Bakers Creek
Sandy Creek

Treatment Trains

Fish ladder at Bakers Creek treatment train

Acknowledgement: This is a Reef Catchments initiative, made possible through funding from the Queensland Government Department of Environment and Science.

Cover image: Bakers Creek treatment train, looking downstream.

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Treatment train systems

In order to assist with the protection and the long-term health of the world's largest coral reef ecosystem, Reef Catchments received funding from the Queensland Government Department of Environment and Science to study the water quality benefits of constructed wetland treatment trains. This study is running since 2017 and is to be finalised by June 2020.

There are different treatment system options available for removing specific pollutants from agricultural production areas. Thus, Reef Catchments objective is to validate the Water Quality improvements though identifying differences between pollutant levels from the inflow and outflow of the two different treatment trains compared against traditional sediment basins and standard cane drains in the Mackay Region.

As a complement to best management practices the different systems are but one component of integrated approach to improve business and environmental performance. Treatment trains use a mix of engineered design and biological process that can have the potential to reduce runoff pollutants like sediment, nutrients and pesticides ensuring improved water quality to enter the catchment, rivers and ultimately the Great Barrier Reef.

Constructed wetland treatment trains use multiple chambers to treat water as it moves through the individual structures or basins. Included within the structures is a shallow macrophytes zone where reeds take up nutrients for their own growth. A biofilm, consisting of different microorganisms, around the reeds, and the reeds themselves, use some nutrients for their growth, removing the excess pollutants from the water. Within the design, a deep chamber can be adapted which landholders can utilise to pump extra water to irrigate crops, providing productivity benefits. A larger biodiversity wetland area also provides a native wetland ecosystem that improves the aesthetic and recreational opportunities, as well as, detaining water on the property longer before entering the receiving waters improving the property microclimate.

It is hoped that the outcome of this project will support investment into constructing more of these structures which provide both water quality and productivity benefits.

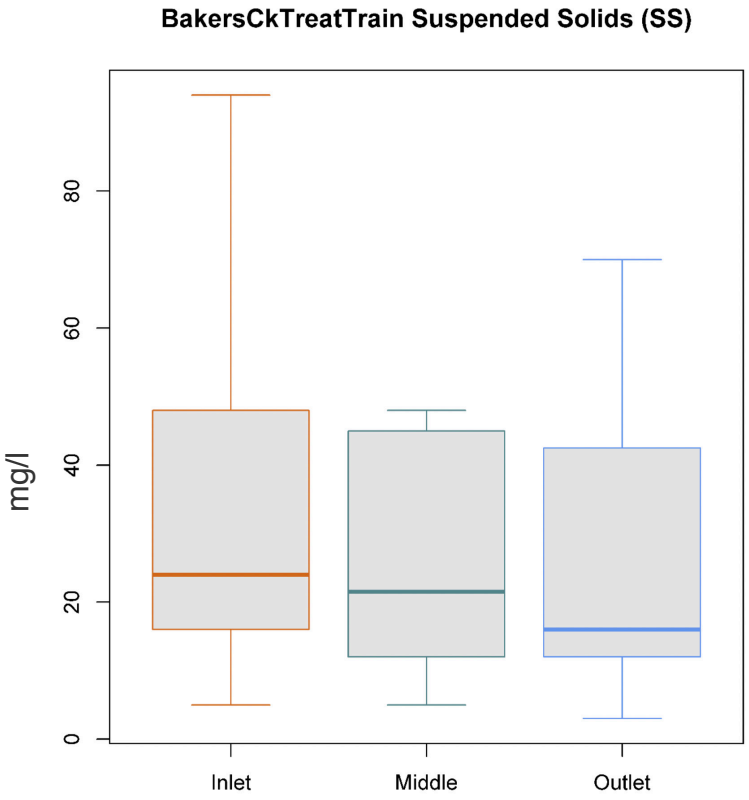
For more information of the different types of treatment systems and guiding information on what maybe the right treatment system for your property a great resource can be found on the WetlandInfo webpage: *https://wetlandinfo.des.qld.gov.au/wetlands/management/treatment-systems/*

Bakers Creek treatment train inlet, looking upstream

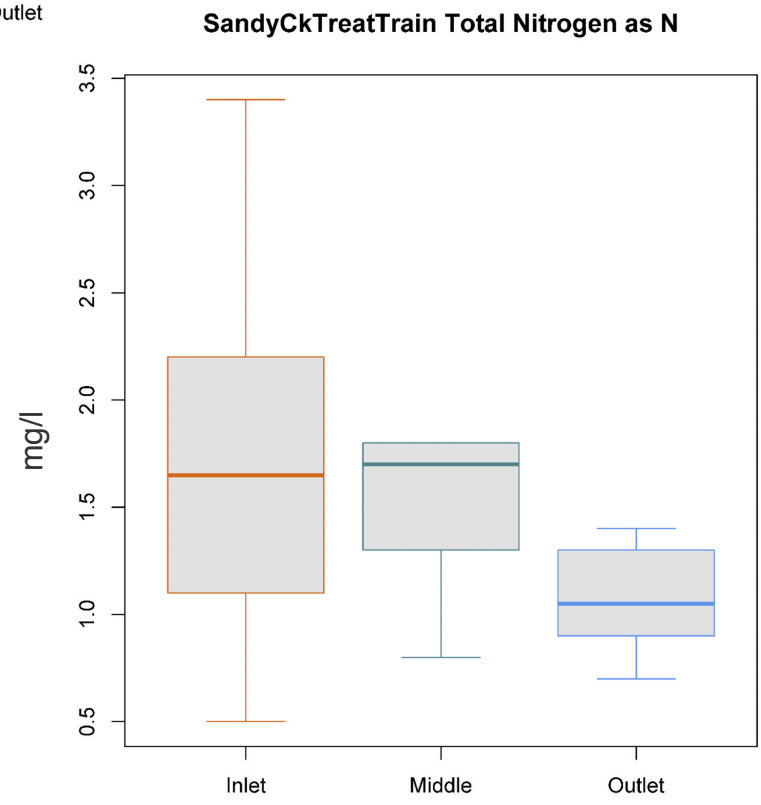
One of the ways to visualize vast amounts of data accumulated overtime is presenting their variation though a boxplot graph. This chart type embodies the distribution of the measured concentration from each location. The box itself represents 50% of all the values and the vertical lines extending from the boxes indicate the variability in the range of concentration from that location. The horizontal line inside the box is the median (the number that is halfway into the dataset) and the average (mean) is represented by the number beside the box.

For the duration of this project the sampling methodology targeted a total of 9 rain events (aiming to capture water samples during the rise, peak and fall), especially targeting the first flushes were pollutants are known to be higher and another 9 ambient samples collected during the dry season (bi-monthly).

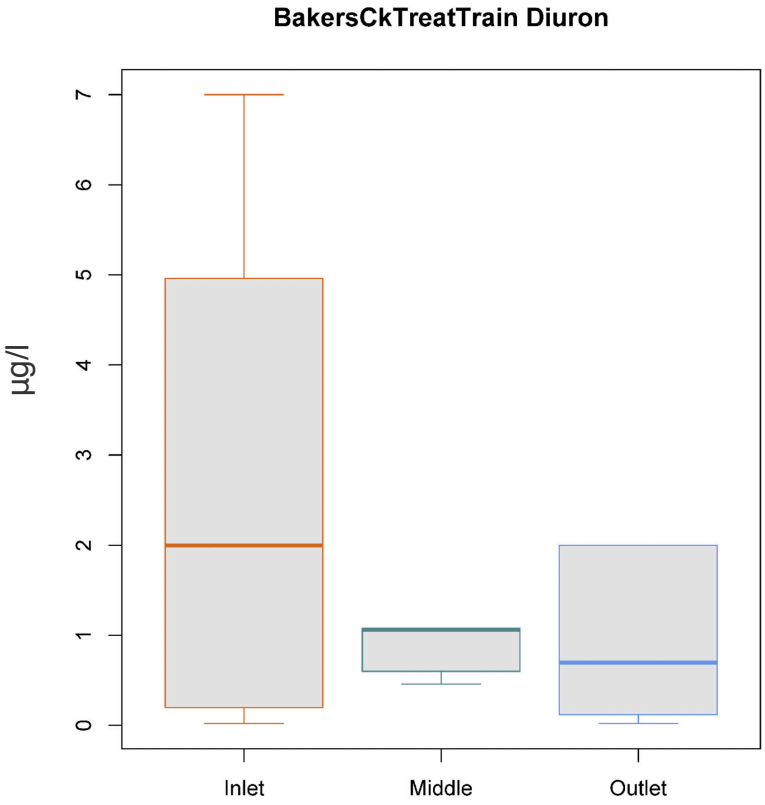
A summary of some of the Water Quality improvements at the treatment trains in the Mackay region are represented in the box and whiskers charts below:



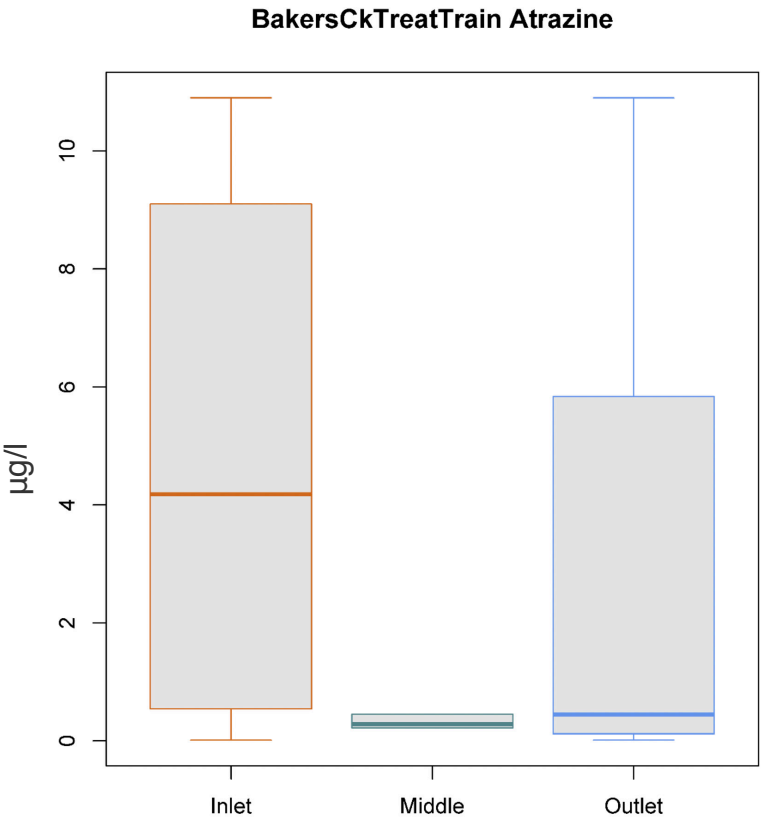
*Graph showing the decrease range in concentration of total suspended solids in **milligrams per litre (mg/l)** through the constructed wetland at three different locations from 2017 to present, amalgamating the rain events from wet season and the ambient sampling that occurs during the dry season*



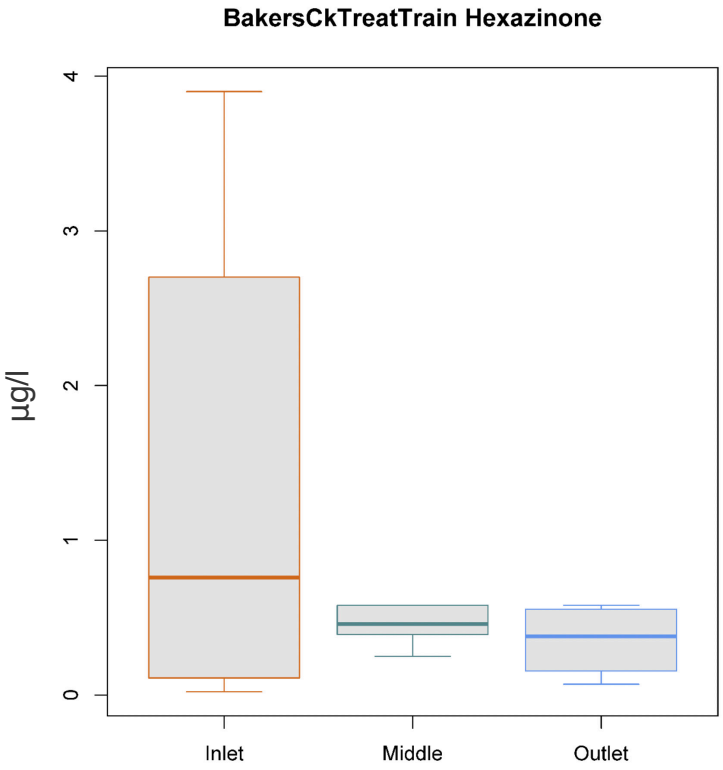
*Graph showing the decrease range in concentration of total nitrogen **(mg/l)** through the constructed wetland at three different locations from 2017 to present, amalgamating the rain events from wet season and the ambient sampling that occurs during the dry season.*



*Graph showing the decrease range in concentration of the herbicide Diuron in **micrograms per litre (µg/l)** through the constructed wetland at three different locations from 2017 to present, amalgamating the rain events from wet season and the ambient sampling that occurs during the dry season*



*Graph illustrating the decrease range in concentration of the herbicide Atrazine **(µg/l)** through the constructed wetland at three different locations from 2017 to present, amalgamating the rain events from wet season and the ambient sampling that occurs during the dry season*



*Graph illustrating the decrease range in concentration of the herbicide Hexazinone **(µg/l)** through the constructed wetland at three different locations from 2017 to present, amalgamating the rain events from wet season and the ambient sampling that occurs during the dry season*

Bakers Creek treatment train outlet, looking upstream