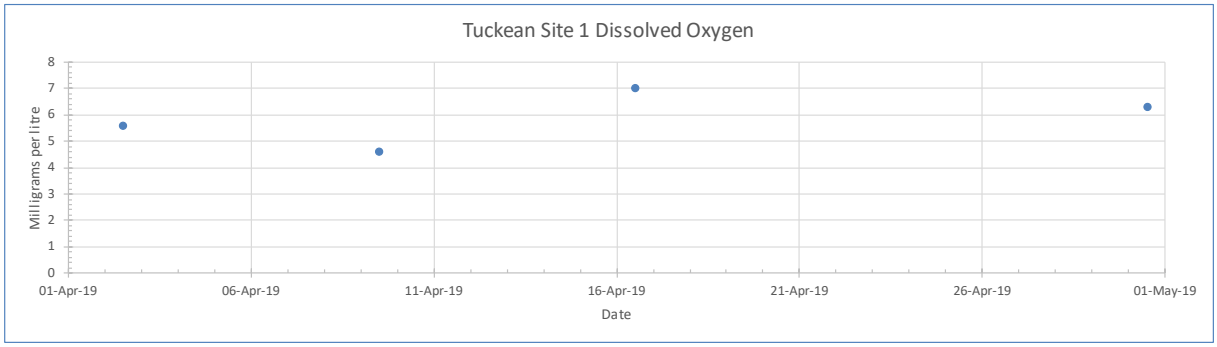
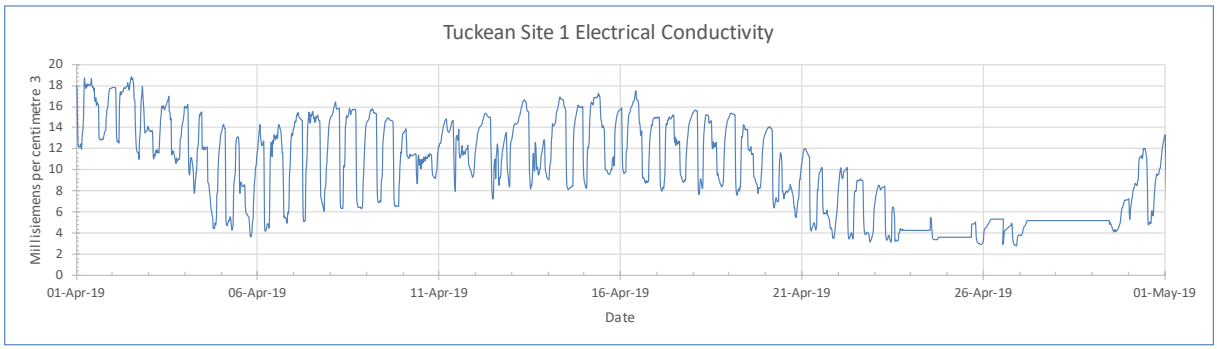
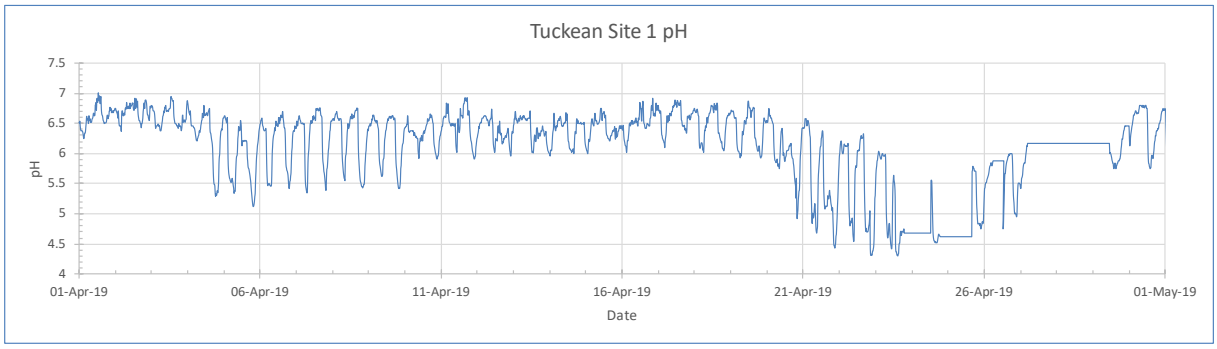
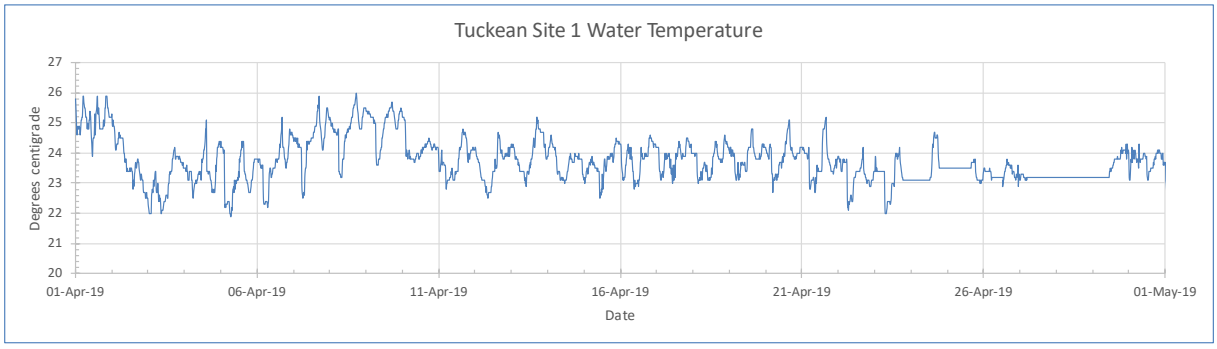
**Tuckean Site 1 water quality – April 2019**

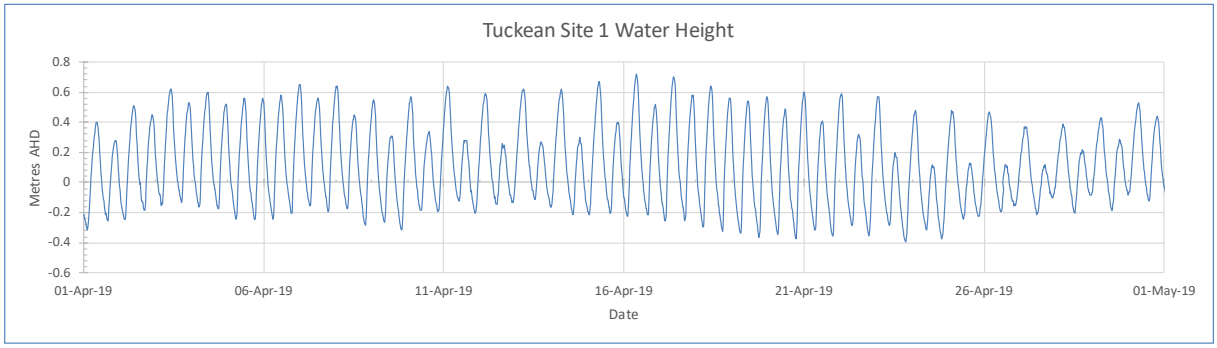
Data logger located at Bagotville in the Broadwater downstream from Bagotville Barrage

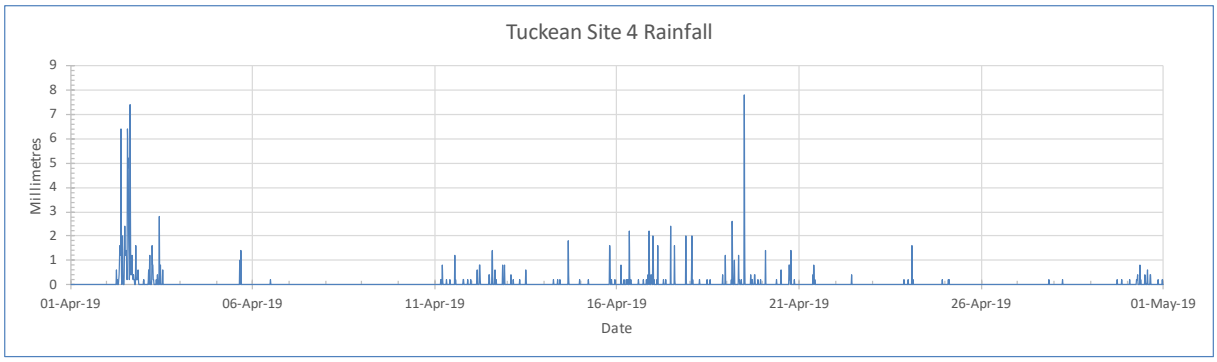





**Interpretation**

Note: - Dissolved oxygen readings are being substituted by weekly manual measurements. Site 1 was cleaned and calibrated on 16th April. Continued cloud cover during April has reduced solar charging and battery voltage causing the water quality meter to turn off four times during night & early morning requiring manual resetting.

On the 24 April, around 30 dead fish were found at the Bagotville Barrage. The fish were on both side of the Barrage and had been dead for a few days, some were decomposing. They were mainly Mullet, all in between 20-30cm long. There were no obvious marks on the fish.

Rous County Council staff advised NSW DPI Fisheries and other relevant stakeholders and monitored water quality. Council's dataloggers in the area show a small discharge event was occurring at the time with slightly lowered salinity levels and pH readings. For the five days following, dissolved oxygen ranged been 3.60 and 4.90 mg/L and pH ranged between 5.2 and 5.49 (on discharging tides). Laboratory analysis of water discharging when the fish were found, show elevated aluminium levels. This is common in areas with large-scale disturbance of acid sulfate soils, like the Tuckean Swamp.
Whether water quality was a factor in the fish's death, is not known. Healthy schools of fish were seen swimming in the Barrage area on the day the fish were found and afterwards. No further dead fish were found, and the event is considered localised. The reason why the fish died or where they died is not known.

The sluice window on the Barrage was opened further by Rous County Council from 150mm to 500mm to increase tidal exchange and assist in improving water quality in the area. The sluice was opened on Wednesday 24 April and lowered back to 250mm on Friday 3 May because of concerns of higher tides.

- **Dissolved oxygen (DO)** was recorded in April by weekly manual measurement on the upstream side of the barrage between 4.62 and 7.03 mg/L with an average of 5.9 which has increased compared to the March average of 5.7. Readings are spot readings and do not take into account tidal variations which can fall at low tide to levels capable of killing fish. Levels below 3 mg/L are considered critical to fish, while between 3 and 6 mg/L is considered marginal and above 6 mg/L is optimal. DO is influenced by temperature, rainfall, tidal movement and chemical and biological oxygen demand.

- **Electrical conductivity (EC)** for April ranged between 2.8 and 18.7 ms/cm$^3$ and averaged 10.0 ms/cm, which is considered saline and has decreased by 12.8 compared to the March saline average of 22.8 due to increased rainfall and reduced tidal exchange. Levels below 1.8 ms/cm are considered freshwater, while from 1.8 to 4.8 is considered brackish and above 4.8 ms/cm saline with seawater equal to approximately 60 ms/cm. EC is influenced by rainfall, runoff, temperature and tidal movement.

- **pH** for April ranged from 4.3 to 7.0 and averaged 6.1, which is acid and has decreased by 0.8 representing 6.3 times more acidity when compared to the March average readings of 6.9. River water under normal conditions is generally near neutral (pH 7), while brackish or saline water moving upstream during dry periods may be higher. Acid water is normally discharged from the Tuckean drains following rain. pH is measured on a logarithmic scale with each consecutive whole number different by a factor of 10.

- **Water temperature** for April ranged from 22.0$^{o}$ to 25.7$^{o}$C giving a range of 3.7$^{o}$C and averaging 23.8$^{o}$C which has decreased by 3.7$^{0}$ compared to the March average of 27.5$^{0}$ due to increased cloud cover and seasonal change. Water temperature is influenced by season, air temperature, solar radiation, cloud cover, day/night, turbidity, tidal movement and rainfall.

- **Water height** was recorded for April between -0.39 m and +0.70 metres giving a range of 1.09 m and averaging +0.12 m which is 0.01 lower than the March average of +0.13 m, however the logger needs to be surveyed into AHD. The highest tides of the month at 1.75 m occurred on 17$^{th}$ at 6:35 am and 18$^{th}$ at 7.24 am at Ballina, while the corresponding peak at the logger of 0.70 m AHD occurred at 9:00 am on 17$^{th}$ and 0.64 m at 9:45 am on 18$^{th}$ giving a delay of 2hr 25 min and 2hr 21 min. Zero AHD approximates to mean sea level or a 0.925 m tide height therefore 1.75 m tide equals 0.825m AHD, however tidal water cannot get in fast enough and without sufficient river flow water cannot back up to this height. Water height can be affected by river level, tides, storm surge and rainfall and to a lesser extent temperature, wind and barometric pressure.

- **Rainfall:** In April the site 4 data logger situated 4 km to the north recorded 164.6 mm over 23 days which compares to 166.6 mm recorded over 17 days in March. Peak 15-minute rainfall of 7.8 mm was recorded between 11:30 am and 11:45 am on 19$^{th}$ April. The April 33-year average for this location is 185.6 mm therefore rainfall is below average. During April the Rocky Mouth Creek data logger located 19 km to the SSW recorded 211.8 mm over 23 days, while the Ballina AWS located 19 km to the NE recorded 158.8 mm over 21 days.