Commentary on our big day out June 27th 2015

Site 89, Somerville's creek, is problematic in how we test the water..if the tide is low should we test above the bridge in deeper water ???
Dave was away searching for ice so Kaya was incharge, good to have Murray taking a watching brief.

What was the day like?
Again the air temperature was cool, between 5-9ºC, with a light wind, E/NE 5-10 knots. The sky was overcast 90-100% cloud cover.
** Recommend we purchase proper field note books!!! Water proof , keep thinking about this!!!

Tide and harbour conditions.
All observations and sample collection occurred between 0950 and 1140. High water at Dunedin was at 1200, 2.00 m. The tide was flooding with observations and collections happening close to high tide.. This was a not a good day to observe what is going on in the intertidal zone.
23 mm of rain has fallen over the last 10 days, little extra point and non point freshwater/storm water flowing into the harbour.
Huge Flooding in the catchment in early June
Water flow from the Leith was slightly high and dropping , about 1.046 cumecs. (median flow about 0.3)
Water temperature of the Waters of Leith was 4.7ºC, not hot!

Is there anything unusual ?
Nothing special was noted other than amounts of litter at #89 Somervilles creek, some dead animal remains, plastics/polystyrene.

Seaweeds.
Check the data
Animals
Check the data

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. 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.

Water temperature
The water temperature ranged from.4.3 ºC (#89) – 7.3 ºC.(#81/2) Many readings around 5/6. The water temperatures are cooler than May 23rd. The water is cold.
The water temperature will have an effect on the solubility of different substances in water, solubity 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

The temperature pattern (winter trend) shows the upper harbour cooling down more compared with the harbour mouth.

[May 23rd 6.7 ºC (#89) – 10.9 ºC .(#81/2]

Salinity

Sites that are directly impacted on by the tidal flow showed a range of 27.8 (#89) -33.7 ppt (#81/2) . The pattern is similar to May 23rd except all readings were slightly lower, this could be explained by reasonable rainfall over the last 10 days,(23 mm), Water of Leith flowing higher and extra non point water is flowing into the harbour along with the usual tidal flows.
[May 23rd 33.6 (#86) -34.4 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 33.5 (standard 33.7ppt). YSI 85 measured 32.0 (vs 33.7). These differences are included in our adjusted calculations for salinity and conductivity.

pH

All sites tested. Range was 7.4(#88) – 8.9(#86).
pH range similar to our May 23rd readings.
What about buffers in the water???
[May 23rd 7.9 (#89) – 8.55 (#88)]

Turbidity

All sites tested. Range was 1.64 NTU (#81) – 12.05 NTU (#89).
The range was similar to May 23rd 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.
Storm water and streams all have higher turbidity.
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.
[May 23rd 0.83 NTU (#81) – 11.55 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 </= 5.6 NTU ANZECC&ARMCANZ (2000)

3 sites #86/8/9 exceeded this value

Dissolved oxygen (DO) mg L^{-1} and % saturation.

The range of DO readings shows a range from all sites 9.1 mg L^{-1} (#89)- 11.5 mg L^{-1}(#86)
Some of the open water sites have high concentration of dissolved oxygen.
% saturation range 85% (#89) – 99.6 % (#86). None of the sites had super saturated water.
Similar range and values for May 23rd with the exceptions of #89, this has been observed at this site before, this site which is a muddy/smelly site on the edge of the Andersons Bay inlet, some anoxic behaviour ???
Generally the water was well oxygenated and saturated with oxygen. All sites have DO concentrations that will support as healthy biological community.
[May 23rd 7.6 mg L^{-1} (#83)- 11.75 mg L^{-1} (#88) and 79.1% (#89) – 103.3 % (#86)]

Chlorophyll a.

Range 0.84 µg/L (#82) – 3.16 µg/L (#89)
The readings have a similar range to May 23rd , 8 sites have **low** readings around 1 µg/L,or less. Two sites have medium value of #84 (Mussel bay) and #89 (Somerville's creek).
Biological activity is less at this time of the year, but small spikes at #84 and #89.
The lowest values have been water from the open ocean and the samples were taken on a flooding tide.

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

[May 23rd 0.47 µg/L (#82) – 4.29 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 0.45 µmol L^{-1}(#84) – 0.70 µmol L^{-1} (#85).

There was a similarity about the readings, all quite low.

Most of the values are similar to May 23rd concentrations.

[May 23rd 0.54 µmol L^{-1}(#87) – 0.72 µmol L^{-1} (#88).].

Unsure of this!!

GUIDELINE value 0.11 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.
5.25 µmol L^{-1} (#82) – 8.15 µmol L^{-1}(#810) Open water sites . Most sites around 6-7 µmol L^{-1}, **higher** than May 23rd readings.
12.62 µmol L^{-1}(#89) – 44.67 µmol L^{-1}(#86)/ 48.13 µmol L^{-1}(#88) Storm water /discharge sites **higher** than May 23rd .

Assume that more NNN being utilised by the phytoplankton. Chloro a levels are low reflecting the low concentration of nutrients. ?? Hypothesis.
The phytoplankton will draw down the NNN in the water, is there biological activity developing in the harbour??

[May 23rd 1.87 µmol L^{-1} (#87) – 4.81 µmol L^{-1}(#82) Open water sites
4.22 µmol L^{-1}(#86) – 5.75 µmol L^{-1}(#88)/ 1.37 µmol L^{-1}(#89) Discharge sites]

7 sites exceed guidelines.
GUIDELINE value 7.161 µ mol L^{-1} (=0.444 mg NO_3^{-1} L^{-1})
LOW/MED ENVIRONMENTAL HEALTH CATEGORY !!!!!!

Enterococci

Indications present at all sites were below the guideline values except for sites #89 (Somervilles stream), 270 cells per 100mL respectively.
Media fine this time, all sites except #81/2 showed signs of enterococci up to 48 cells/100mL at #84 Mussel bay, 68 cells/100mL at #86 Andersons bay outlet and 30 cells/100mL at #85 Ravensbourne Boat club.
We tested a **blank** on the distilled water, it showed 0 cells/100mL.

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

SUMMARY OF DATA.

DATE: **02/04/2015**

What is the weather like? • ***Air temperature*** • ***Wind speed and direction***	#81 and 2	Weak NE breeze, 5oC, wide,thin clouds
	#83	light -South, hazy and overcast
	#84	5oC,no wind, light cloud
	#85	9.4oC,weak northerly, 100%ccv, thin

• ***Cloud cover***	#81 and 2 5.2oC, northerly light, 100% ccv, thin patches #86 6.3oC,calm, 90% ccv #87 5oC,calm, mildSE, 90% ccv #88 7.6oC, hardly any wind, 90% ccv #89 hardly any wind, 80% ccv #810
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 and 2 high tide #83 0959, mid-high tide #84 0937, medium tide #85 high tide, flooding #86 1140 #87 0950, highest tide #88 1020,tide going out ?? #89 1030 high tide #810 1055 high 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 and 2 dischrge pipe 25m away from point #83 _ #84 one discharge pipe,southend,plastic bottles in the water #85 _ #86 _ #87 nothing #88 No #89 dead seagull, rotten fish smell, polystyrene,lolly papers #810 Nil
• ***Special seaweeds*** ***f=few*** ***s=some*** ***m=many***	See data sheets

Animals	See data sheets
What condition is the surface of the water?	#81 and 2 ripples with no white caps #83 very calm #84 calm #85 calm no white caps #86 getting rougher #87 slightly ripply, turbid #88 ripples #89 small ripples, quite calm #810 small rippples, calm, can see rock bed
Does the water have any real, or apparent colour?	#81 and 2 blue/green colour #83 blue/green colour #84 gree-blue #85 greeny-blue #86 greenish blue #87 grey-green #88 grey/dark olive green #89 dark green #810 Green

Understanding Estuarine Processes

SITE: _____ DATE:

What is the water temperature ?	#81 and 2 7.3 #82 #83 6.2 #84 5.7 #85 5.4 #86 5.4 #87 5.1 #88 5.2 #89 4.3 #810 5.3 ^{o}C

What is the salinity of the sample ?	#81 and 2 33.701 #82 #83 33.198 #84 32.0914 #85 32.192 #86 30.2806 #87 32.3271 #88 5.265 #89 27.7992 #810 32.3271 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***	#81 and 2 34.388/_ #82 #83 33.024/_ #84 31.402/_ #85 31.387/_ #86 28.61/_ #87 31.295/50.502 #88 #89 26.588/44.079 #810 31.485/50.734 mS/cm
What is the pH of the sample ?	#81 and 2 8.19 #82 8.18 #83 8.03 #84 8.02 #85 7.9 #86 8.9 #87 7.57 #88 7.46 #89 7.79 #810 7.82
What is the water turbidity?	#81 and 2 1.66 #82 1.64 #83 1.97

	#84 4.13 #85 2.32 #86 6.15 #87 3.51 #88 12.05 #89 8.20 #810 1.72 NTU
What is the oxygen concentration of your sample *? Measure both methods mg/L and % saturation*	#81 and 2 9.19 #82 #83 9.72 #84 9.8 #85 9.79 #86 11.5 #87 9.8 #88 – #89 9.1 #810 9.7 mg/L #81 and 2 95.1 #82 #83 96.7 #84 95 #85 97 #86 99.6 #87 95 #88 96 #89 85 #810 94.5 % saturation
What is the chlorophyll a concentration of the sample ? • ***Record the volume of water filtered***	#81 and 2 0.84 #82 0.87 #83 1.10 #84 2.71 #85 1.45 #86 1.04 #87 1.59

	#88 1.00 #89 3.16 #810 1.03 µg/L 0-2 low >2-5 medium >5-10 high >10 very high
******NNN**	#81 and 2 5.56 #82 5.24 #83 6.60 #84 7.76 #85 7.25 #86 44.67 #87 7.30 #88 48.13 #89 12.62 #810 8.15 µmol/L
******DRP**	#81 and 2 0.57 #82 0.57 #83 0.55 #84 0.45 #85 0.70 #86 0.60 #87 0.52 #88 0.49 #89 0.53 #810 0.55 µmol/L
What is the enterococci count in the sample ?	#81 and 2 2 #82 0 #83 21 #84 48 #85 30 #86 12 #87 13 #88 10 #89 270

	#810 68 colonies indicated /100mL