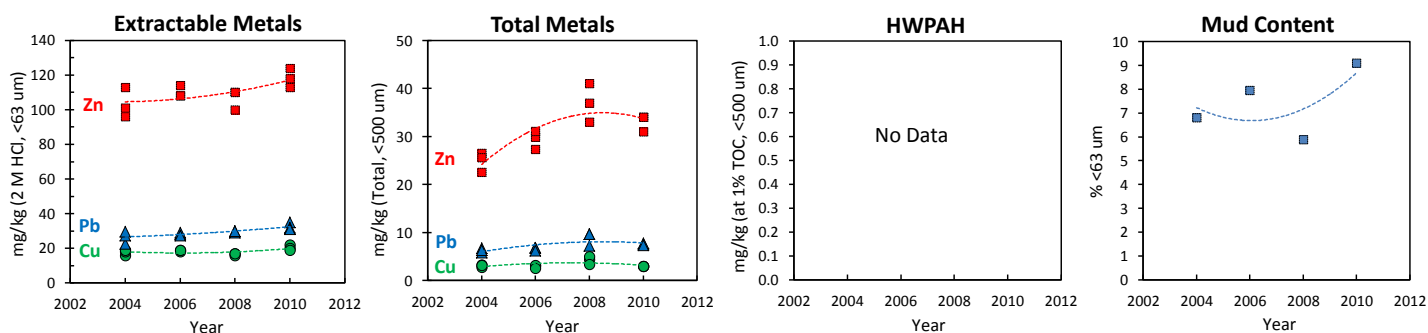


#### Additional Notes

Sampling undertaken in RDP from 2004 to 2010. Sampling also undertaken in 2002 at very close location called "Whau Outer C" (KML for ARC).

Site	Description	ERC Status	Trends & Comments
Whau Entrance	Sandy OZ site. Large urban catchment. Inner Whau Estuary sites contaminated.	<div style="display: flex; flex-wrap: wrap;"> <div style="margin: 2px;">Cu</div> <div style="margin: 2px;">Pb</div> <div style="margin: 2px;">Zn</div> <div style="margin: 2px;">PAH</div> </div>	6 year monitoring period (2002 data from "Whau Outer C" site not included). Current contaminant status ERC-Amber. Zn & Pb may be increasing?
Reporting Area			
Central Waitemata Harbour			

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% , <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2004	6.8	no data	18.0	27.4	101	3.2	6.3	26	no data	no data
2006	7.9	no data	19.0	28.3	108	3.1	6.8	30	no data	no data
2008	5.9	no data	17.0	30.0	110	4.4	9.7	37	no data	no data
2010	9.1	no data	20.0	32.0	118	3.0	7.6	34	no data	no data
Median	7.4	no data	18.5	29.4	110	3.2	7.0	31	no data	no data
Trend (absolute units per year)	0.2	no value	0.3	1.0	2.1	0.1	0.3	1.6	no value	no value
Trend (% of median per year)	↑ 3.3	no value	↗ 1.6	↑ 3.4	↗ 1.9	↗ 1.6	↑ 4.4	↑ 5.1	no value	no value

**Environmental Response Criteria (ERC)**

Cu <19 Pb <30 Zn <124 PAH <0.66
Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7
Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction data

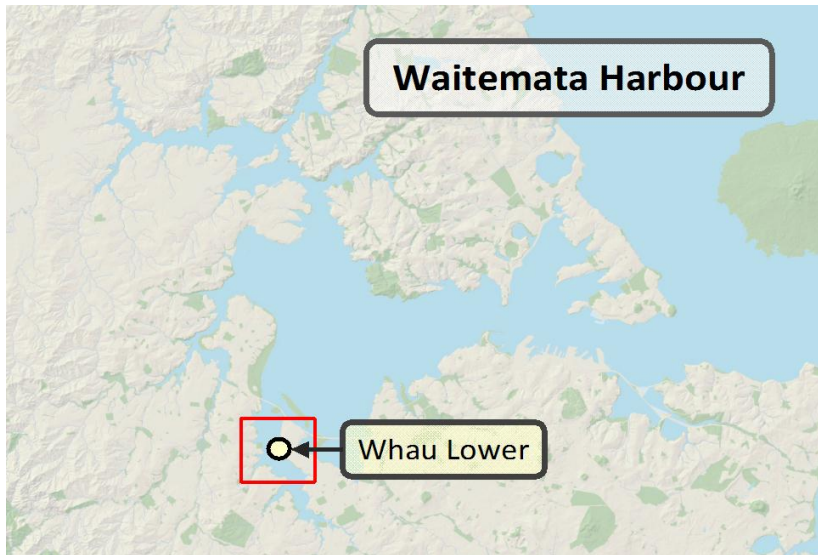
**Trend Indicators**

↔ < ±1%
↗ ↘ ±1 - 2%
↑ ↓ > ±2%

Average annual rate of change, as % of median per year

### 1.33 Whau Lower (SoE)

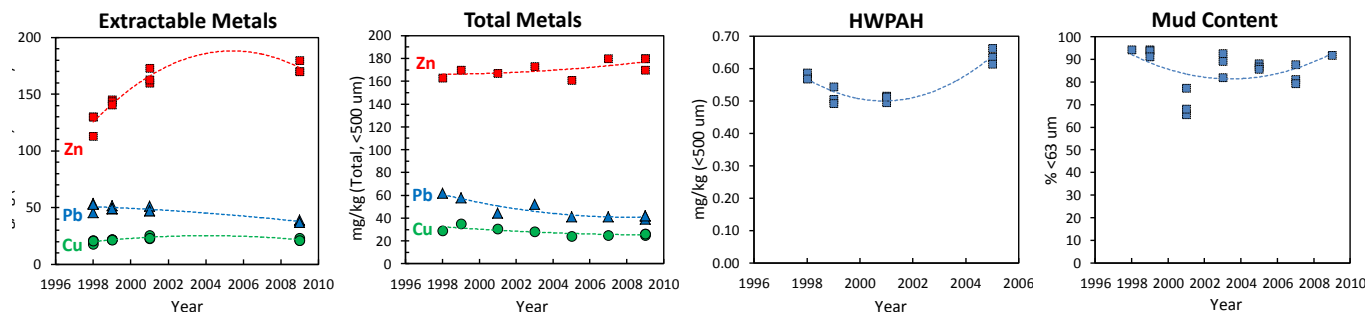
Site	Type	Description & Notes
Whau Lower (SoE)	Muddy SZ	
Reporting Area	Land Use	Site is located in the lower reaches of the Whau estuary. Catchment is high density mature urban. Neighbouring landuse is commercial & industrial. Estuary is highly contaminated. The sediment texture is deep mud.
Central Waitemata Harbour	Mature urban	



**Additional Notes**

Site	Description	ERC Status	Trends & Comments
Whau Lower (SoE)	Muddy SZ site. Urbanising catchment.	<div style="display: flex; flex-wrap: wrap;"> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Cu</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Pb</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Zn</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">PAH</div> </div>	11 year monitoring period. Extractable metals' data for 2003-2007 considered unreliable, therefore not shown. Assess metals' trends from Total Metals. Current contaminant status - ERC Red (Zn). No major changes over time. Pb may be decreasing? Texture analysis problem in 2001 (lower % mud)?

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 μm	Organic Carbon TOC (% <500 μm)	Extractable Metals (mg/kg, <63 μm)			Total Metals (mg/kg, <500 μm)			HWPAAH (mg/kg, <500 μm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
1998	94.3	no data	20.5	52.9	130	28.8	62.0	163	0.575	no data
1999	93.8	no data	21.7	49.4	144	35.2	57.7	170	0.505	no data
2001	68.1	no data	23.0	47.2	163	30.7	44.5	167	0.514	no data
2003	89.3	2.02	no data	no data	no data	28.0	52.1	173	no data	no data
2005	86.8	1.90	no data	no data	no data	24.2	41.3	161	0.636	0.338
2007	81.2	1.80	no data	no data	no data	25.0	41.0	180	no data	no data
2009	91.9	no data	21.0	37.0	170	26.0	42.0	180	no data	no data
Median	87.8	1.90	21.6	48.1	152	26.0	42.0	170	0.557	0.338
Trend (absolute units per year)	-0.2	-0.05	0.1	-1.2	3.7	-0.6	-1.6	1.1	0.012	no value
Trend (% of median per year)	⇒ -0.2	⇩ -2.5	⇒ 0.3	⇩ -2.5	⇧ 2.4	⇩ -2.4	⇩ -3.9	⇒ 0.6	⇧ 2.2	no value

**Environmental Response Criteria (ERC)**

Cu <19 Pb <30 Zn <124 PAH <0.66
Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7
Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 μm and <500 μm fraction data. Settling Zones - the <500 μm fraction data

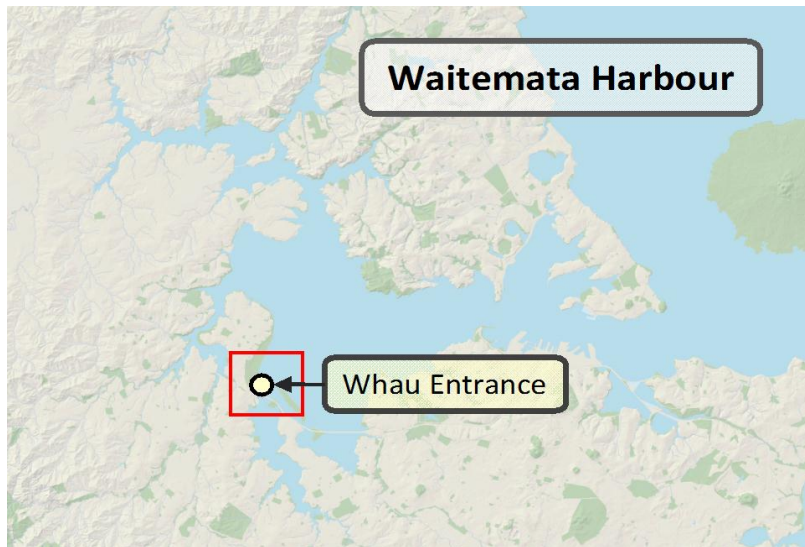
**Trend Indicators**

⇒ < ±1%
⇧⇩ ±1 - 2%
⇧⇩ > ±2%

Average annual rate of change, as % of median per year

### 1.34 Whau Outer A

Site	Type	Description & Notes
Whau Outer A	Sandy OZ	
Reporting Area	Land Use	Site is located outside the mouth of the Whau estuary. Catchment is high density mature urban. Inner estuary is highly contaminated. The sediment texture is not recorded, but is likely to be sandy.
Central Waitemata Harbour	Mature urban	

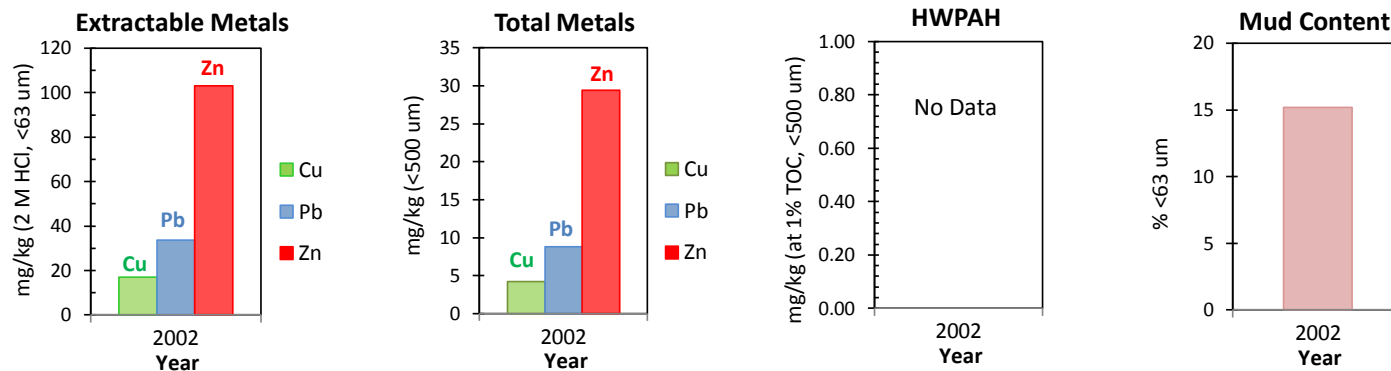


#### Additional Notes

Sampling undertaken in RDP from 2004 to 2010 at "Whau Entrance". Sampling undertaken in 2002 at nearby locations called Whau Outer A, B, C, and D (KML for ARC).

Site	Description	ERC Status	Trends & Comments				
Whau Outer A	Sandy OZ site outside the entrance to Whau Estuary (ca. 1.5 km from SH16 bridge). Urban catchment.	<table border="1"> <tr> <td>Cu</td> <td>Pb</td> </tr> <tr> <td>Zn</td> <td>PAH</td> </tr> </table>	Cu	Pb	Zn	PAH	1 year of monitoring only (2002). No trends can therefore be assessed. Current contaminant status ERC-Amber.
Cu	Pb						
Zn	PAH						
Reporting Area							
Central Waitemata Harbour							

### Sediment chemistry summary



### Annual median concentrations. Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% , <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2002	15.2	no data	17.0	33.7	103	4.2	8.8	29	no data	no data
Trend (absolute units per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value
Trend (% of median per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value

### Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

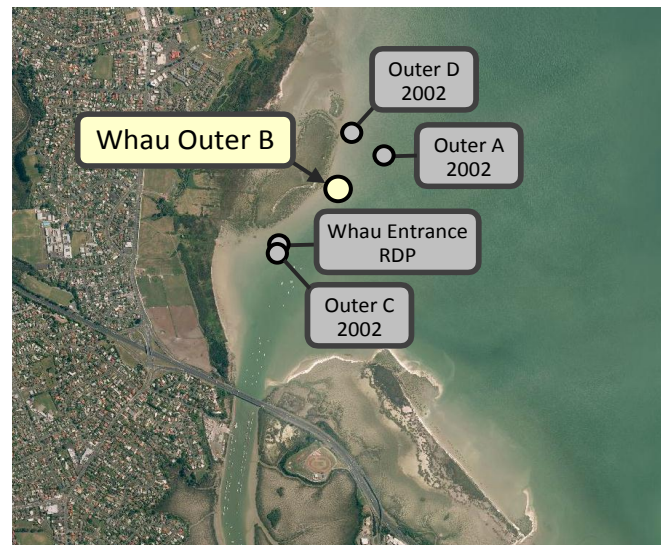
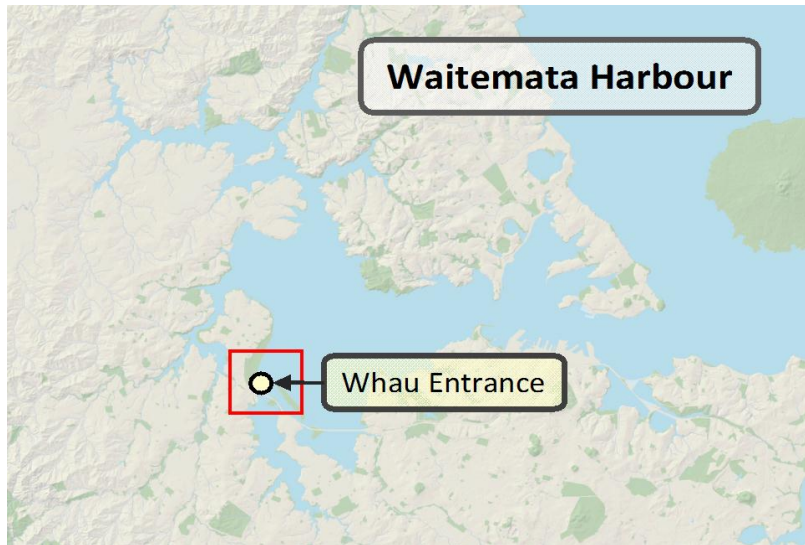
Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fractions. Settling Zones - the <500 µm fraction

### 1.35 Whau Outer B

Site	Type	Description & Notes
Whau Outer B	Sandy OZ	
Reporting Area	Land Use	Site is located outside the mouth of the Whau estuary. Catchment is high density mature urban. Inner estuary is highly contaminated. The sediment texture is not recorded, but is likely to be sandy.
Central Waitemata Harbour	Mature urban	



#### Additional Notes

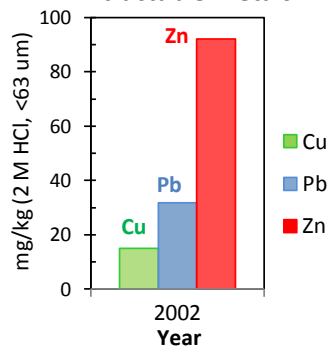
Sampling undertaken in RDP from 2004 to 2010 at "Whau Entrance". Sampling undertaken in 2002 at nearby locations called Whau Outer A, B, C, and D (KML for ARC).



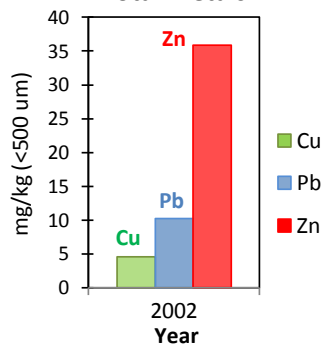
Site	Description	ERC Status	Trends & Comments
<p>Whau Outer B</p> <p>Reporting Area</p> <p>Central Waitemata Harbour</p>	Sandy OZ site outside the entrance to Whau Estuary (ca. 1.2 km from SH16 bridge). Urban catchment.	<div style="display: flex; flex-wrap: wrap;"> <div style="border: 1px solid gray; padding: 2px; margin: 2px;">Cu</div> <div style="border: 1px solid gray; padding: 2px; margin: 2px;">Pb</div> <div style="border: 1px solid gray; padding: 2px; margin: 2px;">Zn</div> <div style="border: 1px solid gray; padding: 2px; margin: 2px;">PAH</div> </div>	1 year of monitoring only (2002). No trends can therefore be assessed. Current contaminant status ERC-Amber.

### Sediment chemistry summary

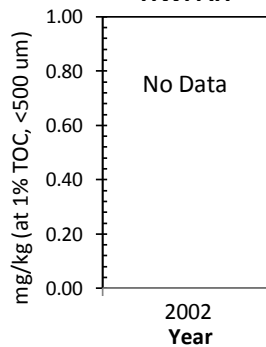
**Extractable Metals**



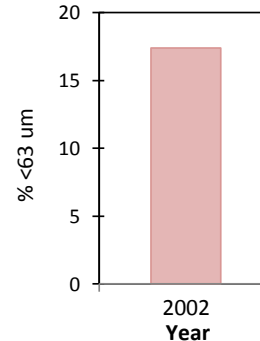
**Total Metals**



**HWPAH**



**Mud Content**



### Annual median concentrations. Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2002	17.4	no data	15.0	31.7	92	4.6	10.2	36	no data	no data
Trend (absolute units per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value
Trend (% of median per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value

### Environmental Response Criteria (ERC)

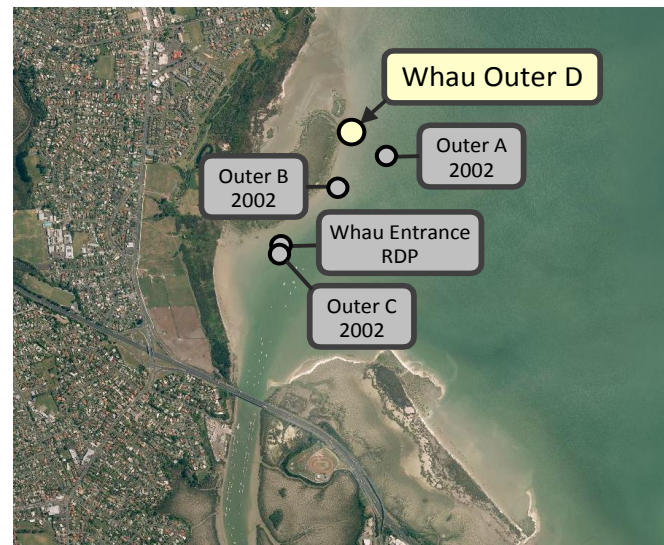
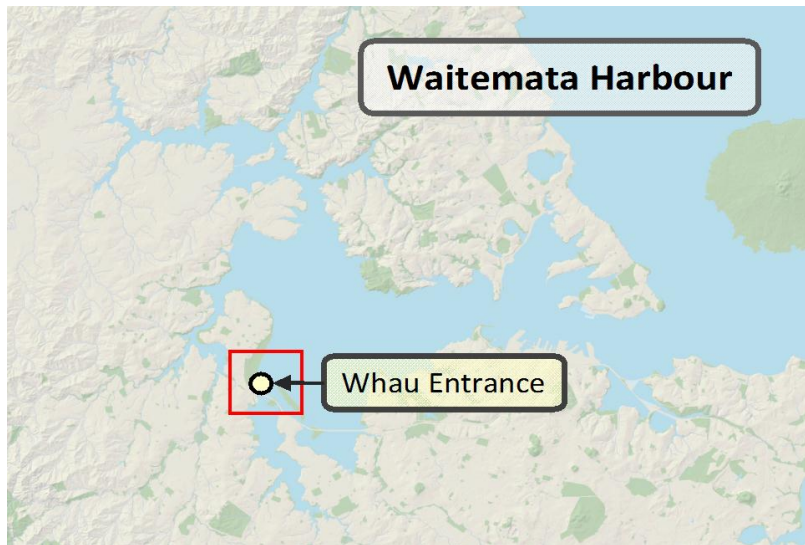
Cu <19 Pb <30 Zn <124 PAH <0.66	Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7	Cu >34 Pb >50 Zn >150 PAH >1.7
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ERC: For Outer Zones - the greater of the <63 µm and <500 µm fractions. Settling Zones - the <500 µm fraction

### 1.36 Whau Outer D

Site	Type	Description & Notes
Whau Outer D	Sandy OZ	
Reporting Area	Land Use	
Central Waitemata Harbour	Mature urban	

Site is located outside the mouth of the Whau estuary. Catchment is high density mature urban. Inner estuary is highly contaminated. The sediment texture is not recorded, but is likely to be sandy.

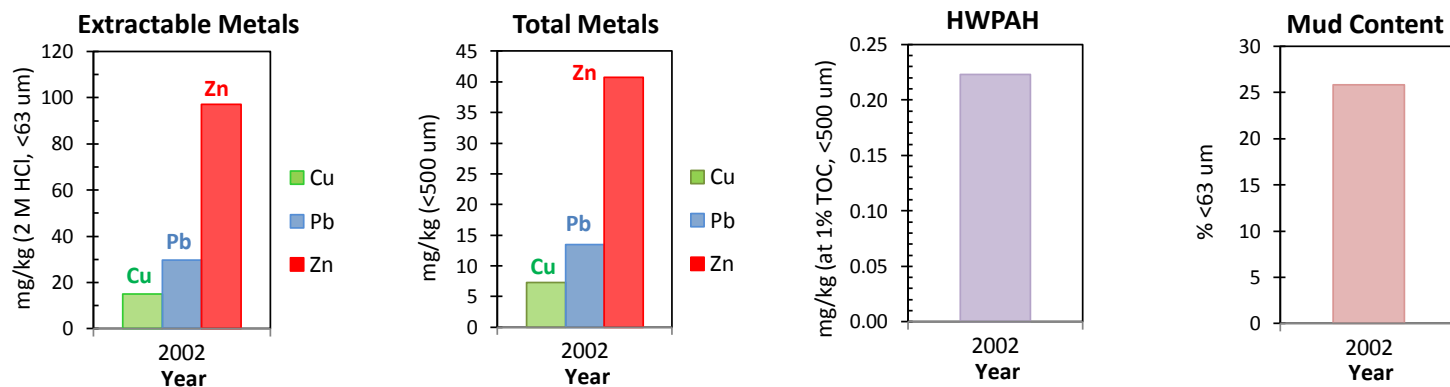


#### Additional Notes

Sampling undertaken in RDP from 2004 to 2010 at "Whau Entrance". Sampling undertaken in 2002 at nearby locations called Whau Outer A, B, C, and D (KML for ARC).

Site	Description	ERC Status	Trends & Comments
Whau Outer D	Sandy OZ site outside the entrance to Whau Estuary (ca. 1.5 km from SH16 bridge). Urban catchment.	<div style="display: flex; flex-wrap: wrap; justify-content: space-around;"> <div style="border: 1px solid gray; padding: 2px; margin: 2px;">Cu</div> <div style="border: 1px solid gray; padding: 2px; margin: 2px;">Pb</div> <div style="border: 1px solid gray; padding: 2px; margin: 2px;">Zn</div> <div style="border: 1px solid gray; padding: 2px; margin: 2px;">PAH</div> </div>	1 year of monitoring only (2002). No trends can therefore be assessed. Current contaminant status ERC-Green.
Reporting Area			
Central Waitemata Harbour			

### Sediment chemistry summary



### Annual median concentrations. Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% , <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2002	25.8	0.49	15.0	29.6	97	7.3	13.5	41	0.106	0.223
Trend (absolute units per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value
Trend (% of median per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value

### Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fractions. Settling Zones - the <500 µm fraction

### 1.37 Whau Upper (SoE)

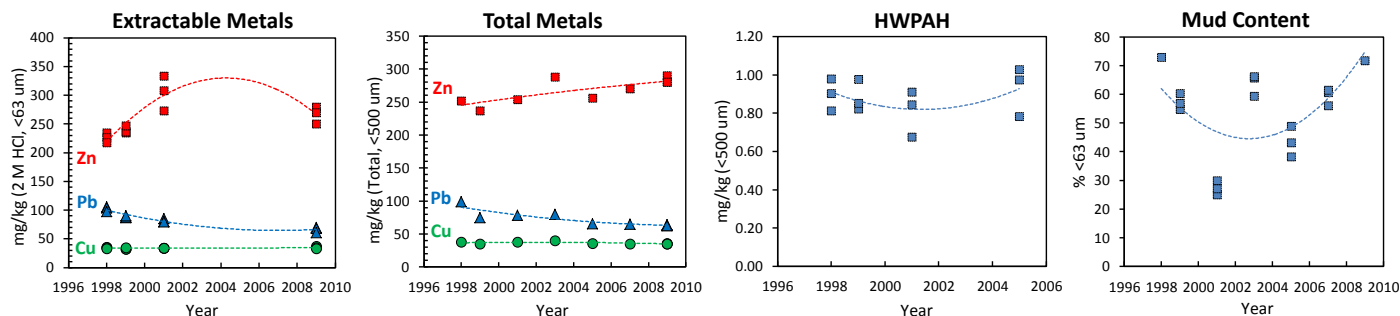
Site	Type	Description & Notes
Whau Upper (SoE)	Muddy SZ	
Reporting Area	Land Use	Site is located in the upper reaches of the Whau estuary. Catchment is high density mature urban. Neighbouring landuse is residential, but commercial & industrial areas upstream. Estuary is highly contaminated. The sediment texture is deep mud.
Central Waitemata Harbour	Mature urban	



**Additional Notes**

Site	Description	ERC Status	Trends & Comments
Whau Upper (SoE)	Muddy SZ site. Urban catchment.	Cu Pb Zn PAH	11 year monitoring period. Extractable metals' data for 2003-2007 considered unreliable, therefore not shown. Assess metals' trends from Total Metals. Current contaminant status - ERC Red (metals). Pb may be decreasing? Zn may be slowly increasing? Mud content variable, analysis problem in 2001?
Reporting Area			
Central Waitemata Harbour			

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% , <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
1998	73.0	no data	34.8	104.3	227	37.8	99.0	252	0.905	no data
1999	56.9	no data	32.7	87.5	236	35.1	74.7	237	0.853	no data
2001	27.2	no data	33.9	80.8	308	37.6	78.3	254	0.845	no data
2003	65.8	2.66	no data	no data	no data	40.0	80.2	288	no data	no data
2005	43.2	2.57	no data	no data	no data	36.0	65.6	256	0.974	0.379
2007	60.8	2.30	no data	no data	no data	35.0	65.0	270	no data	no data
2009	71.8	no data	35.0	68.0	270	35.0	63.0	280	no data	no data
Median	56.9	2.57	34.0	86.2	249	36.0	65.6	270	0.879	0.379
Trend (absolute units per year)	0.7	-0.09	0.1	-2.8	2.6	-0.2	-2.3	3.2	0.005	no value
Trend (% of median per year)	↗ 1.3	↘ -3.6	↔ 0.3	↘ -3.2	↗ 1.1	↔ -0.5	↘ -3.6	↗ 1.2	↔ 0.5	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66      Cu 19-34 Pb 30-50 Zn 124-150 PAH 0.66-1.7      Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction data

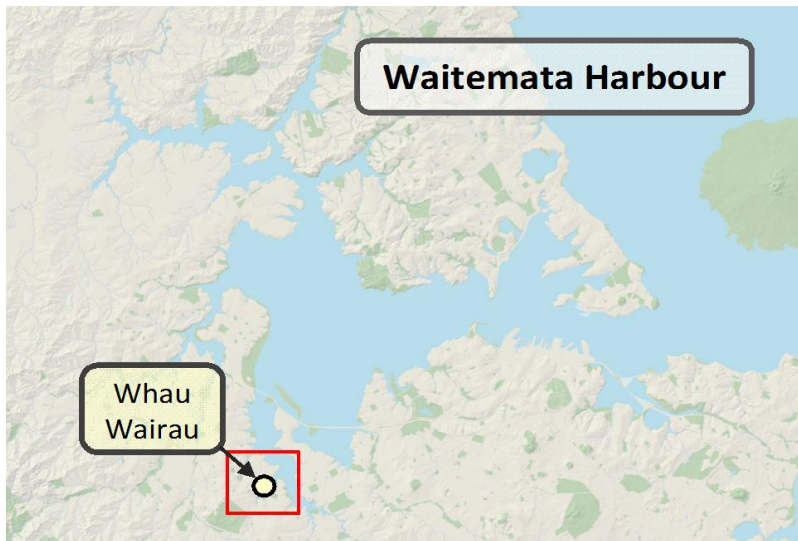
Trend Indicators

↔ < ±1%      ↗ ↘ ±1 - 2%      ↕ > ±2%

Average annual rate of change, as % of median per year

### 1.38 Whau Wairau (SoE)

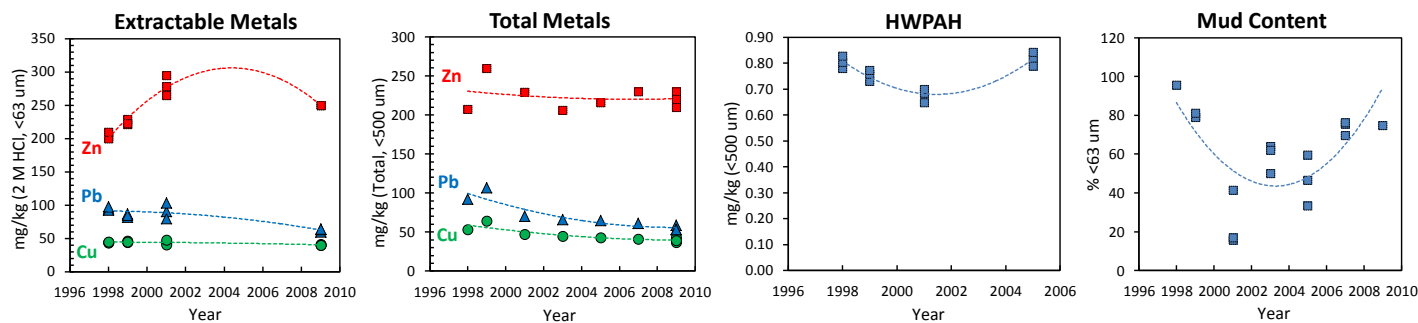
Site	Type	Description & Notes
Whau Wairau (SoE)	Muddy SZ	
Reporting Area	Land Use	Site is located in the narrow upper reaches of the Wairau Creek arm of the Whau estuary. Catchment is high density mature urban. Neighbouring landuse is commercial, industrial & residential. Estuary is highly contaminated. The sediment texture is mud.
Central Waitemata Harbour	Mature urban	



**Additional Notes**

Site	Description	ERC Status	Trends & Comments
Whau Wairau (SoE)	Muddy SZ site. Urban catchment.	<div style="display: flex; flex-wrap: wrap;"> <div style="border: 1px solid red; padding: 2px; margin: 2px;">Cu</div> <div style="border: 1px solid red; padding: 2px; margin: 2px;">Pb</div> <div style="border: 1px solid red; padding: 2px; margin: 2px;">Zn</div> <div style="border: 1px solid green; padding: 2px; margin: 2px;">PAH</div> </div>	11 year monitoring period. Extractable metals' data for 2003-2007 considered unreliable, therefore not shown. Assess metals' trends from Total Metals. Current contaminant status - ERC Red (metals). Pb is decreasing? Other changes minor. Mud variable, analysis problem in 2001?
Reporting Area			
Central Waitemata Harbour			

Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% , <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
1998	95.6	no data	43.9	94.2	203	53.5	92.3	207	0.805	no data
1999	79.2	no data	44.7	84.5	223	64.4	106.6	260	0.758	no data
2001	17.0	no data	43.7	90.5	278	47.3	70.4	229	0.685	no data
2003	62.0	1.74	no data	no data	no data	45.0	65.8	206	no data	no data
2005	46.6	1.98	no data	no data	no data	42.9	64.6	216	0.818	0.424
2007	75.5	2.20	no data	no data	no data	41.0	61.0	230	no data	no data
2009	74.8	no data	40.0	63.0	250	39.0	53.0	220	no data	no data
Median	64.0	1.98	43.8	85.6	239	43.0	64.6	220	0.777	0.424
Trend (absolute units per year)	-0.2	0.12	-0.4	-2.7	2.9	-1.6	-3.7	-0.8	0.004	no value
Trend (% of median per year)	→ -0.3	↑ 6.1	→ -0.9	↓ -3.2	↗ 1.2	↓ -3.8	↓ -5.7	→ -0.4	→ 0.5	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66
Cu 19-34 Pb 30-50 Zn 124-150 PAH 0.66-1.7
Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction data

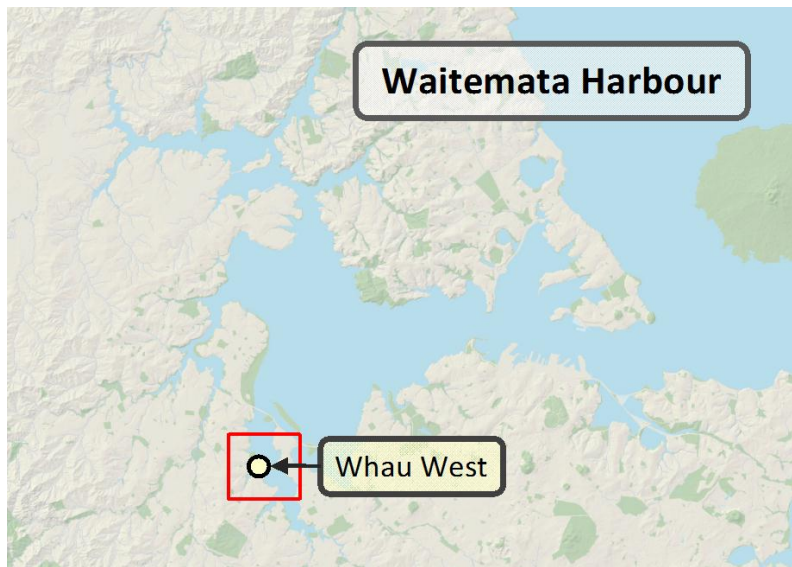
Trend Indicators

→ < ±1%
↔ ±1 - 2%
↕ > ±2%

Average annual rate of change, as % of median per year

### 1.39 Whau West

Site	Type	Description & Notes
Whau West	Muddy SZ	
Reporting Area	Land Use	Site is located in the lower reaches of the Whau estuary, opposite the Whau Lower SoE monitoring site. Catchment is high density mature urban. Estuary is highly contaminated. The sediment texture is not documented, but likely to be muddy.
Central Waitemata Harbour	Mature urban	



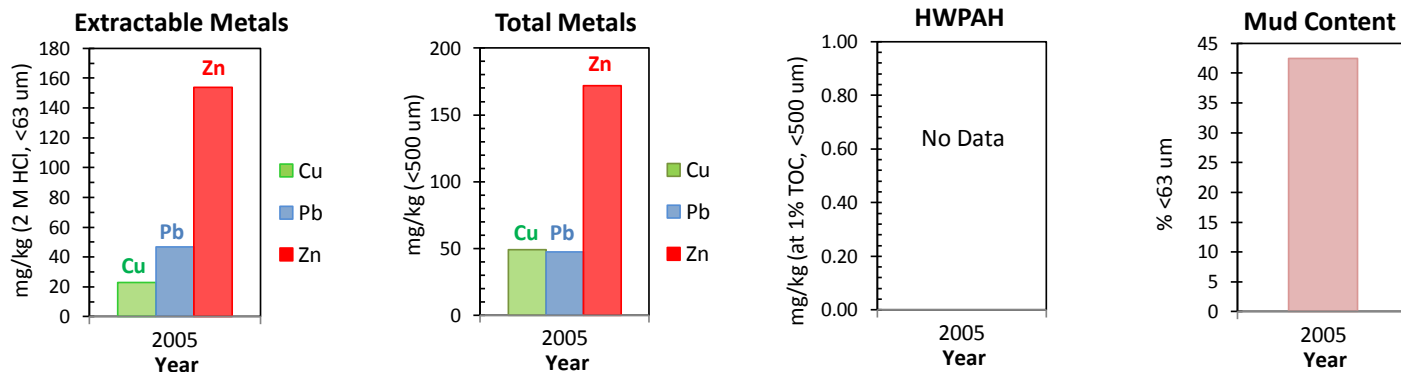
#### Additional Notes

Sampling undertaken in 2005 only (BHM?).



Site	Description	ERC Status	Trends & Comments
Whau West	Muddy SZ site near confluence of Glendene Stream & Whau Estuary main body. Urban catchment.	<div style="display: flex; flex-wrap: wrap;"> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Cu</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Pb</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">Zn</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">PAH</div> </div>	1 year of monitoring only (2005). No trends can therefore be assessed. Current contaminant status ERC-Red.
Reporting Area			
Central Waitemata Harbour			

### Sediment chemistry summary



### Annual median concentrations. Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% , <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2005	42.5	no data	23.0	46.8	154	48.9	47.4	172	no data	no data
Trend (absolute units per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value
Trend (% of median per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value

### Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fractions. Settling Zones - the <500 µm fraction