CURRENCY CREEK & FINNISS RIVER WATER QUALITY REPORT

Report 3, to 14th July 2009

OBSERVATIONS AT A GLANCE

- Site CC@GC where Currency Creek meets the Goolwa Channel is for the first time showing signs of impact from ASS. Alkalinity and pH levels have deteriorated.
- After initial improvements following aerial dosing, pH and alkalinity levels have decreased at all high risk monitoring sites within Currency Creek.
- pH levels in the Finniss region have continued to decline at most sites.
- Alkalinity levels at all Finniss sites have declined with the exception of site FR@GC.

BACKGROUND

The Environment Protection Authority, Department for Environment and Heritage, and the South Australian Murray–Darling Basin Natural Resources Management Board are monitoring to assess potential water quality impacts associated with water level decline and the exposure of acid sulfate soils in the Goolwa Channel, Currency Creek and Finniss River region (Figure 1).

WATER QUALITY PARAMETERS

A wide range of water quality parameters are being analysed but the key parameters reported are pH, acidity, alkalinity and salinity.

***pH* is a measure of acidity or alkalinity. Pure 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 – 8.5.**

***Acidity* is a measure of the acid (hydrogen Ions) and dissolved metal ions (e.g. iron and aluminium) present in water bodies. Acidity is expressed as the volume of calcium carbonate (mg/L of $CaCO_3$) required to neutralise any acid. Acidity build up occurs when the alkalinity or buffering capacity has been consumed. Acidity is not normally present in the Lower Lakes.**

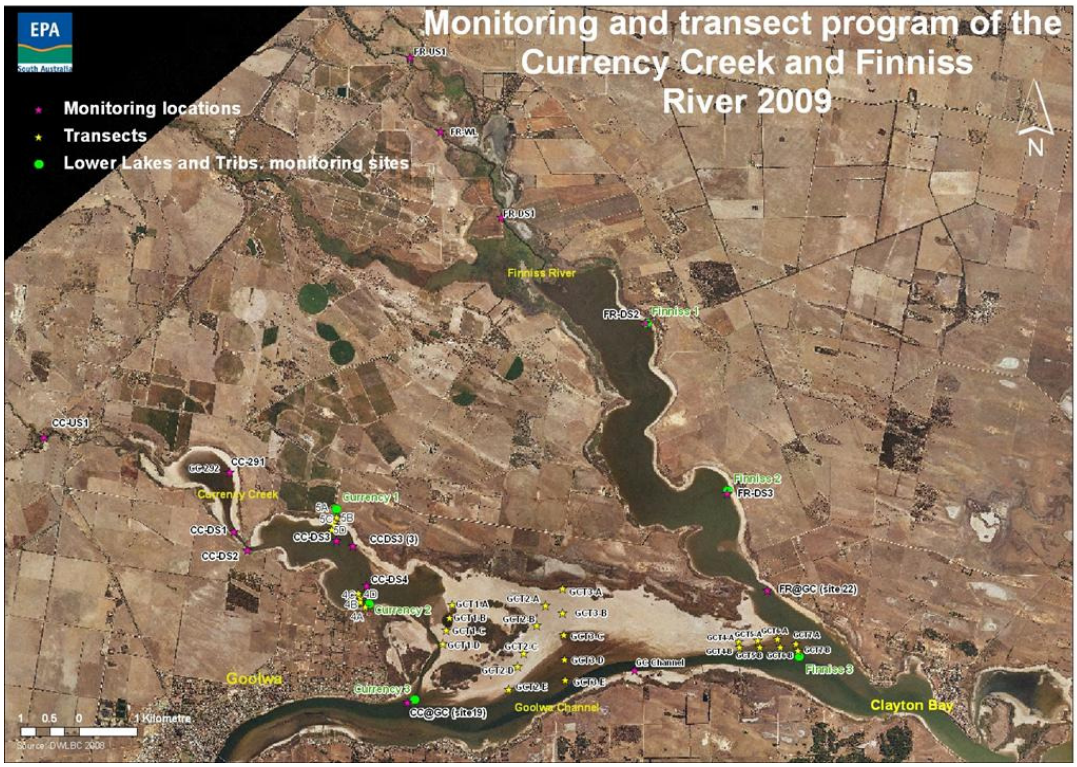
***Alkalinity* is a measure of the buffering capacity of water, or the capacity of the water to neutralise acids and resist pH change. Alkalinity within**

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 levels within this region have been measured between 100 – 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 levels increase it may become toxic to native freshwater organisms. Prior to drought conditions salinity was observed between 1 and 1.2 mS/cm (1000-1200 EC) within the region.

Metals may be toxic to aquatic organisms if they are found at high levels. Acidification of soils releases metals which can subsequently enter into adjacent water bodies (e.g. through shallow groundwater flow, or vertical mobilisation out of the soil during rewetting).

Figure 1 Map of sample sites



A number of sites have been identified as high risk sites and as a result are being monitored as regularly as possible (in some instances up to 5 times per week). Table 1 shows basic descriptions and justifications for the selection of high risk monitoring sites within the Goolwa Channel, Currency Creek and Finniss River region.

Table 1 Selection and description of high risk sites

Site	Location	Description
CC-291	Currency	On the northern margin of the upper Currency Creek representing the transition from creek to open channel. The site is located over sediments exposed in summer that have now been re-inundated due to rainfall events. Catchment inflows recommenced this reporting period.
CCDS2	Currency	A narrow midway bottle neck that formerly was a disconnected pool in summer. It is now reconnected to water throughout Currency Creek due to rainfall events and inflows.
CCDS3	Currency	On the northern margin of mid to lower Currency Creek. The site is located over sediments that were exposed in summer and now have been re-inundated due to rainfall events and inflows.
CCDS4	Currency	On the southern margin of the lower Currency Creek. The site is located over sediments that were exposed in summer and have now been re-inundated due to rainfall events and inflows.
CC@GC	Currency/ Goolwa Channel	At the mouth of Currency Creek where it enters the Goolwa Channel. The site is located within the Goolwa Channel and has remained inundated. It is an important site to monitor the buffering capacity of Lake Alexandrina water and potential impact of outflows from the Currency Creek region.
FRDS1	Finniss	Within the upper Finniss River and adjacent to wetlands that have shown signs of ASS driven acidity on rewetting. Minor flow in the region continued over summer that has now increased with rainfall events and catchment inflows.
FRDS2	Finniss	On the eastern margin of the Finniss River downstream of where it initially enters Lake Alexandrina. The site remained inundated in summer although water levels shallowed markedly and nearly disconnected from the Goolwa channel.
FRDS3	Finniss	On the eastern margin of the Finniss River further downstream of FRDS3 and closer to the Goolwa Channel. The site remained inundated in summer although water levels shallowed markedly and nearly disconnected from the Goolwa channel.
FR@GC	Finniss/ Goolwa Channel	Located at the mouth of Finniss River where it enters the Goolwa Channel. It is an important site to monitor the buffering capacity of Lake Alexandrina water and potential impact of outflows from the Finniss River region.

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.

In late April, pre-emptive limestone mounds were placed at the upper entrances of Currency Creek and the Finniss River prior to rainfall events so that inflows would be intercepted.

Following several rainfall events in late April and May that caused pooling of water in and acidification of Currency Creek, a limestone barrier was constructed immediately downstream of the Currency Creek bottle neck near CCDS2 and two were constructed in lower Currency Creek below CCDS4 to stop acidic water from reaching the Goolwa Channel.

In mid June, aerial limestone dosing took place in the Currency Creek region with limestone dispersed over both the upper Currency Creek (below site CCDS1) and lower Currency Creek water bodies (below site CCDS2).

Addition aerial dosing is planned for Currency Creek if: 1) improvements in water quality begin to falter, 2) acidity continues to be released from porewaters to surface waters or 3) breaches occur in the Currency Creek temporary limestone barriers.

CURRENCY CREEK WATER QUALITY

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

Alkalinity

- Alkalinity at CC291 had shown signs of improvement and considerable variability since the first round of aerial limestone dosing. Post dosing the site recorded an increase in alkalinity to 55 mg/L (29th June) however it has since dropped to 4 mg/L (13th July).
- Alkalinity at CCDS2 remained absent for a few weeks however did return and rise as high as 51 mg/L (6th July); it has since dropped to 15 mg/L (13th July).
- Alkalinity levels at CCDS3 remain quite variable since dosing. The last five samples recorded between 14 – 55 mg/L. It appears that alkalinity has almost disappeared with current levels observed at only 4 mg/L (13th July).
- Alkalinity levels at CCDS4 remain low and were recorded at 15 mg/L (14th July).

- Alkalinity at the Goolwa Channel (CC@GC) site has deteriorated in recent days. Throughout the time of the monitoring program alkalinity has remained between 177-198 mg/L. On the 13th of July levels had dropped to 49 mg/L and on the 14th July levels were observed to have fallen to 25 mg/L.

Acidity

- Acidity levels for CC291, CCDS2, CCDS3 and CCDS4 have all exhibited declines (improvement) and some variability in acidity since the first aerial dosing program. Current acidity levels for these sites are as follows. CC291 86 mg/L, CCDS2 0 mg/L and CCDS3 13 mg/L and CCDS4 67 mg/L as $CaCO_3$.

pH

- pH levels at sites CC291, CCDS2, CCDS3, CCDS4 and also CC@GC are declining. All five sites are exhibiting pH levels below the ANZECC guideline level for aquatic ecosystem health of <6.5. The five sites currently have pH levels between 3.85 and 6.24.
- Site CC@GC has shown a substantial decline in pH levels and also alkalinity in recent days. Throughout the monitoring program pH levels at this site have shown little variation and have remained at or between 7.75 and 8.54. However, pH has now declined to 6.24 on the 14th July.

Salinity (EC)

- Salinity levels at CC291, CCDS2 and CCDS4 have shown steady declines (electrical conductivity mS/cm). Currently levels at these sites remain between 3.51 – 15.8 mS/cm.
- Salinity at CC@GC is also exhibiting results suggesting freshening as a result of recent rains current level stands at 15.8 mS/cm on the 14th July.

FINNISS RIVER WATER QUALITY

Surface water quality results are discussed below for selected sites and parameters in the Finniss River region**.** Please refer to graphs in Figure 3 for this section.

Alkalinity

- FR@GC had shown declines in alkalinity over recent weeks. On the 2nd July the site exhibited its lowest recorded level to date with an alkalinity of 63 mg/L. Nevertheless this has since increased and currently stands at 122 mg/L (10th July).
- FRDS1 continues to show a declining trend. Currently the level stands at 45 mg/L (14th July).

- FRDS2 continues to show a declining trend. Currently the level stands at 39 mg/L (10th July).
- FRDS3 continues to show a declining trend. Currently the level stands at 49 mg/L (10th July).

pH

- pH levels at all Finniss monitoring sites remain within ANZECC guidelines for ecosystem health (pH 6.5 to 9).
- FRDS1 was the first monitoring site to exhibit a pH level that exceeded ANZECC guidelines for aquatic ecosystems. The pH for this site fell to 6.35 on the 2nd of July but has now risen to 6.88 (10th July).

Salinity (EC)

- Levels continue to remain steady at FRUS1 (currently 1.6 mS/cm).
- Salinity levels at FRDS1 have fallen to 0.98 mS/cm.
- Levels at FR@GC have increased to 13.47 mS/cm.
- Salinity levels at site FRDS2 have fallen in the last week as a result of recent rain. Level currently stands at 2.62 mS/cm.
- Salinity levels at site FRDS3 have also fallen in the last week as a result of recent rain. It currently stands at 3.27 mS/cm.

Figure 2 - Currency Creek Water Quality

(Blue shading indicates time period of aerial limestone dosing program)

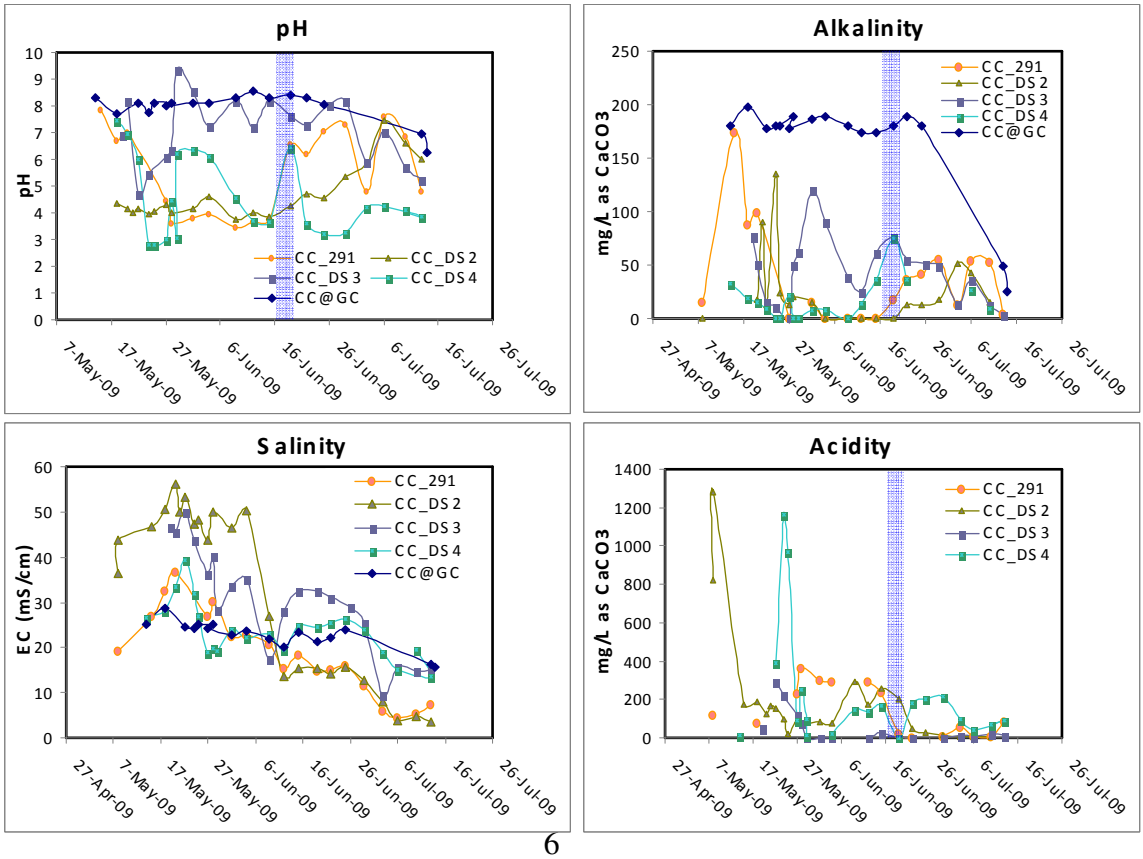


Figure 3 - Finniss water quality

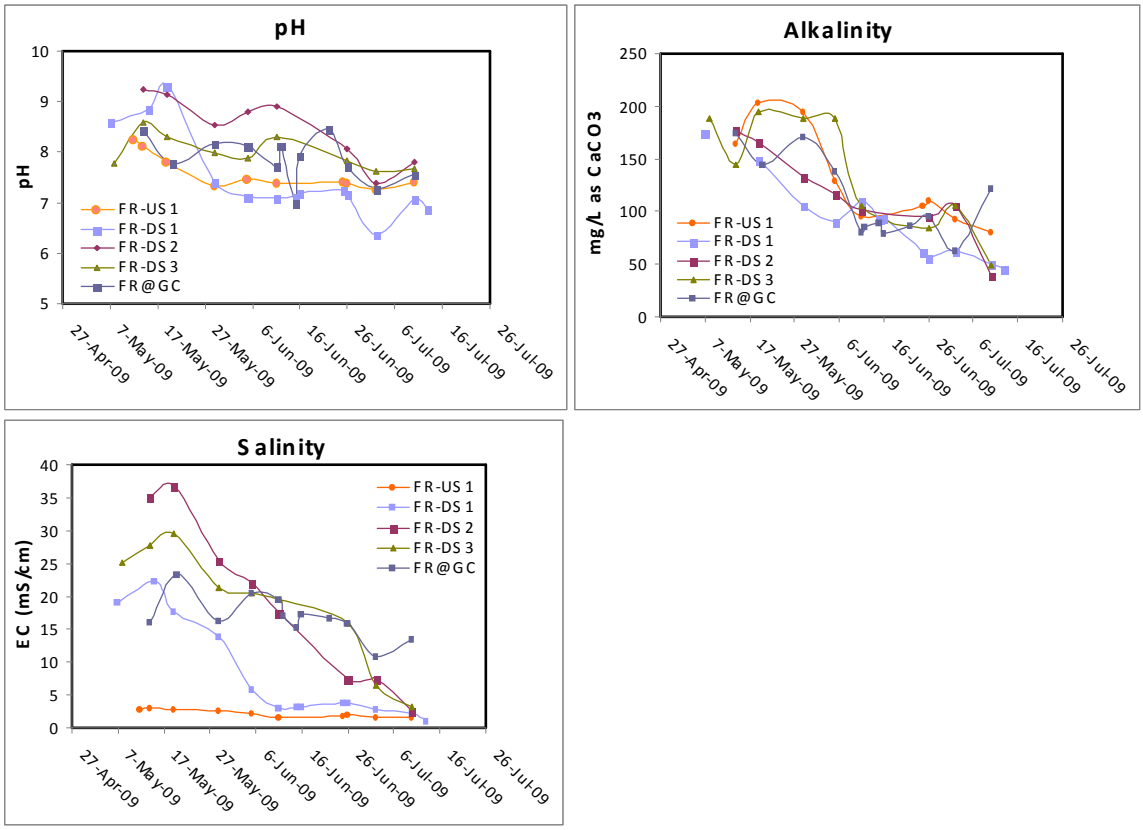
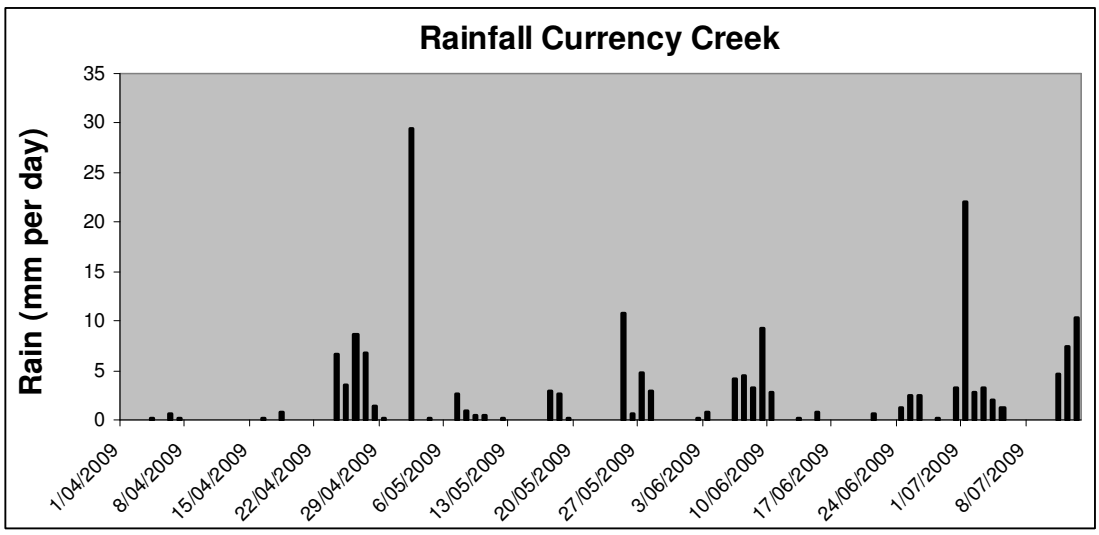


Figure 4 - Rainfall at Currency Creek



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

Further information on water quality and quantity can be found on the following websites:

- **Department for Environment and Heritage** http://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
- **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