Commentary on our big day out Sept 12th 2015

WE are still short of the YSI 85, it has gone to be serviced. No reading with the DO despite changing the electrolyte and membrane. Some of the data is limited.

What was the day like?
Another cool (7-12°C) spring again, 10-40% cloud cover, calm. W wind 0-10 knots, building through out the morning, gusting from the NE.
** Recommend we purchase proper field note books!!! Water proof , keep thinking about this!!!

Tide and harbour conditions.
All observations and sample collection occurred between 0930 and 1140.. The tide was low and staring to flood later in the morning. All observations and collections happening close to low tide... Water samples at storm water outfalls influenced by the low water.
15mm rain over last 10 days, no heavy falls.
Water flow from the Leith was close to its median flow.
Water temperature of the Waters of Leith was 6.0°C, not hot!

Is there anything unusual ?
Plastic and road markers in the water (#81/2), lots of dog poo and litter(#84), 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 again quite calm and flat with some ripples. The wind did build later in the morning so the surface behave more disturbed. These conditions would not mix the water in the water column with sediment. The storm water sites usually carry sediment into the harbour.
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.5.0 °C (#88) – 8.5 °C.(#81/2) Many readings around 8. The water temperatures are slightly warmer than. The water is cold.
Sites closer to the mouth are slightly warmer than those up the harbour. 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.

[August 22nd 5.1 ºC (#88) – 8.4 ºC.(#81/2)]

Salinity

Sites that are directly impacted on by the tidal flow showed a range of 31.88 (#810) -34.1 ppt (#81/2) . The pattern is similar to August 22nd , suggestion of a gradient of higher salinity close to the mouth of the harbour. All measurements taken close to low water.

Interesting readings were taken at #86 (water of Leith) 4.4 at surface and 31.4 deeper!!

Some samples were tested in the lab.

[August 22nd 33.03 (#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 33.4 (standard 33.7ppt). YSI 85 measured 32.1 (vs 33.7). These differences are included in our adjusted calculations for salinity and conductivity.

pH

All sites tested. Range was 8.04 (#88) – 8.23(#85).

pH range was greater with most readings around 8.

What about buffers in the water???

 [August 22nd 7.53 (#88) – 8.18(#86).]

Turbidity

All sites tested. Range was 0.67 NTU (#83) – 8.9 NTU (#89).

The water is very clear!

The range was slightly less than Aug 22nd, readings, this is not suprising as the wind was less and the water column not being agitated as much at the surface. Samples exposed directly to the tidal changes had readings around 1-2 NTU. These samples indicate clear water column.

Discharge sites higher than the open water sites

 Some turbidity could be explained by the extra phytoplankton in 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.

[August 22nd 0.85 NTU (#84) – 11.4 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 #88 and #89.

Dissolved oxygen (DO) mg L^{-1} and % saturation.
The range of DO readings shows a range from sites tested 9.63 mg L^{-1} (#83)- 11.52 mg L^{-1}(#86)
Some of the open water sites have high concentration of dissolved oxygen.
% saturation range 94.6 (#84) – 120.2 % (#85/6). Most of the sites had super saturated water.
The DO values similar to those of August 22nd, despite similar temperatures, the increase could be due to the noticeably higher concentrations of chlorophyll a and a greater rate of photosynthesis. Generally the water was well oxygenated and saturated with oxygen. All sites have DO concentrations that will support as healthy biological community.
[August 22nd 9.76 mg L^{-1} (#83)- 12.95 mg L^{-1}(#86) and 102.3% (#83) – 116 % (#86)]

Chlorophyll a.
??? Problem with the data !!
Values above 5.0 are classified in estuaries as a matter for concern, possible algal blooms???

 [August 22nd 1.83 µg/L (#84) – 7.81 µg/L (#89)]

LOW ENVIRONMENTAL HEALTH CATEGORY for open water

 0-2 (µg L^{-1}) low
 >2-5 medium
 >5-10 high
 >10 very high

DRP (dissolved reactive phosphate)

Range of 0.33 µmol L^{-1}(#87) – 1.13 µmol L^{-1} (#89).

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 ?

[August 22nd 0.080 µmol L^{-1}(#87) – 0.85 µmol L^{-1} (#85)]

All sites exceed the Guidelines.

GUIDELINE value 0.0322 µ mol L^{-1} (= 0.010 mg P- PO_4^{3-} 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.

NNN (total dissolved nitrates and nitrites)

Variable readings from different sites.

0.083 μmol L^{-1}(#85) -3.64 μmol L^{-1}(#83)   Open water sites. Most sites around 1-2 μmol L^{-1} **slightly higher** than August 22nd.

7.62 μmol L^{-1}(#89) –42.43 μmol L^{-1}(#86)/ 71.28 μmol L^{-1}(#88) Storm water /discharge sites **higher overall** than August 22nd

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??

[August 22nd 0.00 μmol L^{-1}(#85) -10.93 μmol L^{-1}(#810)   Open water sites

23.44 μmol L^{-1}(#89) – 22.04 μmol L^{-1}(#86)/ 2.62 μmol L^{-1}(#88) Discharge sites]

Two open water sites exceed guidelines.
GUIDELINE value 1.79 μ mol L^{-1} (=0.025 mg N-NO_3^{-1} L^{-1})
LOW/MED ENVIRONMENTAL HEALTH CATEGORY !!!!!!

Enterococci

 All sites were below the guideline values.

Guideline value 140 cells per 100mL of sample indicated *Enterococci* bacteria

SUMMARY OF DATA.

DATE: **12/09/2015**

What is the weather like?		
	#81/2	10.3oC,W wind, medium ccv
	#82	
• *Air temperature*	#83	10.3oC,calm,W light ccv
• *Wind speed and direction*	#84	10.3oC, calm westerly, light ccv
• *Cloud cover*	#85	8.7oC,NE, 15-20 km,10% ccv
	#86	NE gusty, 10-15 km/hr, 10%ccv
	#87	6.0oC,calm,40%ccv
	#88	6.5oC,5 kph NE,40% ccv
	#89	12oC,med SE
	#810	11oC,SE med, low-med 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)*	#81/2 1015 low tide #82 #83 945, low #84 930, tide is very low #85 low tide, flooding #86 low, starting to flood #87 low #88 low #89 1030 very low tide #810 1050, low tide

Is there anything unusual to report (dead crabs, nasty smell, coloured sheen on the water)?
• **Discharge pipes**
 	
• **Any star fish/other animals ??**
 	
• **Rubbish or litter.**
	#81/2 plastic and road makers in water
	#82
	#83 _
	#84 lots of dog poo, some litter
	#85 _
	#86 no large litter, green moss on rocks
	#87 no
	#88 _
	          sulfur like smell, some litter among the
	#89 algae,
	          a lot of lime green weedy algae
	#810 _

• *Special seaweeds* *f=few* *s=some* *m=many*	See data sheets
Animals	See data sheets
What condition is the surface of the water?	#81/2 ripples #82 #83 no waves #84 clear #85 low choppy swells, no wc. #86 small swells, no white caps

	#87	calm
	#88	frothy
	#89	
		calm
	#810	turbulent
Does the water have any real, or apparent colour?	#81/2	dark blue
	#82	
	#83	insipid blue
	#84	Beige
	#85	Greenish colour
	#86	green, sl cloudy
	#87	usual grey-green
	#88	turbid
	#89	
		light murky brown
	#810	clear

Understanding Estuarine Processes

SITE: _____ DATE:

What is the water temperature ?	#81/2 8.5
	#82
	#83 8.1
	#84 7.9
	#85 8
	#86 8.3
	#87 8.5
	#88 5
	#89 7
	#810 6.5
	ºC

What is the salinity of the sample ?		
	#81/2	34.10
	#82	34.10
	#83	33.90
	#84	
	#85	33.10
	#86	4.44
	#87	33.30
	#88	0.40
	#89	29.66
	#810	31.88
		ppt
What is the electrical conductivity of the sample ? ***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 º C***	mS/cm	
What is the pH of the sample ?		
	#81/2	8.17
	#82	8.17
	#83	8.08
	#84	8.05
	#85	8.23
	#86	8.22
	#87	8.12
	#88	8.04
	#89	8.05
	#810	8.16
What is the water turbidity?		
	#81/2	1.56
	#82	1.23
	#83	0.67
	#84	0.84
	#85	1.82
	#86	2.99
	#87	1.25

	#88　　　　　8.9	
	#89　　　　　8.79	
	#810　　　　2.61	
		NTU
What is the oxygen concentration of your sample *? Measure both methods mg/L and % saturation*	#81/2　　　10.76 #82 #83　　　　9.63 #84　　　　11.3 #85　　　　11.47 #86　　　　11.52 #87　　　　– #88　　　　– #89　　　　– #810　　　– 	mg/L
	#81/2　　　114.8 #82 #83　　　　101.2 #84　　　　94.6 #85　　　　120.2 #86　　　　120.2 #87　　　　– #88　　　　– #89　　　　– #810　　　–	% saturation
What is the chlorophyll a concentration of the sample ? • ***Record the volume of water filtered***	No data 0-2 low >2-5 medium >5-10 high >10 very high	µg/L
****NNN	#81/2　　　1.83 #82　　　　1.76 #83　　　　3.64 #84　　　　1.23 #85　　　　0.83 #86　　　　42.43 #87　　　　1.03 #88　　　　71.28 #89　　　　7.62 #810　　　1.12	

		µmol/L
****DRP	#81/2 0.33 #82 0.33 #83 0.45 #84 0.38 #85 0.45 #86 0.36 #87 0.27 #88 0.56 #89 1.13 #810 0.34	
		µmol/L
What is the enterococci count in the sample ?	#81/2 0 #82 0 #83 1 #84 0 #85 1 #86 12 #87 0 #88 0 #89 10 #810 3	
		colonies indicated /100mL