CURRENCY CREEK, FINNISS RIVER AND GOOLWA CHANNEL WATER QUALITY REPORT

Report 20, to 22nd April 2010

OBSERVATIONS AT A GLANCE

- pH remains at satisfactory levels at all sites.
- Alkalinity levels at several Currency Creek sites have declined to between 30 and 72 mg/L.
- Alkalinity remains relatively stable at most Finniss River sites but levels at site FRWL2 have declined to 53 mg/L.
- Salinity continues to increase at all sites.

BACKGROUND

The Environment Protection Authority, Department for Environment and Heritage and Department of Water, Land and Biodiversity Conservation are monitoring water quality to assess potential water impacts associated with the exposure of acid sulfate soils and recent water level changes in the Goolwa Channel, Currency Creek and Finniss River region as a result of the Goolwa Channel Water Level Management Project. Further information regarding the project can be found at: http://www.dwlbc.sa.gov.au/murray/drought/gcll.html.

WATER QUALITY PARAMETERS

A wide range of water quality parameters are being analysed in an integrated program across the Lower Lakes (see http://www.epa.sa.gov.au/environmental_info/water_quality/monitoring_programs_and_assessments/lower_lakes). Key field-based parameters for Currency Creek, Finniss River and Goolwa Channel reported herein are pH, acidity, alkalinity, salinity and turbidity.

pH is an indicator of acidity or alkalinity. Neutral water has a pH of 7, acidic solutions have lower values and alkaline solutions have higher values. Prior to the recent drying and re-wetting, the pH in the region was between 8 and 8.5.

Alkalinity is a measure of the buffering capacity of water, or the capacity of the water to neutralise acids and resist pH change. Alkalinity within water bodies is consumed as acid is released from acid sulfate soils. Adding limestone contributes alkalinity to waters helping to neutralise any acid released from the sediments. Historically, alkalinity levels within this region have been between 100 and 250 mg/L as $CaCO_3$.

***Salinity* is a measure of the amount of dissolved salts in the water. Saline water conducts electricity more readily than freshwater so electrical conductivity (EC) is routinely used to measure salinity. As salinity increases it may become toxic to native freshwater organisms. Prior to drought conditions salinity was observed between 1000 and 1200 µS/cm (EC) within the region.**

***Turbidity* is a measure of the cloudiness or haziness in water caused by suspended sediment. Turbidity is expressed in Nephelometric Turbidity Units (NTU) and is measured using a relationship of light reflected from a given sample. Turbidity is very variable in the Lower Lakes and influenced primarily by wind events.**

SAMPLING SITES

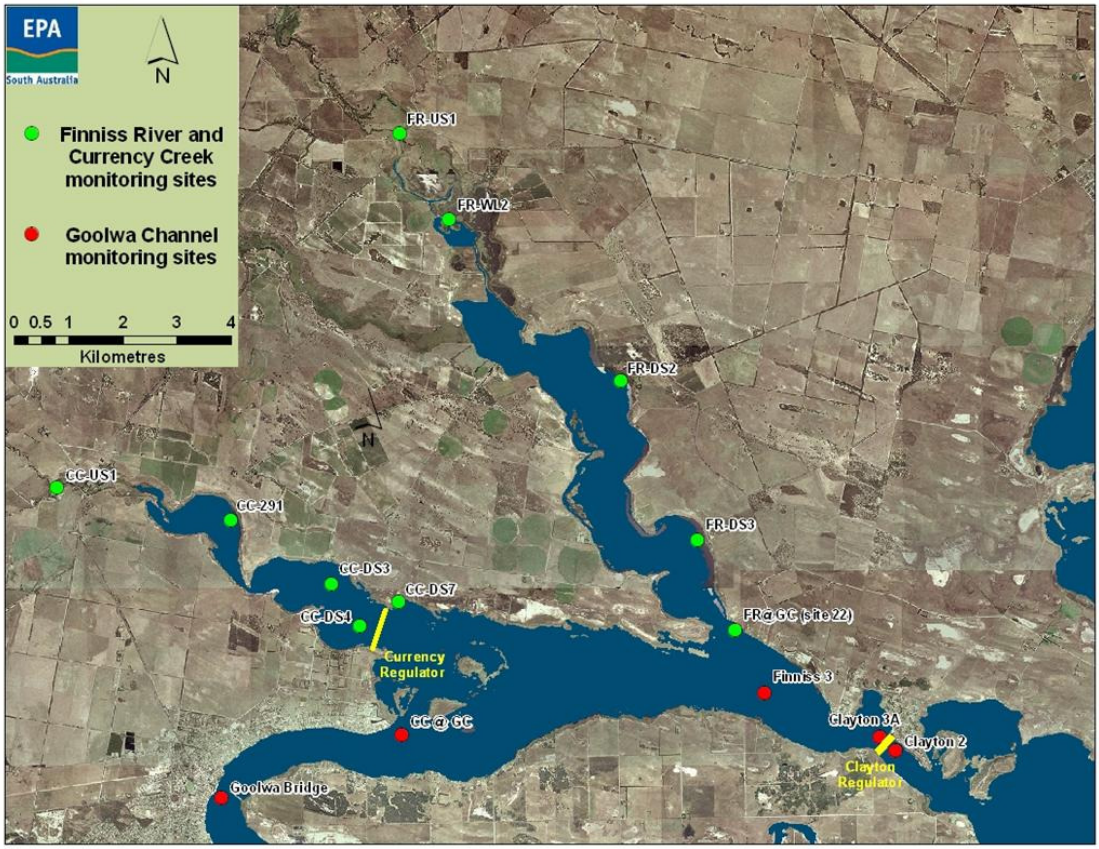
The sample sites where water quality monitoring is undertaken are shown in Figure 1. Several of these sites have been identified as high risk and as a result have been monitored as regularly as possible (in some instances up to 5 times per week).

Currency Creek and Finniss River site descriptions and justification for their selection are contained in prior reports (e.g. see Table 1, Report 7 on the EPA website).

Some of the sediment (groundwater) transects previously reported on are no longer being monitored as they have been reinundated with the rising water level behind the regulator.

The Goolwa Channel sites selected include sites both upstream (e.g. Clayton 2) and downstream (e.g. Clayton 3C, Finniss 3, GC Channel and Goolwa Bridge) of the regulator near Clayton.

Figure 1 - Map of Sample Sites



LIMESTONE MANAGEMENT RESPONSE

Trials of various pre-emptive or reactive (to water acidity) limestone additions have been undertaken in the area between April and July 2009 to mitigate the risk of acidification. For details of locations and volumes refer to Report 5 on the EPA website. Further limestone additions may be undertaken in the future as required.

CURRENCY CREEK WATER QUALITY

Surface water quality results are discussed below for selected sites and parameters in the Currency Creek region. Please refer to the graphs in Figure 2 for this section and to Figure 3 for rainfall at Currency Creek.

pH

- The pH levels of all sites within Currency Creek are stable between 7.82 and 8.91 (19/04/10) and within the ANZECC guidelines (pH 6.5 to 9.0) for protection of aquatic ecosystems.

Alkalinity

- Although pH is satisfactory at all Currency Creek sites, alkalinity continues to remain quite variable with declining trends at several sites.
- CCUS1 continues to exhibit high alkalinity (475 mg/L on 19/4/10) which is most likely a result of the groundwater inputs (high alkalinity) into the Currency Creek catchment being relatively undiluted at this time of year. Flows down Currency Creek are now minimal and slight increases in flow are only seen after significant rainfall events, like that experienced in the region on the 6/4/2010. At present this high alkalinity water is not providing a significant alkalinity load to the lower region.
- Site CC291 continues to exhibit low alkalinity and is displaying a declining trend, currently values stand at 30 mg/L (19/04/10).
- Alkalinity at site CCDS3 previously exhibited signs of improvement with values reaching 135 mg/L on the 14/01/09. Since that time this site has also shown a clear declining trend and values currently (19/04/10) stand at 72 mg/L.
- Over the past two months the site CCDS4 has exhibited a clear declining trend. Currently values stand at 65 mg/L (19/04/10).
- Alkalinity at the mouth of Currency Creek at the Goolwa Channel (CC@GC) currently stands at 183 mg/L (22/04/10). This site has exhibited an increasing trend in alkalinity after falling to a low of 27 mg/L in September of 2009.

Salinity (EC)

- Salinity levels at CC291, CCDS3, CCDS4 and CC@GC are quite similar (between 17746 µS/cm and 20526 µS/cm on 19/04/10).There is still an increasing salinity trend due to evaporative concentration and relatively low inputs through rainfall or tributary flows (see figure 3).

Figure 2 - Currency Creek Water Quality

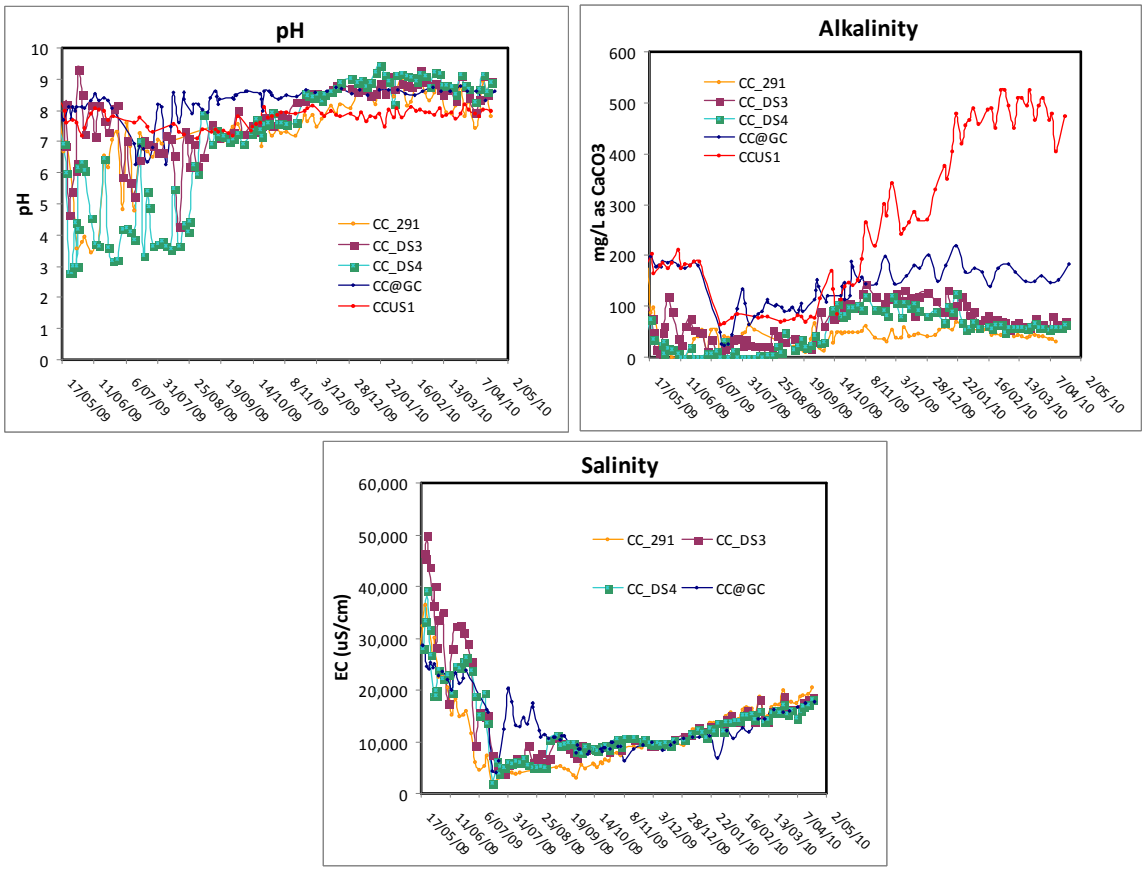
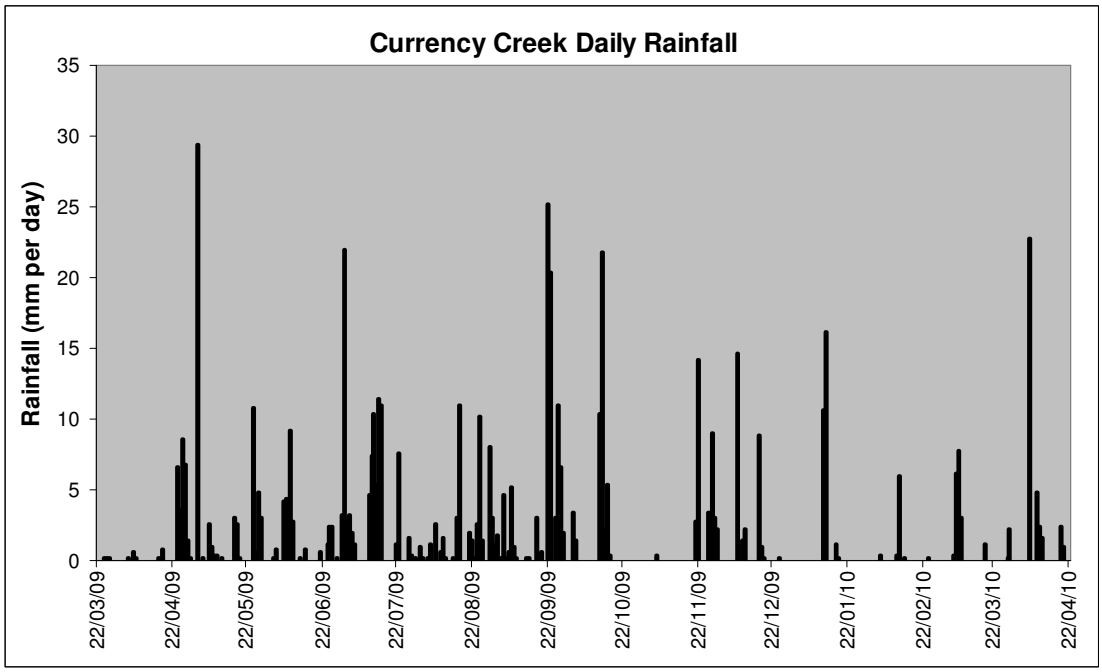


Figure 3 - Rainfall at Currency Creek



Data from South Australian Murray-Darling Basin NRM Board weather station (refer to http://www.samdbnrm.sa.gov.au/Portals/7/AWMN/awsview.php)

FINNISS RIVER WATER QUALITY

Water quality results are discussed below for selected sites and parameters in the Finniss River region**.** Please refer to the graphs in Figure 4 for this section.

pH

- pH levels at all Finniss River sites are now between 7.41 and 8.48 (19/04/10) and within the ANZECC guidelines (pH 6.5 to 9.0) for protection of aquatic ecosystems.

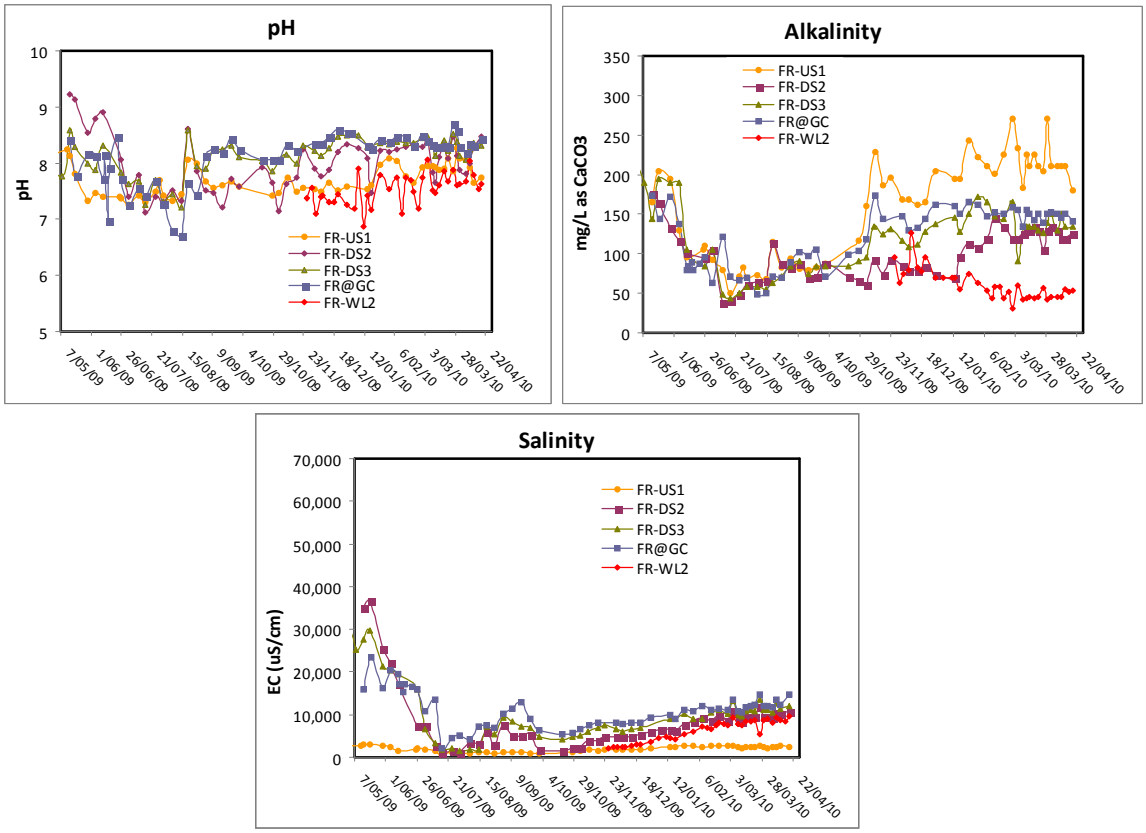
Alkalinity

- Most sites in the Finniss River have satisfactory alkalinity levels (they range between 53 mg/L and 180 mg/L on 19/04/10).
- Alkalinity at sites FRUS1, FR@GC and FRDS3 remained relatively stable since the 29th December and on 19/04/10 stand at 135 mg/L (FRDS3), 141 mg/L (FR@GC) and 180 mg/L (FRUS1).
- Alkalinity at FRDS2 dropped to 70 mg/L on the 14/01/10, however since this time has increased to currently stand at 127 mg/L (19/04/10).
- FRWL2 has been showing a declining trend in alkalinity since 9/12/09 where it stood at 126 mg/L, and currently (19/04/10) levels stand at 53 mg/L. This is much lower than the upstream site FR-US1 and could indicate localised acid inputs from acid sulfate soils. This area has been previously identified by CSIRO an acid sulfate soil “hotspot”.

Salinity (EC)

- All sites have exhibited an increasing salinity trend, with the higher levels recorded closer to the Goolwa Channel. Currently (19/04/10) salinity at the sites ranges between 2525 µS/cm (upstream site, FR-US1) and 14592 µS/cm (downstream site, FR@GC). The upstream site (FR-US1) has showed less salinity rise than the other sites, presumably as a result of some localised low tributary flows.

Figure 4 - Finniss River Water Quality



GOOLWA CHANNEL WATER QUALITY

Surface water quality results are discussed below for selected sites and parameters in the Goolwa Channel region. Please refer to the graphs in Figure 5 for this section. Many of these sites were added as the Goolwa Regulator near Clayton neared completion. Pumping of water from Lake Alexandrina (approximately 26 GL) began on 11 September 2009 and ceased on 9 November 2009.

pH

- The pH of all sites monitored in the Goolwa Channel are now between 8.45 and 8.84 (19/04/10) and within the ANZECC guideline values for protection of aquatic organisms.

Alkalinity

- Alkalinity in the Goolwa Channel has remained at satisfactory levels at all sites (above 150 mg/L; 19/04/10). Since the Goolwa Channel Water Level Management Project was implemented there has been an overall increase in alkalinity at all sites in the Goolwa channel.

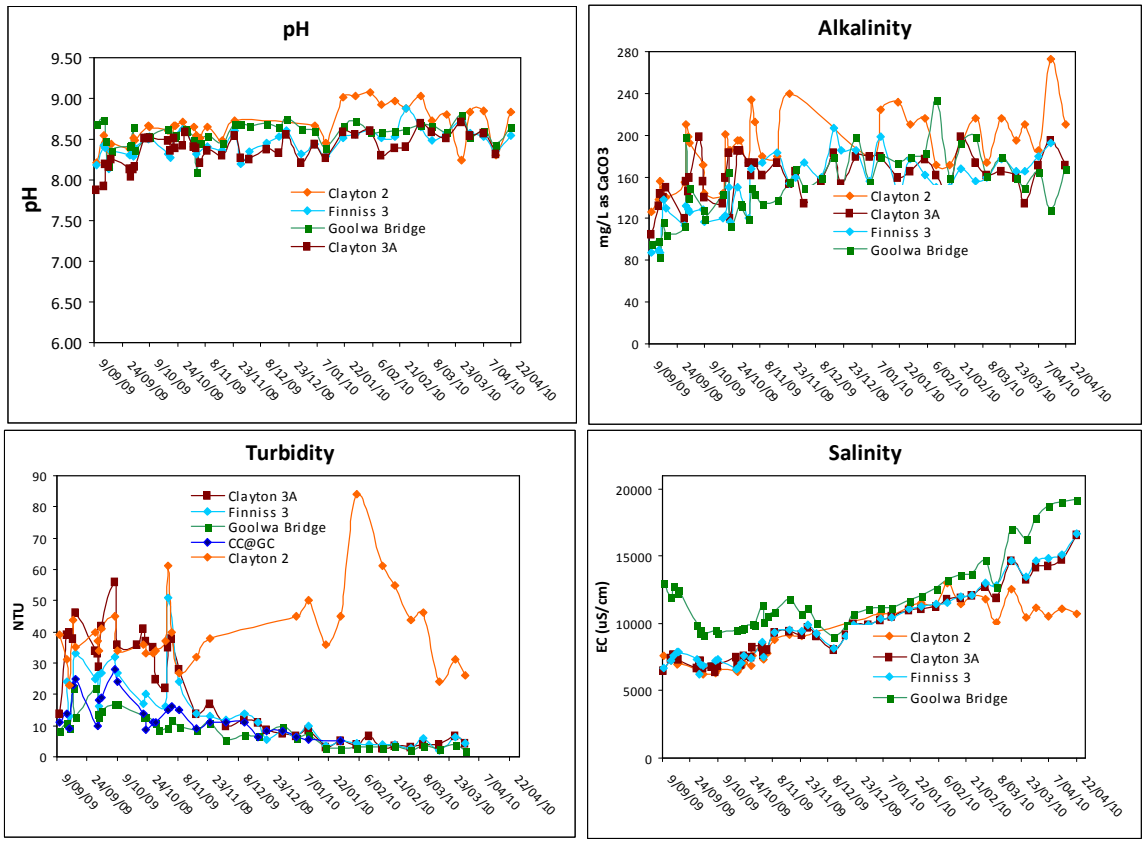
Salinity (EC)

- Since pumping conculded, salinity levels at all sites have exhibited increasing trends. Currently salinity levels at all sites are between 10718 and 19226 µS/cm (19/04/10).

Turbidity

- Since pumping finished the turbidity at the sites closest to the regulator (Finniss 3, Clayton 3A) has decreased markedly. Currently all four sites (Goolwa side of regulator) range between 2.0 and 6.6 NTU (6/04/10) and have a declining trend. The very low turbidity in this region is likely due to lower concentrations of suspended particles in tributary flow, settling in the pool behind the regulator and salt-induced coagulation of clay colloids. During warmer months a large increase in filamentous (*Cladophora* sp.) and macro-algal growth (*Stuckenia pectinata*) has been observed in this region, presumably as a result of the greater water clarity. Site Clayton 2, however, has much higher turbidity than the other sites. Located on the eastern side of the Goolwa Regulator, the higher turbidity at this site is most likely a result of the influence of waters from Lake Alexandrina, which have comparable turbidity. Overall, although the turbidity is higher at Clayton 2, the site does show a recent decline from 84 NTU (5/02/2010) to the current value of 26 NTU (6/4/2010).

Figure 5 - Goolwa Channel Water Quality



Further information on water quality and quantity, and acid sulfate soils, can be found on the following websites:

- **Department for Environment and Heritage** www.environment.sa.gov.au/cllmm/
- **River Murray Data** http://data.rivermurray.sa.gov.au/ (real-time data)
- **Environment Protection Authority** www.epa.sa.gov.au or for specific Lower Lakes data see www.epa.sa.gov.au/environmental_info/water_quality/monitoring_programs_and_assessments/lower_lakes
- **Department of Water, Land and Biodiversity Conservation** www.dwlbc.sa.gov.au
- **South Australian Murray–Darling Basin Natural Resource Management Board** www.samdbnrm.sa.gov.au
- **Murray–Darling Basin Authority** www.mdba.gov.au
- **Waterwatch** www.waterwatch.org.au
- **CSIRO acid sulfate soils** www.clw.csiro.au/acidsulfatesoils/murray.html