

Commentary on our big day out March 12th 2016.

YSI 85 doing well, no DO from Pro2030.

MAIN MESSAGES when compared with Nov 28th 2016.

- 1 Water temperature cooler**
- 2 Chloro a concentrations lower, less biological activity**
- 3 NNN lower concentrations**
- 4 DRP similar**
- 5 Turbidity lower**

What was the day like?

A mild to cool day (12-15°C) with variable cloud cover, 40-70%. Wind direction was NE/E, with a wind speed of around 10knots gusting to 15knots.

Tide and harbour conditions.

All observations and sample collection occurred between 0950 and 1134. All observations carried out on an ebbing tide. The tide was low at 1400 at Dunedin 0.06m, quite a low tide..

Water of Leith, 0.215 cumecs and 11.8°C at 13.55..

Rainfall 6.5 mm on previous day. 11.5 mm over the last 10 days.

This has been a dry month.

Is there anything unusual ?

Nothing significant

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 were reasonably calm at most sites. There was a slight ripple or chop at most sites. Water was fast flowing out of Andersons bay Inlet.. 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 10.8 °C (#88) – 14.1 °C. (#85) A limited number of readings, most around 13. The water temperatures are similar to Nov 28th.

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.

[November 28th 13.1 °C (#89) – 15.9 °C.(#86)]

Salinity

Sites that are directly impacted on by the tidal flow showed a range of 28.28 (#86) -34.81 ppt (#81/2)
The pattern is similar to Nov 28th, suggestion of a gradient of higher salinity close to the mouth of the harbour. All measurements taken close to mid tide and an ebbing tide.

Some samples were tested in the lab.

[Nov 28th 22.19 (#89) -34.71 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 32.8 (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 8.06 (#89) – 8.73(#88).

pH range was smaller than Nov 28th data. Most readings around 8.2 . Many of the readings were quite consistent around 8.

What about buffers in the water???

[November 28th 7.79 (#82) – 9.64(#88).]

Turbidity

All sites tested. Range was 0.89 NTU (#84) – 5.29 (#810) /20 NTU (#89).

The water was relatively clear at open water sites, similar to Nov 28th. Some discharge sites quite turbid.at discharge sites. A reflection of the recent rainfall carrying sediment into the harbour.

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.

[November 28th 1.49 NTU (#83) – 13.1 (#86) /15.6 NTU (#88)/ 16.9 NTU (#810).]

**** 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, #89. This a discharge sites.

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

The range of DO readings shows a range from sites tested 6.2 mg L⁻¹ (#89)-10.73 mg L⁻¹ (#88),, % saturation range 66% (#89) – 100.6 % (#810).

Only 4 sites were measured for DO.

[November 28th 4.90 mg L⁻¹ (#89)-10.7 mg L⁻¹ (#88), and % saturation range 69.5% (#89) – 101.9 % (#81/2).]

Chlorophyll a.

The range of values is 1.06 µg L⁻¹ (#85)/1.04 µg L⁻¹(#810) – 2.64 µg L⁻¹(#89)/ 2.69µg L⁻¹(#88). Range is less than Nov 28th, overall smaller values. suggesting a reasonable level of biological activity but less than Nov 28th.

There was no neat story correlating a high concentration of chlorophyll a with a very low concentration of NNN. If there has been a steady point and non point input of NNN from the land then this relationship may not show.

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

[November 28th 1.21 µg L⁻¹ (#84)/1.41 µg L⁻¹(#87) – 3.67 µg L⁻¹(#88)/ 3.57µg L⁻¹(#89).]

Four sites had medium values,

Medium 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.

0.7 µmol L⁻¹(#85) -2.7 µmol L⁻¹(#83) Open water sites. Most sites around 2 µmol L⁻¹ **lower than Nov 28th**

3.94 µmol L⁻¹(#89) – 6.31 µmol L⁻¹(#86)/ 20.85 µmol L⁻¹(#88) Storm water /discharge sites **lower than Nov 28th vakues..**

Smaller range of values in Open water sites.

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??

[November 28th 0.07 µmol L⁻¹(#85) -9.38 µmol L⁻¹(#810) Open water sites

3.42 $\mu\text{mol L}^{-1}$ (#86) – 20.01 $\mu\text{mol L}^{-1}$ (#88)/ 33.82 $\mu\text{mol L}^{-1}$ (#89) Discharge sites]

Eight sites exceed guidelines.

GUIDELINE value 1.79 $\mu\text{mol L}^{-1}$ (=0.025 mg N-NO₃⁻¹ L⁻¹)

Medium ENVIRONMENTAL HEALTH CATEGORY !!!!!

DRP (dissolved reactive phosphate)

Range of 0.40 $\mu\text{mol L}^{-1}$ (#81) – 1.49 $\mu\text{mol L}^{-1}$ (#86).

The range of values is similar to Nov 28th values.

[November 28th 0.43 $\mu\text{mol L}^{-1}$ (#82) – 1.32 $\mu\text{mol L}^{-1}$ (#88).]

All sites exceed the Guidelines.

GUIDELINE value 0.0322 $\mu\text{mol L}^{-1}$ (= 0.010 mg P- PO₄³⁻ L⁻¹)

HIGH ENVIRONMENTAL HEALTH CATEGORY

Enterococci

No data.

#88 Macandrew bay stormwater and #89 Somervilles Creek exceeded the guideline value.

Guideline value 140 cells per 100mL of sample indicated

***Enterococci* bacteria**

SUMMARY OF DATA.

DATE: 28/11/2015

What is the weather like? <ul style="list-style-type: none"> • <i>Air temperature</i> • <i>Wind speed and direction</i> • <i>Cloud cover</i> 	#81and 2	12oC,NE breeze,40%ccv,light highcloud
	#82	
	#83	12oC,NE breeze,40%ccv,light highcloud
	#84	12oC,NE breeze,40%ccv,light highcloud
	#85	NE 15k/h, 80% ccv
	#86	Northerly, 10 k/h, 85% ccv
	#87	11.9oC,NE 10k/h,50%ccv,
	#88	13.1oC,NE, high cloud, 50%ccv
	#89	11/12oC,Easterly,70% ccv
	#810	14.9oC, easterly, 70%ccv

<p>What is the time, and what stage is the tide?</p> <p><i>What is the condition of the Leith ?</i></p> <p><i>Check websites (Met service and Port otago)</i></p>	<table border="0"> <tr><td>#81and</td><td></td></tr> <tr><td>2</td><td>1010, 3/4 full, ebbing</td></tr> <tr><td>#82</td><td></td></tr> <tr><td>#83</td><td>950, High tide</td></tr> <tr><td>#84</td><td>0935, High tide</td></tr> <tr><td>#85</td><td>1115, ebbing tide, half way</td></tr> <tr><td>#86</td><td>1134, ebbing tide , half way</td></tr> <tr><td>#87</td><td>0953,mid-low</td></tr> <tr><td>#88</td><td>0910, mid-low</td></tr> <tr><td>#89</td><td>1012, low tide</td></tr> <tr><td>#810</td><td>1056, low</td></tr> </table>	#81and		2	1010, 3/4 full, ebbing	#82		#83	950, High tide	#84	0935, High tide	#85	1115, ebbing tide, half way	#86	1134, ebbing tide , half way	#87	0953,mid-low	#88	0910, mid-low	#89	1012, low tide	#810	1056, low
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<p>Is there anything unusual to report (dead crabs, nasty smell, coloured sheen on the water)?</p> <ul style="list-style-type: none"> • Discharge pipes • Any star fish/other animals ?? • Rubbish or litter. 	<table border="0"> <tr><td>#81and</td><td></td></tr> <tr><td>2</td><td>–</td></tr> <tr><td>#82</td><td>–</td></tr> <tr><td>#83</td><td>–</td></tr> <tr><td>#84</td><td>–</td></tr> <tr><td>#85</td><td>lot of boats</td></tr> <tr><td>#86</td><td>lot of plant material,sticks ,grass,wind foam blown up L.</td></tr> <tr><td>#87</td><td>–</td></tr> <tr><td>#88</td><td>foam on the water</td></tr> <tr><td>#89</td><td>–</td></tr> <tr><td>#810</td><td>–</td></tr> </table>	#81and		2	–	#82	–	#83	–	#84	–	#85	lot of boats	#86	lot of plant material,sticks ,grass,wind foam blown up L.	#87	–	#88	foam on the water	#89	–	#810	–
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<ul style="list-style-type: none"> • Special seaweeds <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="padding: 2px;"><i>f=few</i></td></tr> <tr><td style="padding: 2px;"><i>s=some</i></td></tr> <tr><td style="padding: 2px;"><i>m=many</i></td></tr> </table>	<i>f=few</i>	<i>s=some</i>	<i>m=many</i>	<p>See data sheets</p>																			
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<p>Animals</p>	<p>See data sheets</p>																						
<p>What condition is the surface of the water?</p>	<table border="0"> <tr><td>#81and</td><td></td></tr> <tr><td>2</td><td>ripple</td></tr> <tr><td>#82</td><td></td></tr> <tr><td>#83</td><td>slight ripple</td></tr> <tr><td>#84</td><td>calm</td></tr> <tr><td>#85</td><td>sl chop, fine ripples, small swells</td></tr> </table>	#81and		2	ripple	#82		#83	slight ripple	#84	calm	#85	sl chop, fine ripples, small swells										
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	#86	sl chop, small swells, 5 cms
	#87	slightly choppy
	#88	smooth
	#89	calm
	#810	fast flow, out of inlet
Does the water have any real, or apparent colour?	#81and 2	clear
	#82	
	#83	clear
	#84	clear
	#85	green
	#86	brownish green
	#87	typical grey green
	#88	clear
	#89	murky stream
	#810	clear

Understanding Estuarine Processes

SITE: _____ DATE: _____

What is the water temperature ?	#81and 2	—
	#82	—
	#83	—
	#84	—
	#85	14.1
	#86	13.8
	#87	13.5
	#88	10.8
	#89	13
	#810	13.2
		°C

<p>What is the salinity of the sample ?</p>	<table border="1"> <tr><td>#81and 2</td><td>34.8153</td></tr> <tr><td>#82</td><td>34.8153</td></tr> <tr><td>#83</td><td>34.7126</td></tr> <tr><td>#84</td><td>34.5072</td></tr> <tr><td>#85</td><td>35.0168</td></tr> <tr><td>#86</td><td>28.2828</td></tr> <tr><td>#87</td><td>34.0844</td></tr> <tr><td>#88</td><td>0.2072</td></tr> <tr><td>#89</td><td>31.598</td></tr> <tr><td>#810</td><td>33.9808</td></tr> </table> <p style="text-align: right;">ppt</p>	#81and 2	34.8153	#82	34.8153	#83	34.7126	#84	34.5072	#85	35.0168	#86	28.2828	#87	34.0844	#88	0.2072	#89	31.598	#810	33.9808
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#810	33.9808																				
<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="1"> <tr><td>#81and 2</td><td>40.418</td></tr> <tr><td>#82</td><td>40.348</td></tr> <tr><td>#83</td><td>39.874</td></tr> <tr><td>#84</td><td>39.418</td></tr> <tr><td>#85</td><td>40.75</td></tr> <tr><td>#86</td><td>33.372</td></tr> <tr><td>#87</td><td>39.2/50.2</td></tr> <tr><td>#88</td><td>.24/.337</td></tr> <tr><td>#89</td><td>35.03/37.8</td></tr> <tr><td>#810</td><td>38.84/50.2</td></tr> </table> <p style="text-align: right;">mS/cm</p>	#81and 2	40.418	#82	40.348	#83	39.874	#84	39.418	#85	40.75	#86	33.372	#87	39.2/50.2	#88	.24/.337	#89	35.03/37.8	#810	38.84/50.2
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#810	38.84/50.2																				
<p>What is the pH of the sample ?</p>	<table border="1"> <tr><td>#81and 2</td><td>8.33</td></tr> <tr><td>#82</td><td>8.43</td></tr> <tr><td>#83</td><td>8.23</td></tr> <tr><td>#84</td><td>8.25</td></tr> <tr><td>#85</td><td>8.27</td></tr> <tr><td>#86</td><td>8.27</td></tr> <tr><td>#87</td><td>8.29</td></tr> <tr><td>#88</td><td>8.73</td></tr> <tr><td>#89</td><td>8.06</td></tr> <tr><td>#810</td><td>8.27</td></tr> </table>	#81and 2	8.33	#82	8.43	#83	8.23	#84	8.25	#85	8.27	#86	8.27	#87	8.29	#88	8.73	#89	8.06	#810	8.27
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<p>What is the water turbidity?</p>	<table border="1"> <tr><td>#81and 2</td><td>2.04</td></tr> <tr><td>#82</td><td>1.87</td></tr> <tr><td>#83</td><td>1.17</td></tr> <tr><td>#84</td><td>0.892</td></tr> <tr><td>#85</td><td>4.08</td></tr> <tr><td>#86</td><td>11.9</td></tr> </table>	#81and 2	2.04	#82	1.87	#83	1.17	#84	0.892	#85	4.08	#86	11.9								
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	#87	2.81	
	#88	5.05	
	#89	20	
	#810	5.29	
			NTU
What is the oxygen concentration of your sample ? Measure both methods mg/L and % saturation	#81and 2	—	
	#82	—	
	#83	—	
	#84	—	
	#85	—	
	#86	—	
	#87	6.85	
	#88	10.73	
	#89	6.2	
	#810	7.97	
			mg/L
	#81and 2	—	
	#82	—	
	#83	—	
	#84	—	
	#85	—	
	#86	—	
	#87	81.5	
	#88	97	
	#89	66	
	#810	100.6	
			% saturation
What is the chlorophyll a concentration of the sample ? <ul style="list-style-type: none"> <i>Record the volume of water filtered</i> 	#81and 2	1.67	
	#82	1.73	
	#83	1.12	
	#84	1.41	
	#85	1.06	
	#86	2.51	
	#87	1.14	
	#88	2.69	
	#89	2.64	
	#810	1.04	
			µg/L
	0-2 low		
	>2-5 medium		

	>5-10 high >10 very high																				
****NNN	<table> <tr><td>#81and 2</td><td>2.54</td></tr> <tr><td>#82</td><td>2.62</td></tr> <tr><td>#83</td><td>2.7</td></tr> <tr><td>#84</td><td>0.95</td></tr> <tr><td>#85</td><td>0.7</td></tr> <tr><td>#86</td><td>6.31</td></tr> <tr><td>#87</td><td>1.96</td></tr> <tr><td>#88</td><td>20.85</td></tr> <tr><td>#89</td><td>3.94</td></tr> <tr><td>#810</td><td>2.41</td></tr> </table> <p style="text-align: right;">μmol/L</p>	#81and 2	2.54	#82	2.62	#83	2.7	#84	0.95	#85	0.7	#86	6.31	#87	1.96	#88	20.85	#89	3.94	#810	2.41
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****DRP	<table> <tr><td>#81and 2</td><td>0.40</td></tr> <tr><td>#82</td><td>0.47</td></tr> <tr><td>#83</td><td>0.50</td></tr> <tr><td>#84</td><td>0.48</td></tr> <tr><td>#85</td><td>0.91</td></tr> <tr><td>#86</td><td>1.49</td></tr> <tr><td>#87</td><td>0.38</td></tr> <tr><td>#88</td><td>1.29</td></tr> <tr><td>#89</td><td>0.97</td></tr> <tr><td>#810</td><td>1.12</td></tr> </table> <p style="text-align: right;">μmol/L</p>	#81and 2	0.40	#82	0.47	#83	0.50	#84	0.48	#85	0.91	#86	1.49	#87	0.38	#88	1.29	#89	0.97	#810	1.12
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What is the enterococci count in the sample ?	<table> <tr><td>#81 and 2</td><td></td></tr> <tr><td>#82</td><td></td></tr> <tr><td>#83</td><td></td></tr> <tr><td>#84</td><td></td></tr> <tr><td>#85</td><td></td></tr> <tr><td>#86</td><td></td></tr> <tr><td>#87</td><td></td></tr> <tr><td>#88</td><td></td></tr> <tr><td>#89</td><td></td></tr> <tr><td>#810</td><td></td></tr> </table> <p style="text-align: right;">colonies indicated /100mL</p>	#81 and 2		#82		#83		#84		#85		#86		#87		#88		#89		#810	
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