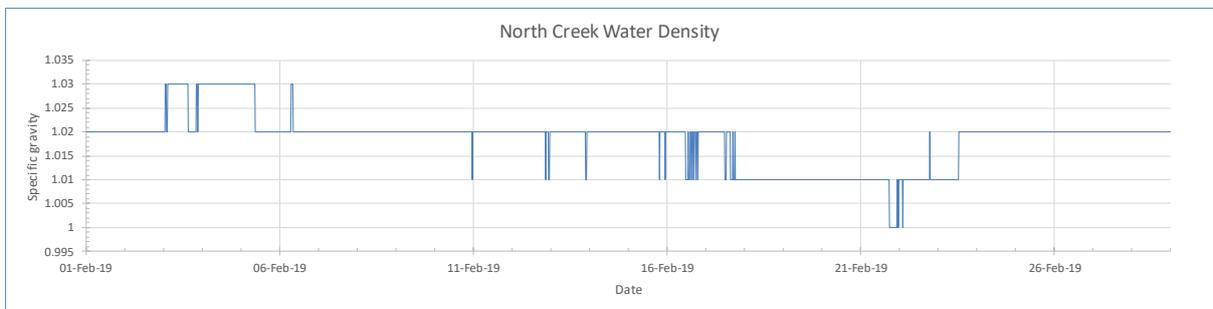
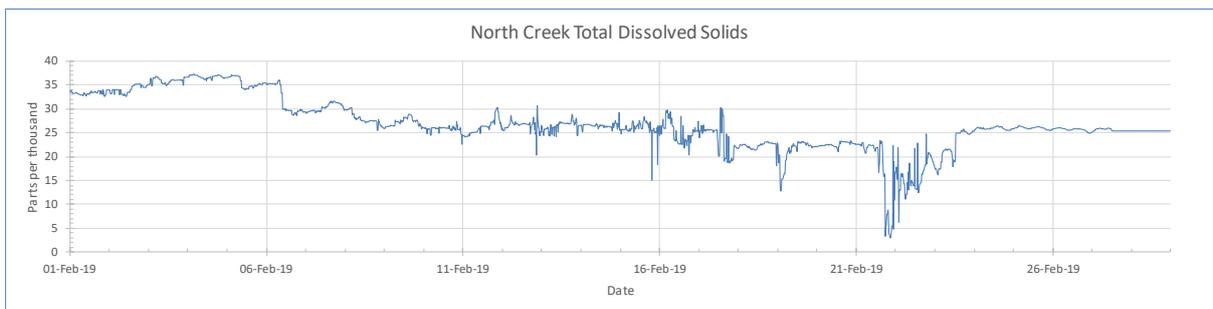
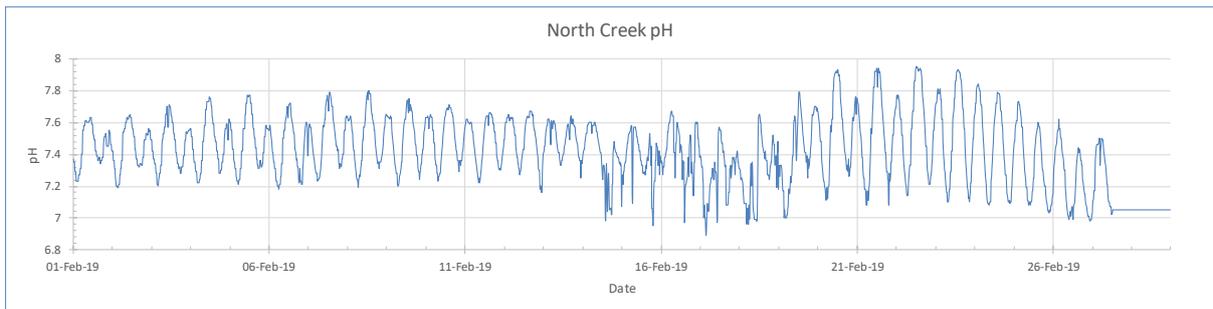
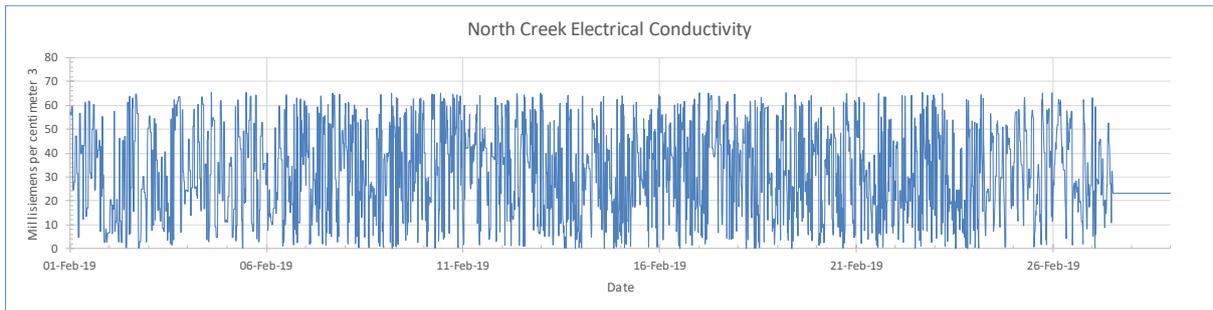
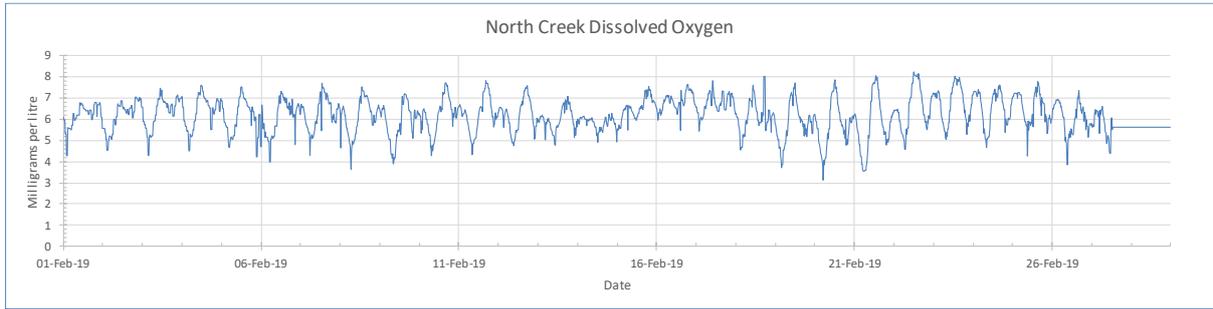
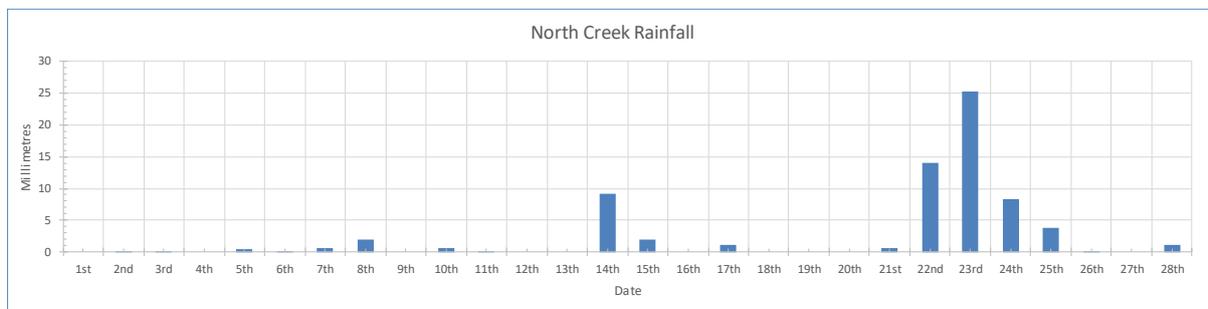
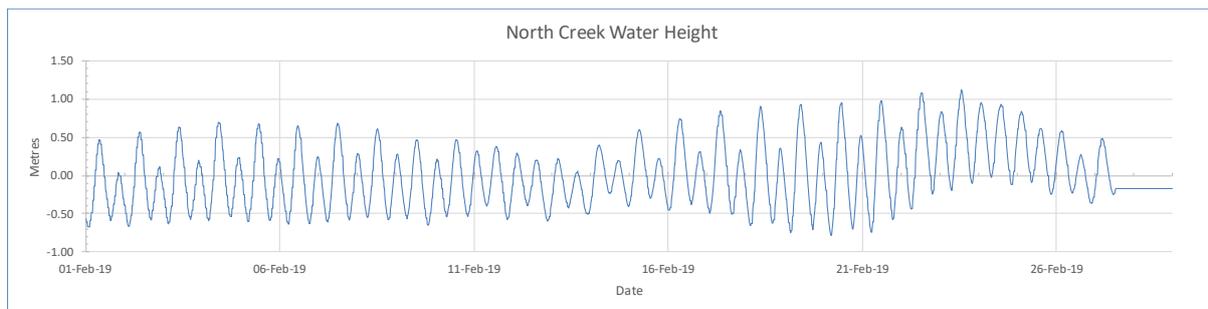
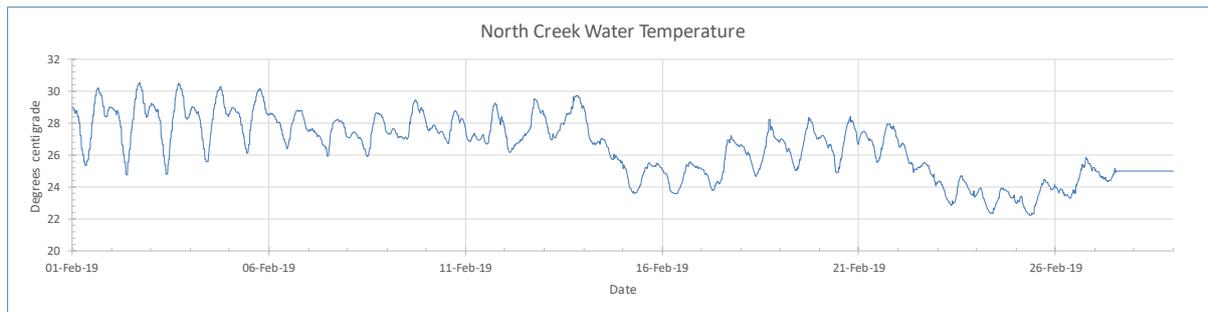


North Creek water quality – February 2019

Data logger located in North Creek near airport.





Interpretation

*Note – EC was showing large random variations and there was depth and TDS errors which have required correction. Depth errors appear to be due to the unit recording in feet rather than metres and this has been adjusted. The unit was removed from North Creek on 27th and sent back for repair on 1st March. Cyclone Oma moved down and hung off the coast during the last week of February causing storm surge, strong wind and some rain.

- **Dissolved oxygen* (DO)** for February was recorded from 3.1 to 8.1 mg/L with an average of 6.2 compared to the January average of 5.9. 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. DO at North Creek is negatively influenced by runoff from drains following rain.
- **Electrical conductivity (EC)** for February is showing large random variations since it was reinstalled on 27th Sept, which seems to be due to a fault at large EC's so the unit has been sent back to the supplier for repair. 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 February was recorded between 6.9 and 7.9 with an average of 7.4, which is alkaline and is equal to the January average of 7.4. 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 in February between 31.3 and 36.7 ppt averaging 26.7 which has fallen by 8.3 compared to the January average of 35.0 ppt due to increased rainfall. 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°C. For February density was recorded between 1.00 and 1.03 with an average of 1.02 compared to the January average of 1.03. Fresh water is normally close to 1.0, while sea water is slightly denser at 1.027g/cm³, which leads to the formation of salt wedges and acid water is even denser (Sulfuric acid SG = 1.94 g/cm³). Density varies with temperature with maximum density occurring at +4.0°C, while tides, rainfall, runoff and acid discharges also affect density.
- **Water temperature** for February was recorded between 20.1 and 30.5°C averaging 26.5⁰ which has decreased by 0.4⁰ from the January average of 26.9 deg C mainly due to cyclone Oma which dropped temperatures for the last week in February. Water temperature is influenced by season, air temperature, solar radiation, cloud cover, day/night, turbidity, tidal movement and rainfall.
- **Water height** was recorded in February between -0.79 and +1.12 and averaging +0.01 m which compares to the January average of -0.04 m however the data was recording in feet and this has been adjusted to metres and approximated to AHD so little comparison can be made. The highest water height of 1.1 metres was measured on 23rd at 1:30 pm due to storm surge from cyclone Oma. The highest tide of the month at 1.85 m occurred on 20th February at 8:48 am at Ballina while the peak at the logger at 0.95 m was recorded on 20th at 11:00 am resulting in a delay of 2 hours 12 min. 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, however the longer delay this month is probably due to storm surge from cyclone Oma. 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 February at the Ballina Airport Automatic Weather Station (AWS) situated 1.8 km to the west of the North Creek logger was 70.2 mm falling over 18 days, which compares to the January rainfall of 2.4 mm over 5 days. The February average for Ballina Airport AWS is 189.3 mm therefore rainfall was well below average. Peak February 24-hour rainfall of 25.2 mm was recorded between 9:00 am on 22nd and 9:00 am on 23rd. During February the Tuckean site 4 data logger located 19 km to the SW recorded 79 mm over 19 days, while the Rocky Mouth Creek data logger located 37 km to the south-west recorded 54 mm over 16 days.