

Commentary on our big day out October 31st 2015

Good news, both our YSIs are back in business!! Due to difficult weather conditions, the YSI was not able to be used at #81/2/4.

SITE of the day was Ravensbourne Boat club (#85) , it showed high turbidity, high chloro a, super saturated with DO and very low NNN. A localised algal bloom!!

What was the day like?

This was a very tough day out on the harbour. Strong gusty SW whipping up the water, cold and gusty. Scattered cloud cover. In some cases it was impossible to use the YSI.

** Recommend we purchase proper field note books!!! Water proof , keep thinking about this!!!

Tide and harbour conditions.

All observations and sample collection occurred between 1005 and 1230. This was a difficult day in exposed places, very strong SW winds up to 25-30 knots in someplaces. 50-70% ccv and cool.

The tide was high at 0729 at a height of 2.2 m. All data was gathered on an ebbing tide, close to mid tide. Water samples at storm water outfalls influenced by the low water.

Is there anything unusual ?

Fertilizer ship inport, 10-20% sea grass? Or an Ulva species? on flats adjacent to Ravensbourne yacht club, one shopping trolley in the Leith and the smell of sulfur(#89).

Seaweeds.

See the data sheets

Animals

See the data sheets.

Conditions of the surface water and does the water have any real or apparent colour?

Surface conditions very rough, white caps at many sites. The wind has stirred up the sediments into the water column making the water appear quite murky. There was nothing unusual about the colour at the surface of the water.

WE make this observation to check for any unusual discharges, like oil on the surface. The good news is that seldom do we notice any sheens or unusual colours on the surface of the water.

Water temperature

The water temperature ranged from 7.8 °C (#88) – 11.9 °C. (#86) Many readings around 11. The water temperatures are slightly warmer than Sept 12th readings.

The water temperature will have an effect on the solubility of different substances in water, solubility of ions will decrease however the solubility of oxygen and gases will increase.

Freshwater flowing in from the Leith is colder than water entering the harbour mouth in winter.

[Sept 12th 5.0 °C (#88) – 8.5 °C. (#81/2)]

Salinity

Sites that are directly impacted on by the tidal flow showed a range of 30.6 (#86) -33.8 ppt (#83) . The pattern is similar to Sept 12th , suggestion of a gradient of higher salinity close to the mouth of the harbour. All measurements taken close to mid tide.

Some samples were tested in the lab.

[Sept 12th 31.88 (#810) -34.1 ppt (#81/2)]

Open sea salinity 34.998 ppt!!!

Salinity readings more accurate, both YSI instruments are check each time against standard sea water. YSI 2030 measured 33.6 (standard 33.7ppt). YSI 85 measured 32.5 (vs 33.7). These differences are included in our adjusted calculations for salinity and conductivity.

pH

All sites tested. Range was 7.46 (#89) – 9.19(#88).

pH range was greater with most readings around 8.

What about buffers in the water???

[Sept 12th 8.04 (#88) – 8.23(#85)]

Turbidity

All sites tested. Range was 1.47 NTU (#87) – 15.5 (#85) /34.6 NTU (#89).

The water was very disturbed and turbid.

The range was significantly greater than Sept 12th, readings, this is not suprising as the strong SW disturbed the water column. Discharge sites higher than the open water sites

Some turbidity could be explained by the extra phytoplankton in the water, but in this case the sediment is mixing well with the water.

The samplers have to be careful collecting their samples at low tide and avoid including sediment in their samples. It was difficult to collect a sample from #89 as the water was very shallow.

[Sept 12th 0.67 NTU (#83) – 8.9 NTU (#89)]

**** Why is turbidity important?? .**

Light is essential for photosynthesis, increased turbidity will inhibit PS deeper in the water column.

Increased surface area will increase the solubility of nutrients?especially phosphates/heavy metals.

Presence of significant amounts of fine particles in the water column will act against filter feeders!!, may block up their siphons/filters.

Guideline values 0.5-10 NTU ANZECC&ARMCANZ (2000)

All samples within these guidelines except for #85, #88 and #89.

Dissolved oxygen (DO) mg L⁻¹ and % saturation.

The range of DO readings shows a range from sites tested 7.95(#810)-11.5 mg L⁻¹ (#88)
Some of the open water sites have high concentration of dissolved oxygen.
% saturation range 79 (#89) – 109.9 % (#86). Two sites have super saturated water.
The DO values similar to those of Sept 12th, but fewer sites were supersaturated. Generally the water was well oxygenated and saturated with oxygen. All sites have DO concentrations that will support as healthy biological community.
[Sept 12th 9.63 mg L⁻¹ (#83)- 11.52 mg L⁻¹(#86) and 102.3% (#83) – 116 % (#86)]

Chlorophyll a.

The range of values is 1.41 µg L⁻¹ (#87)/1.43 µg L⁻¹(#81/83) - 9.11 µg L⁻¹(#85)/ 6.30 µg L⁻¹(#89). Many sites had quite high values > 3, suggesting good level of biological activity.
Sites in open waters all had lower values.
Sites that had high chloro a concentrations did show very low NNN concentrations eg #85 9.11 µg L⁻¹ chloro a, with 0.87 µmol L⁻¹ NNN, and high turbidity.?? A mini algal bloom.

Values above 5.0 are classified in estuaries as a matter for concern, possible algal blooms???

[Sept 12th No data]

LOW ENVIRONMENTAL HEALTH CATEGORY for open water

0-2 (µg L⁻¹) low

>2-5 medium

>5-10 high

>10 very high

NNN (total dissolved nitrates and nitrites)

Variable readings from different sites.

0.37 µmol L⁻¹(#85) -3.64 µmol L⁻¹(#83) Open water sites. Most sites around 0-3 µmol L⁻¹ **similar to Sept 12th** .

3.32 µmol L⁻¹(#86) –20.62 µmol L⁻¹(#89)/ 29.06 µmol L⁻¹(#88) Storm water /discharge sites **lower values** than Sept 12th

Assume that more NNN being utilised by the phytoplankton. Chloro a levels are **higher** reflecting the **lower** concentration of nutrients. ??

Hypothesis.

A Brief algal bloom!!!!

The phytoplankton will draw down the NNN in the water, is there biological activity developing in the harbour??

[Sept 12th) 0.083 µmol L⁻¹(#85) -3.64 µmol L⁻¹(#83) Open water sites
7.62 µmol L⁻¹(#89) –42.43 µmol L⁻¹(#86)/ 71.28 µmol L⁻¹(#88) Discharge sites]

Seven sites exceed guidelines.

GUIDELINE value 1.79 µ mol L⁻¹ (=0.025 mg N-NO₃⁻¹ L⁻¹)

MED ENVIRONMENTAL HEALTH CATEGORY !!!!!

DRP (dissolved reactive phosphate)

Range of 0.30 $\mu\text{mol L}^{-1}$ (#87) – 1.06 $\mu\text{mol L}^{-1}$ (#85).

The range of values larger than August 22nd and the values are low, could this correlate with the increased biological activity or lack of disturbance of the sediment into the water column ?

[Sept 12th 0.33 $\mu\text{mol L}^{-1}$ (#87) – 1.13 $\mu\text{mol L}^{-1}$ (#89).]

All sites exceed the Guidelines.

GUIDELINE value 0.0322 $\mu\text{mol L}^{-1}$ (= 0.010 mg P- $\text{PO}_4^{3-} \text{L}^{-1}$)

HIGH ENVIRONMENTAL HEALTH CATEGORY

**** We need to be careful with the prep of the mixed reagent, at the first attempt, colour looked good, reaction occurred but the readings kept climbing, suggesting the reaction was continuing.**

Enterococci

Range of values was 1(#81/2)-46 cells 100 mL⁻¹(#84)/45 cells 100 mL⁻¹(#86)/ 68 cells 100 mL⁻¹(#89)/ 168 cells 100 mL⁻¹(#88)

These results reflect on the weather conditions of the day, all sites except 1/2 showed definite indications of *Enterococci*, suggesting the idea that the sediment is a reservoir of the bacteria.

#88 Macandrew bay stormwater exceeded the guideline value.

Guideline value 140 cells per 100mL of sample indicated

***Enterococci* bacteria**

SUMMARY OF DATA.

DATE: **31/10/2015**

What is the weather like?	#81+82	v strong SW,25-30 knots, 50 % ccv
• <i>Air temperature</i>	#82	
• <i>Wind speed and direction</i>	#83	v strong SW,25-30 knots, 50 % ccv
• <i>Cloud cover</i>	#84	very str SW, 25kts, scattered cloud
	#85	Strong SW, 65%ccv
	#86	12oC,Strong SW , 70% ccv, gusty
	#87	10.1oC
	#88	8.7oC

	#89 Gale forceSW,70% ccv #810 9.9oC,gale force SW, about 50%ccv
What is the time, and what stage is the tide? What is the condition of the Leith ? Check websites (Met service and Port otago)	#81+82 1046 #82 #83 1020 #84 1005 #85 half tide, 1210 #86 half, 1230 #87 – #88 – #89 1025 mid tide #810 1055
Is there anything unusual to report (dead crabs, nasty smell, coloured sheen on the water)? <ul style="list-style-type: none"> • Discharge pipes • Any star fish/other animals ?? • Rubbish or litter. 	#81+82 – #82 #83 – #84 #85 Fertilizer ship in port 10-20% seagrass on flats,shopping trolley #86 #87 – #88 – #89 urky, sulfurous smell,dead black swan #810 –
<ul style="list-style-type: none"> • Special seaweeds 	See data sheets
f=few	
s=some	
m=many	
Animals	See data sheets
What condition is the surface of the water?	#81+82 whitecaps/spray #82 #83 Rough white caps #84 v choppy,large waves, white caps #85 Rough white caps,lots of suspendedmatter

	#86	small swells, up from harbour, rough surface
	#87	–
	#88	–
	#89	very turbid, white peaks due to wind
	#810	rough foaming, murky brown
Does the water have any real, or apparent colour?	#81+82	Aqua blue
	#82	
	#83	Blue/green
	#84	Br/green/blue lots of sediments stirred up
	#85	Murky brown colour
	#86	Grey muddy look
	#87	–
	#88	–
	#89	grey-blue
	#810	Murky brown colour

Understanding Estuarine Processes

SITE: _____ DATE: _____

What is the water temperature ?	#81+#82	–
	#82	
	#83	11.2
	#84	–
	#85	11.8
	#86	11.9
	#87	10.6
	#88	7.8
	#89	11.8
	#810	11.2
		°C

<p>What is the salinity of the sample ?</p>	<table border="0"> <tr><td>#81+#82</td><td>_</td></tr> <tr><td>#82</td><td>_</td></tr> <tr><td>#83</td><td>33.79773</td></tr> <tr><td>#84</td><td>_</td></tr> <tr><td>#85</td><td>33.39657</td></tr> <tr><td>#86</td><td>30.58845</td></tr> <tr><td>#87</td><td>32.66235</td></tr> <tr><td>#88</td><td>0.10369</td></tr> <tr><td>#89</td><td>15.65719</td></tr> <tr><td>#810</td><td>33.59556</td></tr> </table> <p style="text-align: right;">ppt</p>	#81+#82	_	#82	_	#83	33.79773	#84	_	#85	33.39657	#86	30.58845	#87	32.66235	#88	0.10369	#89	15.65719	#810	33.59556
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<p>What is the electrical conductivity of the sample ?</p> <p><i>NOTE: record the first conductivity, this is the actual conductivity at this temperature, the next reading is the specific conductance, the conductivity adjusted by the instrument to 25 °C</i></p>	<table border="0"> <tr><td>#81+#82</td><td>_</td></tr> <tr><td>#82</td><td></td></tr> <tr><td>#83</td><td>38.016/</td></tr> <tr><td>#84</td><td>_</td></tr> <tr><td>#85</td><td>38.118/_</td></tr> <tr><td>#86</td><td>35.145/_</td></tr> <tr><td>#87</td><td>35.63/48.45</td></tr> <tr><td>#88</td><td>.18/.270</td></tr> <tr><td>#89</td><td>_/24.25</td></tr> <tr><td>#810</td><td>29.8/_</td></tr> </table> <p style="text-align: right;">mS/cm</p>	#81+#82	_	#82		#83	38.016/	#84	_	#85	38.118/_	#86	35.145/_	#87	35.63/48.45	#88	.18/.270	#89	_/24.25	#810	29.8/_
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<p>What is the pH of the sample ?</p>	<table border="0"> <tr><td>#81+#82</td><td>8.28</td></tr> <tr><td>#82</td><td>8.22</td></tr> <tr><td>#83</td><td>8.1</td></tr> <tr><td>#84</td><td>7.95</td></tr> <tr><td>#85</td><td>8.25</td></tr> <tr><td>#86</td><td>8.26</td></tr> <tr><td>#87</td><td>7.84</td></tr> <tr><td>#88</td><td>9.19</td></tr> <tr><td>#89</td><td>7.46</td></tr> <tr><td>#810</td><td>7.67</td></tr> </table>	#81+#82	8.28	#82	8.22	#83	8.1	#84	7.95	#85	8.25	#86	8.26	#87	7.84	#88	9.19	#89	7.46	#810	7.67
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<p>What is the water turbidity?</p>	<table border="0"> <tr><td>#81+#82</td><td>3.13</td></tr> <tr><td>#82</td><td>2.8</td></tr> <tr><td>#83</td><td>4.63</td></tr> <tr><td>#84</td><td>5.63</td></tr> <tr><td>#85</td><td>15.5</td></tr> </table>	#81+#82	3.13	#82	2.8	#83	4.63	#84	5.63	#85	15.5										
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	#86 8.2 #87 1.47 #88 10.4 #89 34.6 #810 5.14	NTU
What is the oxygen concentration of your sample ? Measure both methods mg/L and % saturation	#81+#82 – #82 #83 8.81 #84 – #85 8.92 #86 9.76 #87 8.12 #88 11.5 #89 – #810 7.95	mg/L
	#81+#82 – #82 #83 99.4 #84 – #85 101.9 #86 109.9 #87 90 #88 94.7 #89 79 #810 89.5	% saturation
What is the chlorophyll a concentration of the sample ? <ul style="list-style-type: none"> Record the volume of water filtered 	#81+#82 1.43 #82 1.81 #83 1.43 #84 4.93 #85 9.11 #86 5.28 #87 1.41 #88 4.42 #89 6.30 #810 2.76 3.54	µg/L

	0-2 low >2-5 medium >5-10 high >10 very high																				
****NNN	<table> <tr><td>#81+#82</td><td>2.5</td></tr> <tr><td>#82</td><td>2.65</td></tr> <tr><td>#83</td><td>3.64</td></tr> <tr><td>#84</td><td>1.2</td></tr> <tr><td>#85</td><td>0.87</td></tr> <tr><td>#86</td><td>3.32</td></tr> <tr><td>#87</td><td>0.37</td></tr> <tr><td>#88</td><td>29.06</td></tr> <tr><td>#89</td><td>20.62</td></tr> <tr><td>#810</td><td>1.07</td></tr> </table> <p style="text-align: right;">μmol/L</p>	#81+#82	2.5	#82	2.65	#83	3.64	#84	1.2	#85	0.87	#86	3.32	#87	0.37	#88	29.06	#89	20.62	#810	1.07
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What is the enterococci count in the sample ?	<table> <tr><td>#81+#82</td><td>2</td></tr> <tr><td>#82</td><td>1</td></tr> <tr><td>#83</td><td>21</td></tr> <tr><td>#84</td><td>46</td></tr> <tr><td>#85</td><td>22</td></tr> <tr><td>#86</td><td>45</td></tr> <tr><td>#87</td><td>6</td></tr> <tr><td>#88</td><td>155</td></tr> <tr><td>#89</td><td>68</td></tr> <tr><td>#810</td><td>31</td></tr> </table> <p style="text-align: right;">colonies indicated /100mL</p>	#81+#82	2	#82	1	#83	21	#84	46	#85	22	#86	45	#87	6	#88	155	#89	68	#810	31
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