Commentary on our big day out September 17th 2016.

Very good day for monitoring. Low tide and pleasant weather. Spring is here!!!! Most impressive observations of the sea weeds in at the sites.

The lab work was carried most efficiently with fine student teams managing all their tasks. Well done!!

MAIN MESSAGES when compared with July 30th data.
Samples collected close to or at low water/tide.
1 Water temperatures noticeably higher.
2 Salinity similar.
3 pH values around 8.00. Similar
4 Dissolved oxygen typical, some sites were supersaturated and this may relate to the higher concentrations of chloro a, that is an increased rate of photosynthesis!!
5 Chloro a concentrations noticeably higher at most sites, higher biological activity. Medium health concern.
6 NNN some showed a decrease increased values. All exceed guideline values
7 DRP slightly lower. All exceed guideline values.
8 Turbidity similar to July 30th , All within guidelines except #88/9, both discharging off the land.
9 Enterococci numbers low except at sites #88/9 which are close to and exceed below guideline values.

What was the day like?
Air pressure at 8.00 100.55kPa.
Winds E changing to SE, low wind speeds, some gust to 10 knots. " almost no wind", light wind. Overcast 50-90% ccv, temperatures quite warm.

Tide and harbour conditions.
Dunedin low water at 1010, 0.1 m tide, quite low. Sampling took place close to or either side of low water. 4 mm of rainfall over the last 10 days.
Waters of Leith flow rate was 0.395 cumecs, close to median flow. Water temperature was 10.5^{o}C at 14.30.
The main influence on our sampling was the low tide starting to flood.

Is there anything unusual ?
Nothing special was noted but I was pleased with observations being made of animals and sea weeds.

Seaweeds.

See data 9 different seaweeds observed and identified correctly.

Animals

See data

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

Surface conditions were quite calm at most sites. This was to be expected with light easterly blowing. There was a slight ripple or chop at some sites... There was nothing unusual about the colour at the surface of the water.
At site 81/2 a large ships caused disturbances to the water, lots of sediment!!!

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.8.6 ^{o}C (#88) – 12.5 ^{o}C.(#84) Most around 11^{o}C.
It is clear that the water temperature is significantly higher than July 30th.
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 (10.5^{o}C at 1430) is still slightly cooler than water entering the harbour mouth.

[July 30th 5.1 ^{o}C (#88) – 8.3 ^{o}C.(#81/2)]

Salinity

Sites that are directly impacted on by the tidal flow showed a range of 29.87 (#84) -34.24 ppt (#81/2)
The salinities are similar to July 30th . Salinity at discharged sites was determined by the freshwater flowing.(0.1 at #88, this was freshwater being sampled!). A salinity gradient of decreasing values the further you go up the harbour quite pronounced.
[July 30th 32.84 (#810) -34.24 ppt (#81/2)

Open sea salinity 34.998 ppt!!!

YSI 85	32.3	1.042415
pro2030	29.7	1.13367

These differences are included in our adjusted calculations for salinity and conductivity.

pH

7.82 (#89)-8.44 (#81/2). pH reasonably uniform 8.2-8.3
pH slightly higher at most sites, more alkaline!!
What about buffers in the water???
[July 30th 8.16 (#89)-8.29 (#810)]

Turbidity

All sites tested. Range was 1.21 NTU (#83) – 12.5 NTU (#88) and 9.97 NTU (#89).

The water was generally clear at all open water sites except 87.
Discharge sites higher than the open water sites
Filtering of the water samples was "easy" as the water generally was very clear.
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.
[July 30th 1.58 NTU (#82) – 9.67 NTU (#88) 10.7 NTU (#87) 11.8 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, #87and 9. One is a discharge sites.
New data:
From 2013 Coastal and estuarine water quality
Median WQ values 2.63 NTU C/5.3 E NTU
Open water sites similar to median values.

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

The DO readings shows a range from sites tested 8.7 mg L^{-1} (#87)-14.55 mg L^{-1} (#84)
DO % saturation range 89.2% (#89) – 131.2 % (#81/2) .
All site appeared to well supplied with dissolved oxygen. Some sites super saturated.
Close to the median DO values for coastal waters. Less photosynthetic activity and calm waters, less -
The sites with supersaturated concentrations of DO generally had elevated concentrations of chlorophyll a
[July 30th 8.07 mg L^{-1} (#89)-11.94 mg L^{-1} (#88) , 76.5% (#89) – 96.5 % (#86)]

From 2013 Coastal and estuarine water quality
Dissolved Oxygen; 99.5% C/95.9 E

Chlorophyll a.
The range of values is 0.92 µgL^{-1}(#87)-4.32 µgL^{-1}(#81)
Range and values are greater than July 30th . This suggests greater biological activity at most sites. Spring is swinging into action.!!!
Values above 5.0 are classified in estuaries as a matter for concern, possible algal blooms???

[July 30th 0.58 µgL^{-1} (#81)/0. – 2.06 µgL^{-1}(#88)]

All sites had low-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.
0.77 µmol L^{-1} (#84) – 13.01 µmol L^{-1} Open water sites. All sites close to 3 µmol L^{-1} **, slightly lower values overall than July 30th , #87 being an exception being higher than last time measured**

25.34 µmol L^{-1}(#86) – 63.09 µmol L^{-1}(#89)/ 56.48 µmol L^{-1}(#88) Storm water /discharge sites some are **similar to July 30th values, #86 higher**
The tide was starting to turn , so discharge sites like #88 and 9 were draining water off the land
Winter values are higher and this story is being told here, less uptake by phytoplankton??

Assume that more NNN being utilised by the phytoplankton. Chloro a levels are **higher** reflecting the **lower** concentration of nutrients. ?? This is shown at some sites.

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

[July 30th 1.65 µmol L^{-1} (#810) – 7.45 µmol L^{-1} Open water sites. All sites around
.
4.09 µmol L^{-1}(#86) – 61.43 µmol L^{-1}(#89)/ 76.41 µmol L^{-1}(#88) Storm water /discharge sites]

ALL sites exceed guidelines, except #84/5
GUIDELINE value 1.79 µ mol L^{-1} (=0.025 mg N-NO_3^{-1} L^{-1})
Medium ENVIRONMENTAL HEALTH CATEGORY !!!!!!

From 2013 Coastal and estuarine water quality
NNN: median values 0.01mg/L, (0.714 µ mol L^{-1}) C/ 0.02 mg/L (1.43 µ mol L^{-1}) E All values exceed the median value.

DRP (dissolved reactive phosphate)

Range of 0.17µmol L^{-1}(#84) – 0.80 µmol L^{-1} (#88)/0.73 µmol L^{-1} (#89)

The range was less and the values are lower compared with July 30th .

[July 30th 0.32µmol L^{-1}(#87) – 3.19 µmol L^{-1} (#89).]

All sites exceed the Guidelines.

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

Enterococci

We did much better this day. Hamish and the OGHS did an excellent job.
Low bacterial activity in the water. The range of values is 0 MPN/100 ml (#83) – 10MPN /100mL(#87)
except we had clear spikes at #88 150 MPN/100 ml and #89 120 MPN/100 ml

[July 30th 0 MPN/100 ml (#81/2/5) – 19MPN /100mL(#86) and 20 (#88)]

Guideline value 140 cells per 100mL of sample indicated *Enterococci* bacteria
Two sites #88 and #89 exceeded or close to exceeding the guideline values.

SUMMARY OF DATA.

DATE: **17/09/2016**

What is the weather like? • ***Air temperature*** • ***Wind speed and direction*** • ***Cloud cover***	#81and 2 15oC,SW breeze, 10%ccv #82 #83 15oC, almost no wind, 50% ccv #84 16oC,almost no wind,70% ccv #85 150oC, NE, 2-5km/h #86 14oC,light wind, 90% ccv #87 12.8oC, WNW 11km/h, 15%ccv #88 16oC, 0-5 km/hr WNW #89 14.1oC,no wind,90% ccv #810 sl wind from west, 90% ccv
What is the time, and what stage is the tide? ***What is the condition of the Leith ?***	#81and 2 957, v low tide #82 #83 1021, low water #84 1044, very low tide #85 1140, low tide, starting to flood

Check websites (Met service and Port otago)	#86 1206,tide coming in, fairly low tide. #87 0950, low water #88 1010, very low #89 1026, low tide #810 1050, v 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.**	#81and 2 lots of sea squirts, crabs and sea cucumbers #82 lot of pollen on the water #83 _ #84 _ #85 free floating seaweed,small patches bubbles, scummy foam line,constant dribbe for boat house #86 gungy stuff, weeds, foam brown scum, platcs/cans rubbish #87 cans in the water, ducks #88 _ #89 rubbish, plenty of seaweeds. #810 some rubbish
• ***Special seaweeds*** ***f=few*** ***s=some*** ***m=many***	See data sheets
Animals	See data sheets
What condition is the surface of the water?	#81and 2 disturbed by passing boat #82 #83 sl ripple #84 still #85 low small ripples #86 almost flat, oily sheen underneath the surface 15cms down. #87 fast running stream #88 _

	#89	water calm and clear
	#810	water flows fast and clear/clean
Does the water have any real, or apparent colour?	#81and 2	brown where disturbed
	#82	
	#83	greeen, very clear
	#84	no colour, very shallow, can see bottom
	#85	green, brownish close to shore
	#86	browny green
	#87	greeny/brown
	#88	_
	#89	no
	#810	no

What is the water temperature ?	#81and 2	11.2
	#82	
	#83	11
	#84	12.5
	#85	11.7
	#86	12.1
	#87	11.2
	#88	8.6
	#89	10.8
	#810	11
		°C

What is the salinity of the sample ?	#81and 2 **34.24** #82 #83 **34.12** #84 **29.87** #85 **30.86** #86 **29.40** #87 **33.57** #88 **0.10** #89 **6.78** #810 **33.15** 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 ° C***	#81and 2 38.96 _ #82 0.00 _ #83 38.57 _ #84 33.78 _ #85 35.61 51.92 #86 34.40 51.84 #87 38.00 51.60 #88 0.28 0.28 #89 7.61 9.28 #810 37.21 50.99 mS/cm
What is the pH of the sample ?	#81and 2 8.44 #82 8.4 #83 8.25 #84 8.35 #85 8.36 #86 8.28 #87 8.07 #88 8.21 #89 7.82 #810 8.19
What is the water turbidity?	#81and 2 22.8 #82 35.6 #83 1.21 #84 2.14

	#85 7.73 #86 4.38 #87 2.14 #88 12.5 #89 9.97 #810 3.3 NTU
What is the oxygen concentration of your sample *? Measure both methods mg/L and % saturation*	#81and 2 14.09 #82 #83 9.68 #84 14.55 #85 10.4 #86 9.63 #87 8.7 #88 12.3 #89 9.07 #810 8.82 mg/L #81and 2 131.2 #82 #83 106.3 #84 136 #85 115.8 #86 96.5 #87 99.5 #88 106 #89 89.2 #810 98 % saturation
What is the chlorophyll a concentration of the sample ? • ***Record the volume of water filtered***	#81and 2 2.97 #82 4.32 #83 0.99 #84 0.95 #85 2.81 #86 2.34 #87 0.92 #88 1.59 #89 1.24

	#810 1.75 µg/L 0-2 low >2-5 medium >5-10 high >10 very high
******NNN**	#81and 2 2.66 #82 2.86 #83 3.29 #84 0.77 #85 1.13 #86 25.34 #87 13.01 #88 56.48 #89 63.09 #810 1.13 µmol/L
******DRP**	#81and 2 0.40 #82 0.43 #83 0.36 #84 0.17 #85 0.32 #86 0.29 #87 0.54 #88 0.80 #89 0.73 #810 0.20 µmol/L
What is the enterococci count in the sample ?	#81and 2 1 #82 2 #83 0 #84 4 #85 1 #86 8 #87 10 #88 150 #89 120 #810 4

	colonies indicated /100mL