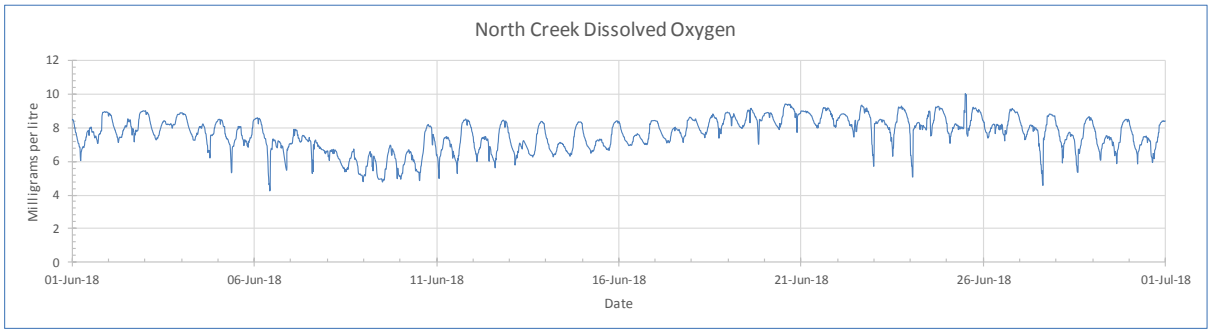
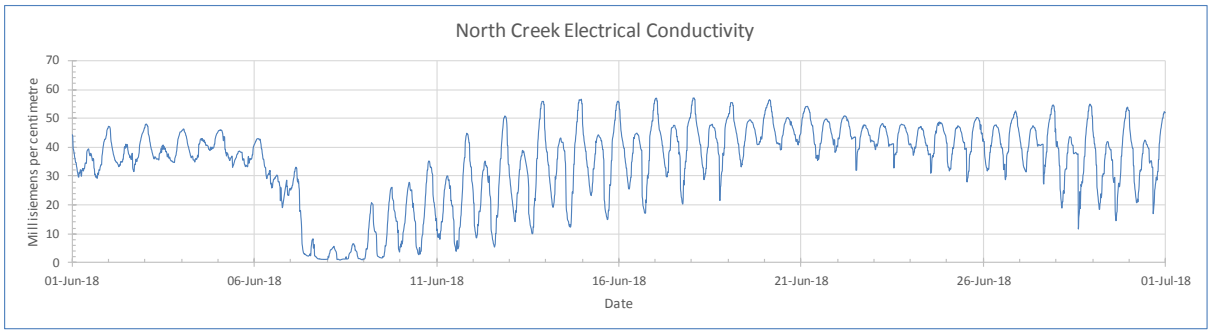
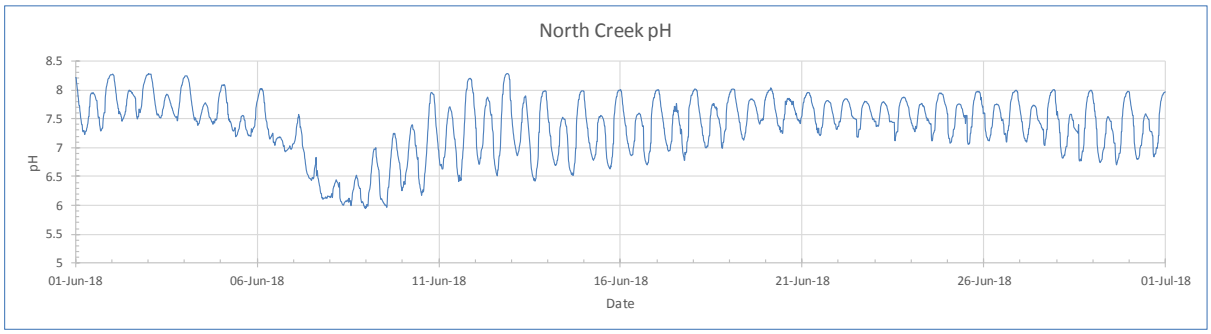
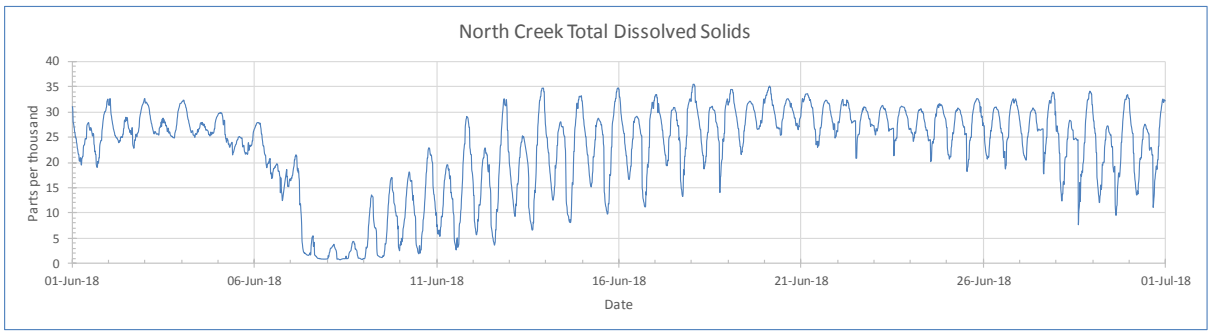
North Creek water quality – June 2018

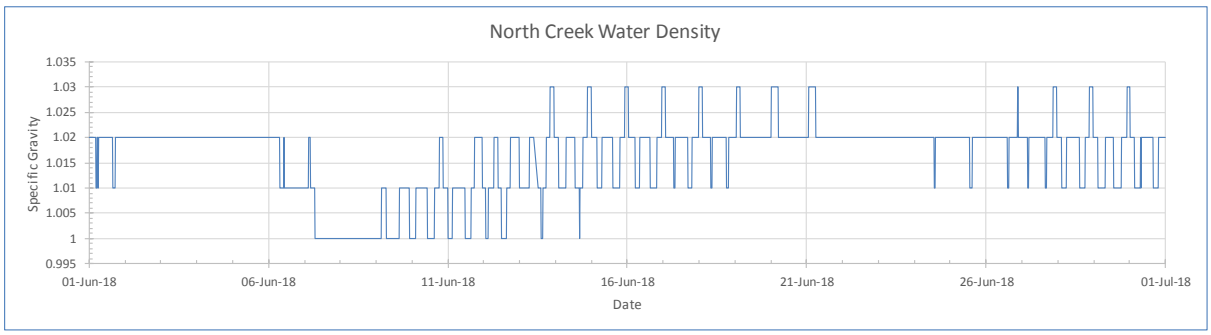
Data logger located in North Creek near airport.

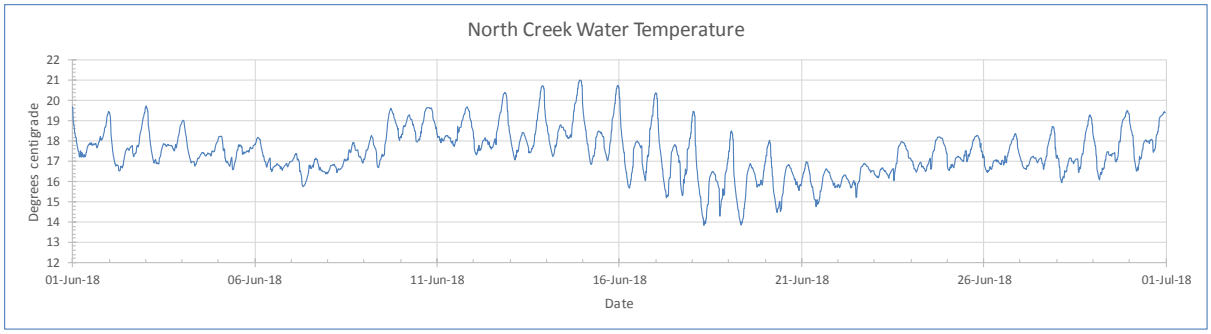


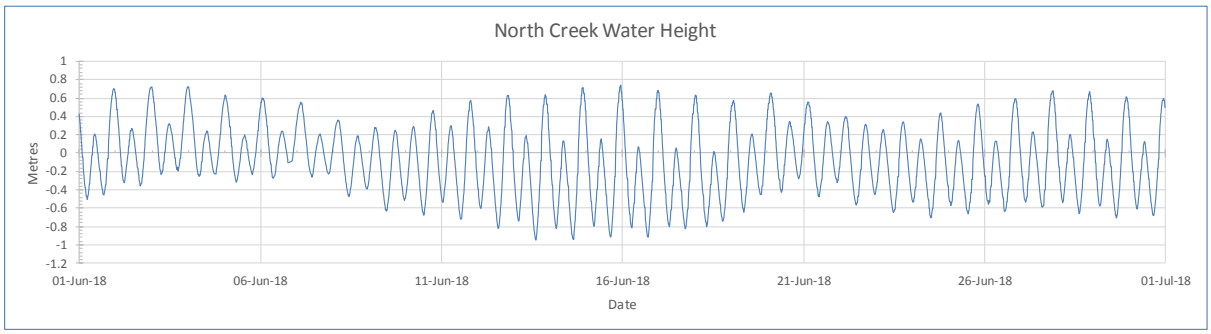


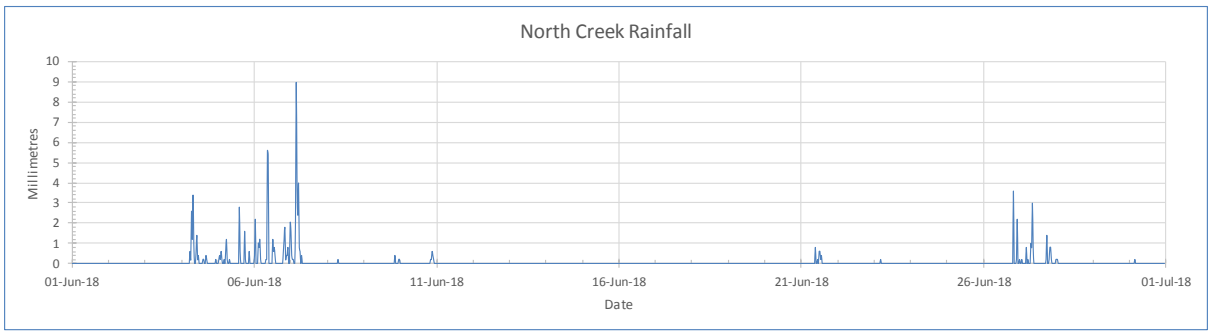












Interpretation

*Note –The data problem with EC data above 32 ms has been resolved however TDS is still going negative so has been manually adjusted. Barnacles were removed and the sensor was calibrated on 13th June with the addition of a copper sheath and a small solar panel.

- **Dissolved oxygen* (DO)** was recorded during June from 0.67 to 35.27mg/L with an average of 7.64 which has increased compared to the May average of 6.4 mg/L. 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, chemical and biological oxygen demand.

- **Electrical conductivity (EC)** for June was recorded between 1.23 and 56.68 ms/cm averaging 34.76 ms which has increased compared to the May average of 24.7 ms/cm. Levels have risen due to below average rainfall, reduced runoff and greater tidal influence. 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 equivalent to approximately 60 ms/cm. EC is influenced by rainfall, runoff, temperature and tidal movement.

- **pH** for June was recorded between 6.0 and 8.3 with an average of 7.4 which is alkaline and has increased by 0.3 compared to the May average of 7.1 representing twice the alkalinity. pH has increased due to lower than average rainfall and increasing tidal influence. Peaks of

pH normally occur on high tide with increasing salinity while troughs occur on low tide as acid drains discharge. River water under normal conditions is generally near neutral (pH 7), while saline water moving upstream during high tides will be higher. pH is measured on a logarithmic scale with each consecutive whole number different by a factor of 10.

- **Total dissolved solids (TDS)** is a measure of the combined content of all inorganic and organic dissolved molecular, ionized or suspended micro-granular substances in the water, including minerals, salts or metals measured in parts per thousand (ppt). TDS was recorded for June between 0.7 and 35.27 ppt averaging 22.72 which has increased compared to the May average of 17.1 ppt. TDS is highest on high tide as salinity increases and lowest on low tide as freshwater is discharged from North Creek. TDS is influenced by tidal movement, rain and runoff.

- **Density** also called specific gravity (SG) is the ratio of the weight of a sample compared to that of fresh water at +4.0^{o}C. For June density was recorded between 1.0 and 1.03 with an average of 1.02 compared to the May average of 1.01. Fresh water is normally close to 1.0, while sea water is slightly denser at 1.027g/cm^{3}, which leads to the formation of salt wedges and acid water is even denser (Sulfuric acid SG = 1.94 g/cm^{3}). Density varies with temperature with maximum density occurring at +4.0^{o}C, while tides, rainfall, runoff and acid discharges also affect density.

- **Water temperature** for June was recorded between 13.9 and 21.0^{0}C averaging 17.4^{0} which has decreased by 2.4^{0} compared to the May average of 19.8 deg C due to 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 June between -0.91 and +0.74 and averaging -0.70 compared to the May average of -0.04m however barnacles within the housing have been removed so the height of the sensor may have changed. The highest tide of the month at 1.93 m occurred on 15th June at 9.44 pm at the Ballina River entrance while the peak at the logger of 0.74 m was recorded at 10.45 pm giving a delay of 61 minutes. The delay in tidal peak along North Creek is caused by restrictions in water entering North Creek due to width and depth, which also reduces the maximum tide height and range. The logger has not yet been surveyed in to the Australian Height Datum (AHD) so all heights are relative. Zero AHD approximates to mean sea level or a 0.925 m tide height and the readings have been adjusted to approximately AHD. Water height can be affected by river level, floods, tides, storm surge and rainfall and to a lesser extent temperature, wind and barometric pressure.

- **Rainfall** recorded during June at the Ballina Airport Automatic Weather Station (AWS) situated 1.8 km to the west of North Creek logger was 99.0 mm falling over 13 days, which compares to the May rainfall of 64.4 mm over 14 days. The June average for Ballina AWS is 210.5 mm therefore rainfall is well below average. Peak rainfall of 9.0 mm was recorded on the 7th June over 30 minutes between 3:00 pm and 3:30 pm. During June the Tuckean site 4 data logger located 19 km to the SW recorded 78 mm over 23 days, while the Rocky Mouth Creek data logger located 37 km to the south-west recorded 72.4 mm over 25 days.