Munna Creek Catchment Waterwatch Network Report

2010 - 2013

Clifton Creek bridge, Brooweena

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MRCCC Catchment Officers

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Introduction

Many of the volunteers of the Munna Creek Waterwatch network have been collecting water quality data for more than 10 years which is providing the community, scientists and government agencies with a better understanding of the characteristics of the waterways in this part of the Mary River catchment. Without this committed volunteer effort we would not have access to this valuable information.

This past year saw the boom-bust weather cycle continue. Between July 2012 and January 2013 the entire catchment experienced severe dry weather with virtually no rainfall recorded during this time with many creeks drying up. Then the late start to the wet season came with a bang on the Australia Day long weekend.

The highest daily rainfall totals recorded at the peak of the rain event (27/1/13) in the Mary River catchment were located in the Munna Creek sub-catchment, with Brooweena recording 336mm and Marodian recording 347mm. This rainfall resulted in record levels of flooding in the upper and lower Munna Creek catchment. The Munna Creek Marodian gauging station broke the 1955 flood record by approximately ½ metre on the 27th January with a flood peak of 16.7m. The Wide Bay Creek catchment at Woolooga, broke the January 2011 flood peak record again by almost 1 metre with a flood peak of 13.87m. Many families and their properties, including Waterwatch volunteers, were directly affected by the floods and we extend our thoughts and wishes to these people.

Even though the Bureau of Meteorology indicates that we are moving into a neutral ENSO weather phase (neither La Nina or El Nino), they point out that many significant summer flooding events in the Mary Catchment have occurred during similar large scale and long-term weather conditions in the past.

Even though the network experienced an extended dry season breaking in January 2013 with a large flood, some Waterwatch sites have improved their grade since the last report in 2010, while other sites have declined in water quality. Generally the sites that declined in water quality were those most affected by rising electrical conductivity (salinity) levels experienced between July 2012 and January 2013. Anecdotal comments written on the datasheets are exceptionally helpful to interpret water quality trends, particularly when the creeks were dropping or stopped flowing and retreated back to waterholes or pools.

Only data from currently active sites are included in this report, which presents the long term data for each site and an indication of change since the last report in 2010. There is now enough long-term data from many sites to draw some statistically valid conclusions about differences in general physical and chemical characteristics of water quality between a number of sub-catchments in this area of the catchment.

Many volunteers have expressed concern about rising electrical conductivity (EC) levels over the winter 2012 period. During this time we experienced the extended dry season which gave us an insight into the baseflow conditions of the creeks after all the alluvial aquifers have been recharged due to good rainfall conditions over the past few years. Sampling of the baseflow in the creeks during this time produced some high electrical conductivity (salinity) levels. After a number of queries from volunteers, we have analysed the long term electrical conductivity data at multiple sites to determine whether an increasing or decreasing electrical conductivity trend is now occurring.

Due to the high risk to personal safety we don't encourage Waterwatch volunteers to collect flood water quality data. Consequently the Waterwatch data does not capture the water quality impacts of large flood events, and do not represent the impact of sediment loads during these events. These sediment loads are generally only measured by specialized monitoring programs using automated equipment. Using such equipment, sediment loads in the Mary during the peak of the 2013 floods were calculated to be greater than the equivalent of ten 35 tonne dump trucks of sediment passing under Dickabram bridge every minute.

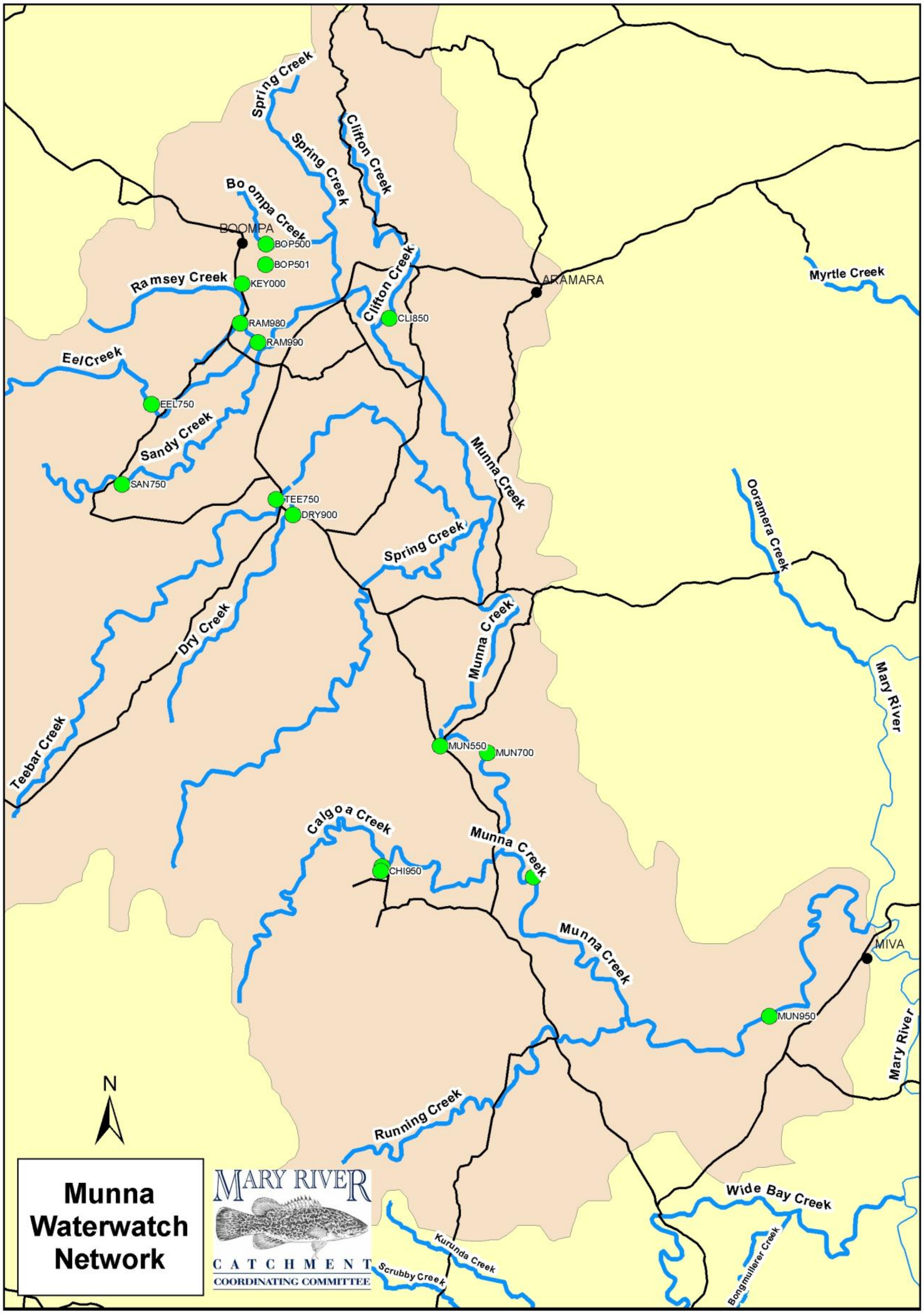
Waterwatch sites monitored in the Munna Creek Waterwatch Network

Munna Creek Waterwatch Network		
BOP500	Boompa Creek	Boompa Railway Rd, Boompa
RAM980	Ramsay Creek	Lagoons, Biggenden Road, Barmagan Flat
RAM990	Ramsay Creek	Junction of Eel & Ramsay Creeks
RAT500	Ramsay Creek tributary	Tributary of Ramsay Creek
SAN750	Sandy Creek	Neerdie Road creek crossing
EEL750	Eel Creek	Innooroolabar Road creek crossing
DRY900	Dry Creek	Woolooga - Brooweena Road
TEE750	Teebar Creek	Woolooga – Brooweena Road
CAL700	Calgoa Creek	Cooke Road, Calgoa
CHG950	Chinamans Gully	Cooke Road, Calgoa
MUN550	Munna Creek	Kolbor Road, Gigoomgan
MUN700	Munna Creek	Ivanhoe
MUN750	Munna Creek	Marodian
MUN950	Munna Creek	Glen Echo Road, Glen Echo

Volunteers

Thanks to the dedicated Waterwatch volunteers past and present for their continued effort, assistance and involvement in the Waterwatch network during 2012-13. Contributors to this report are: Malcolm Beresford, Cassandra Hansen, Ross & Michelle Kinbacher, Lesley & Spencer Innes, Cam & Lisa Hughes, Tracey Jamieson, Helen & Kev Rogers, Iain Lewis, Neville & Joy Turner, Tammy & Brett Marsh.

Munna Creek Waterwatch Network map



2013 Floods

The Munna Creek district has experienced the La Nina weather cycle since 2010 which has produced unprecedented levels of flooding in some districts leading to severe damage in some parts of the catchment.

In 2013, like the January 2011 floods, the worst flooding occurred in sub-catchments located downstream of Gympie in the middle reaches around Miva, Tiaro, western section (Wide Bay Creek - Kilkivan, Woolooga & Glastonbury Creek) and north-western sections (Munna Creek - Brooweena, Teebar) of the Mary River Catchment.

The highest daily rainfall totals recorded at the peak of the January 2013 rain event (27/1/13) in the Mary River catchment were located in the north-western Munna Creek sub-catchment, with Brooweena (in the upper Munna Creek) recording 336mm and Marodian (in the lower Munna Creek) recording 347mm. Mt Kanigan on the eastern side of the Mary River in the Gutchy Creek sub-catchment, near Gundiah, recorded the highest daily total rainfall of 397mm. The Munna Creek sub-catchment is the Mary River catchment's largest sub-catchment with approximately 15% of the total Mary River catchment area.

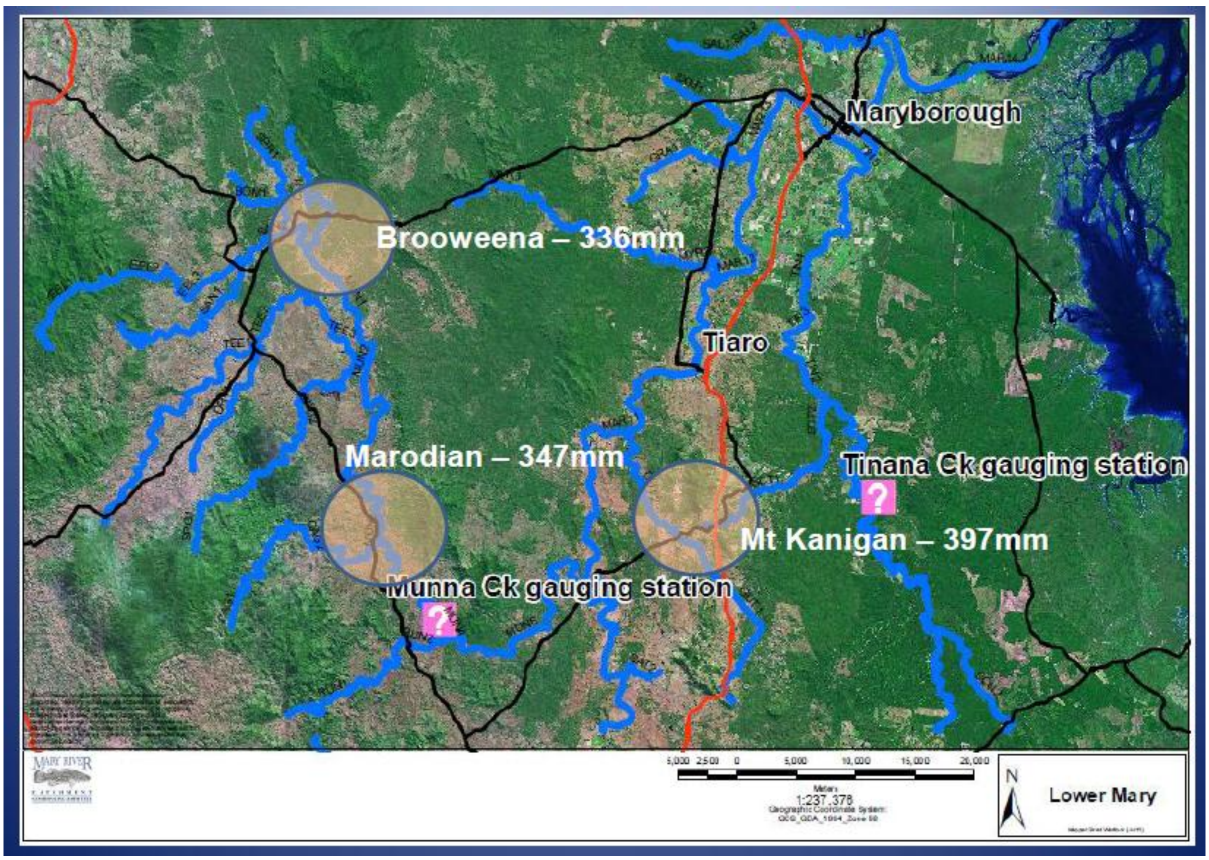


Figure 1 – peak daily rainfall recorded on 27/1/13

Flood peaks

In 2013 Munna Creek recorded a new flood peak at the Marodian gauging station. Figure 2 compares the flood peaks and rises from the 2011 & 2013 Munna Creek floods. Locals in the Upper Munna Creek catchment near Teebar reported this was one of the largest floods in living memory with floodwaters reported under the Teebar Hall. Calgoa Creek recorded the highest flood level in living history.

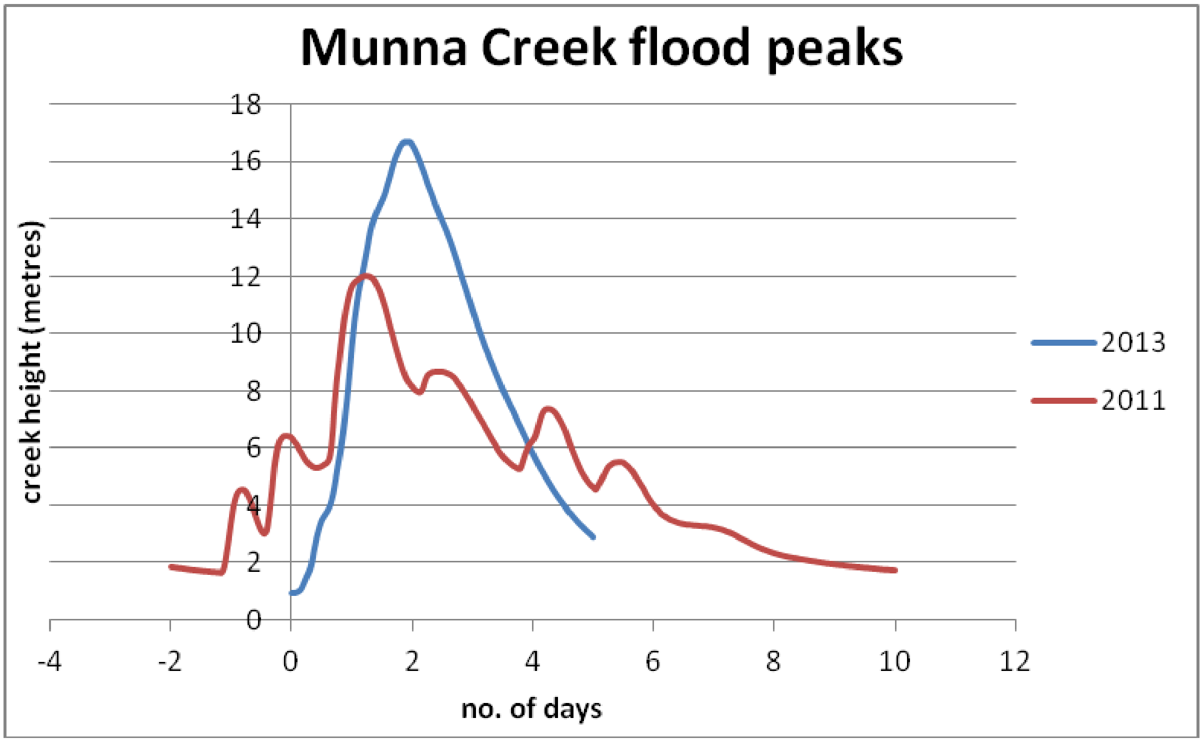


Figure 2 – 2011 & 2013 flood comparisons on Munna Creek

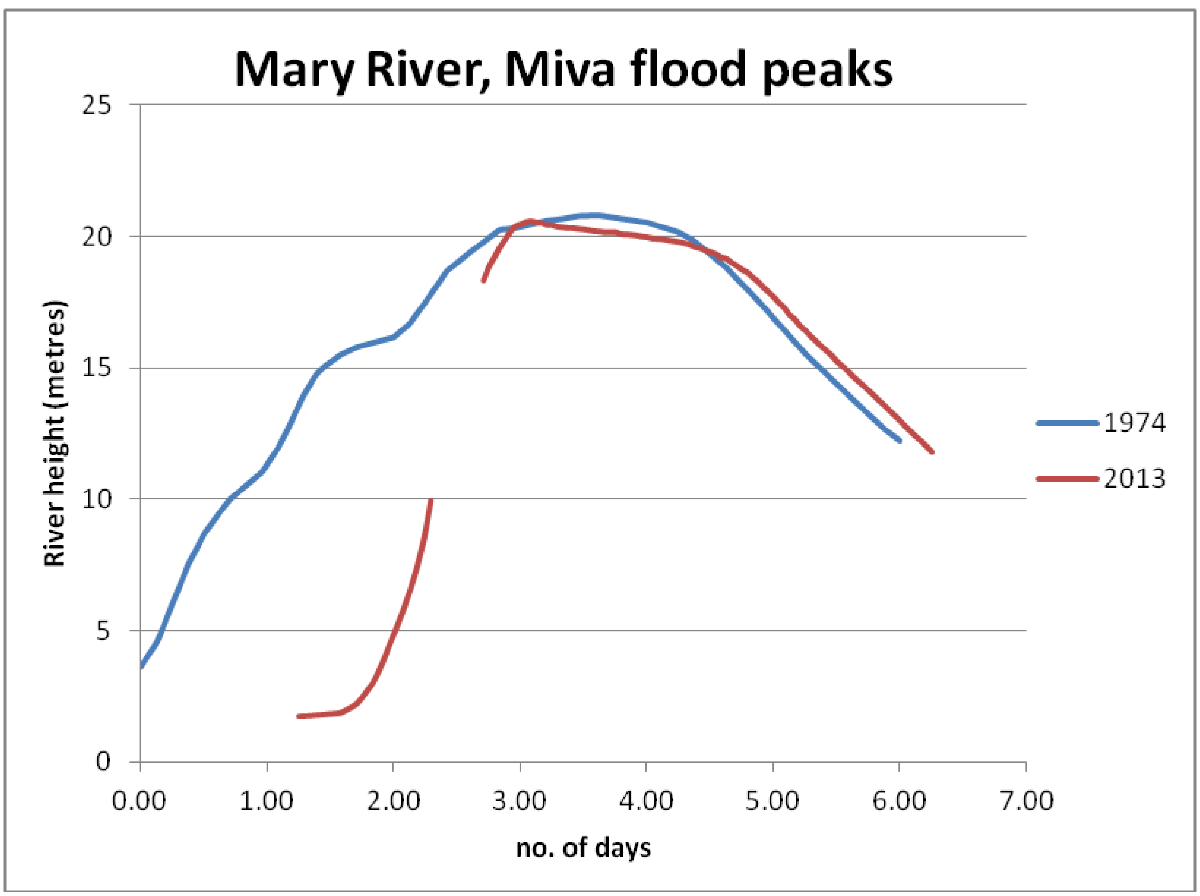


Figure 3 – comparison of 1974 & 2013 flood peaks on the Mary River at Miva

In 2013 the Mary River at Miva recorded its 3rd highest flood peak since 1910, only 30cm below the flood recorded in 1974. Maryborough recorded a flood peak of 10.7m (8am 29/1/13) - its 4th highest flood peak since 1893. The Mary River at Home Park recorded a new peak height of 23.565m, the highest since recording began at this location in 1982. Figure 3 compares the flood peaks on the Mary River at Miva from 1974 and 2013. Comparing the 2013 flood to the 1974 flood at Miva, the 2013 flood increased to approximately the same height, but rose much faster from a significantly lower initial river height.

The difference between the 2011 and 2013 floods was the Mary River and creeks started rising from almost cease-to-flow conditions in January 2013 due to the extended dry period experienced from July 2012 until late January 2013. Whereas in early 2011 the catchment was saturated and the river and creeks had considerably higher ambient flows before the floods began.

Peak discharges of the Mary River Tributaries

The tributaries of the Mary River discharged an enormous volume of water over the Australia Day long weekend, particularly in the Mary River downstream of Gympie. Munna Creek, Wide Bay Creek and Glastonbury Creek all recorded new flood peaks. These tributaries flow into the Mary River between Gympie and Tiaro, and resulted in Maryborough recording its 4th highest flood event since 1893.

Figure 4 displays the daily peak discharges of the main tributaries contributing to flooding of the Mary River between Gympie and Maryborough, for comparison, the full supply level of Borumba Dam (the Mary Catchment largest dam) is shown at 42,000 megalitres of storage.

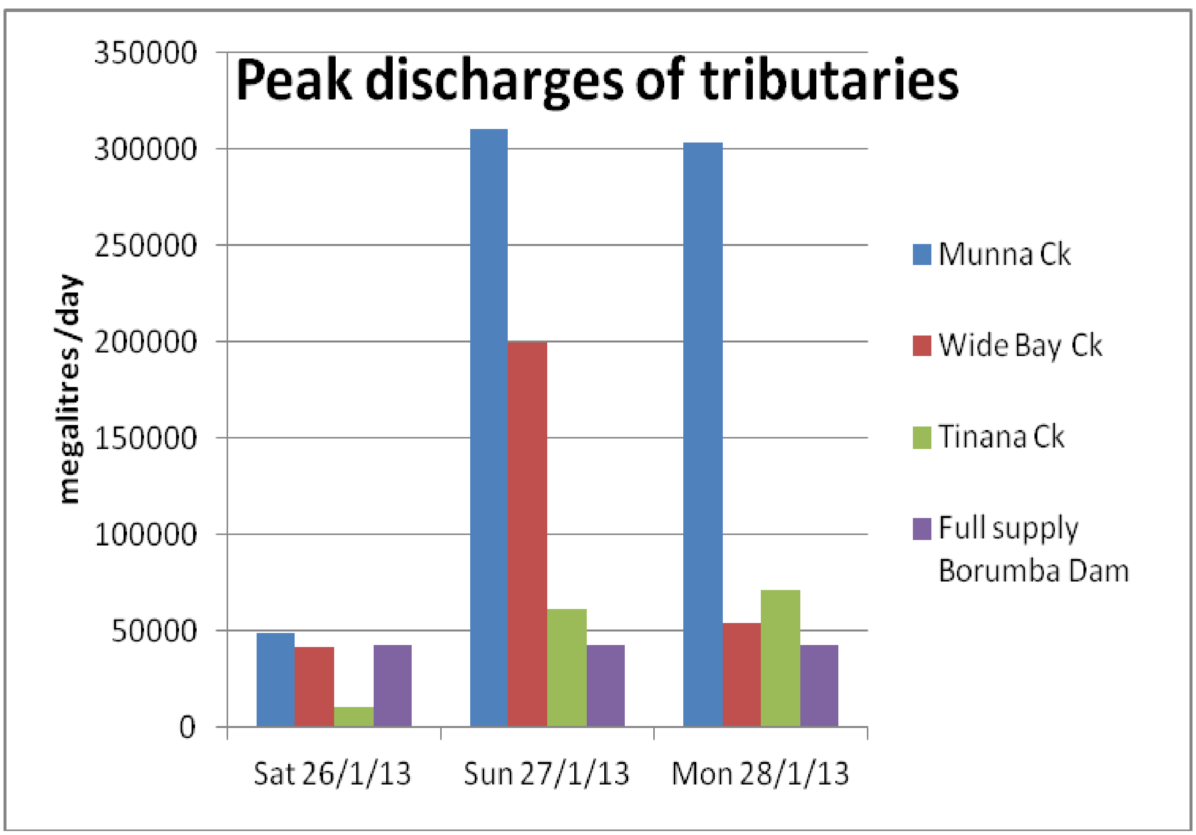


Figure 4: comparison of peak discharges of creeks compared to the full supply level of Borumba Dam

Flood heights

Figure 5 shows the heights of the creeks and the Mary River downstream of Gympie increased at the same time and speed (on average 50cm per hour). However rises of 1m per hour were recorded near the peak of flood at some gauging stations.

Information at the Mary River (Miva) and Wide Bay Creek (Brooyar) gauging stations was lost on the rising limb of this flood.

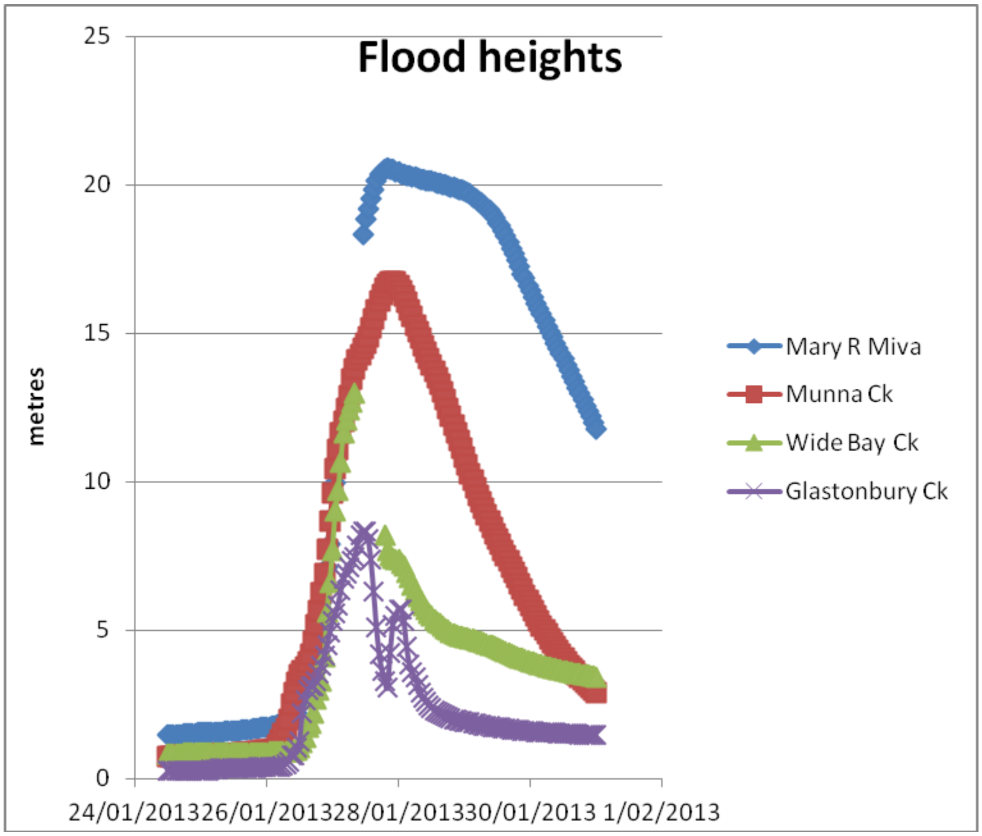


Figure 5 – flood heights, and rate of rise.

Wide Bay Creek inundates Woolooga township

New flood peak record at Marodian Munna Creek

Sediment Loads

Using analysis of flood turbidity data and comparing with the peak flows experienced at the Mary River at Miva (Dickabram bridge) in January 2013 (assuming a turbidity peak of 800 NTU's, which is conservative as more than 1000 NTU's was recorded in 2012) equates to approximately 368 tonnes of sediment (or more than ten 35-tonne dump trucks) flowing under the Dickabram bridge at Miva every minute during the 2013 flood peak.

In 2011 the flood peak flow at the Mary River at Miva equated to approximately 237 tonnes of sediment (or seven dump trucks) flowing under the Dickabram bridge every minute during the flood peak.

SedNET studies for the Mary River Catchment indicate the majority of sediment sources in the Mary River is generated from riverbank erosion. Flood events over 10 metres have been quite frequent in the lower catchment in recent years. These repeated flood events at this height are very damaging to riverbanks, and contribute large sediment loads to the estuary.

In 1992 a large flood plume from the mouth of the Mary River caused significant losses of the sea-grass beds in the Great Sandy Strait due to sediment smothering. The sea-grass beds in the Great Sandy Strait are important feeding grounds for dugongs. This led to large populations of dugongs starving to death and washing up on the beaches near Hervey Bay. Dugongs radio-tagged from the Great Sandy Strait were also found travelling as far south as Sydney trying to find suitable sea-grass beds.

Figure 6: sediment plume in Mary River estuary, January 2013

Widgee Creek flood flows, January 2013

Monitoring Methods

Sites monitored by the network are visited monthly. The volunteers use a TPS WP-81 to measure the temperature, pH and electrical conductivity, a TPS WP-82 to measure dissolved oxygen and a turbidity tube to measure turbidity. Volunteers are trained to follow the techniques as outlined in the Mary River Catchment Coordinating Committee's (MRCCC) Quality Assurance Manual. The network coordinator verifies all data before being entered into the Waterwatch database. Each equipment kit is maintained and calibrated monthly by MRCCC staff with occasional shadow testing against other equipment.

Each of the sub-catchments monitored in the Mary Catchment is unique in terms of its geology, flow regime and land use. It is therefore expected that the water in a sub-catchment would have its own unique baseline levels of the various parameters measured by Waterwatch. Some differences between sub-catchments in the Mary Catchment are recognized in the Queensland Water Quality Guidelines

MRCCC Waterwatch Report Card grades are based on how well the data at each site complies with the ***Environmental Protection (Water) Policy 2009*** **Mary River environmental values and water quality objectives Basin No. 138, including all tributaries of the Mary River July 2010**

Different guidelines are applicable to different sub-catchments of the Mary Catchment. The Munna Creek Catchment Waterwatch report uses the Mary Basin Lowland Freshwater guidelines with Western Mary Electrical Conductivity guidelines. Water temperature data is compared to long term guidelines derived from Home Park

Mary Catchment Lowland Freshwater water quality guidelines – Northwest- sub-catchments	
pH	6.5 – 8.0
Electrical Conductivity (EC)	<1200 µS/cm
Dissolved Oxygen (DO)	85 – 110 % Saturation
Turbidity	< 50 NTU
Temperature	Home Park, Mary River reference site:
	(Summer 22-30 ºC or Winter 16-24ºC)

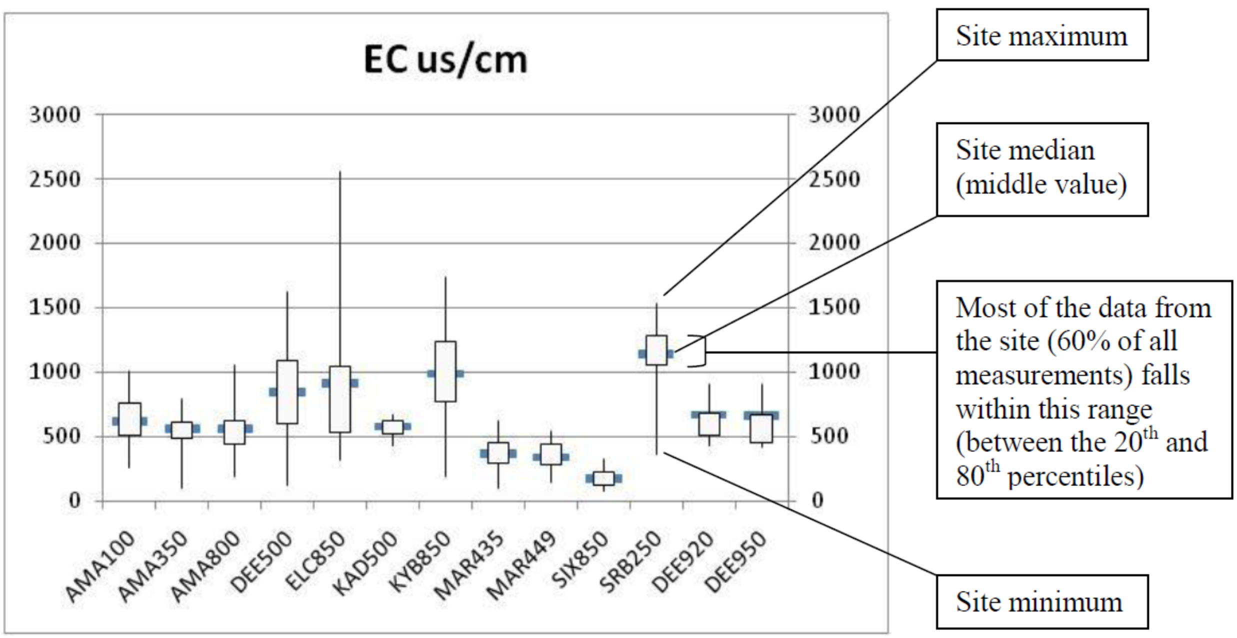
Results- inter-site comparisons

Within each waterwatch network, the spread of pH, EC and dissolved oxygen values are compared across all the sites in the network. These inter-site comparisons use a modified box and whisker graph to look at the spread of values recorded for each parameter at each site.

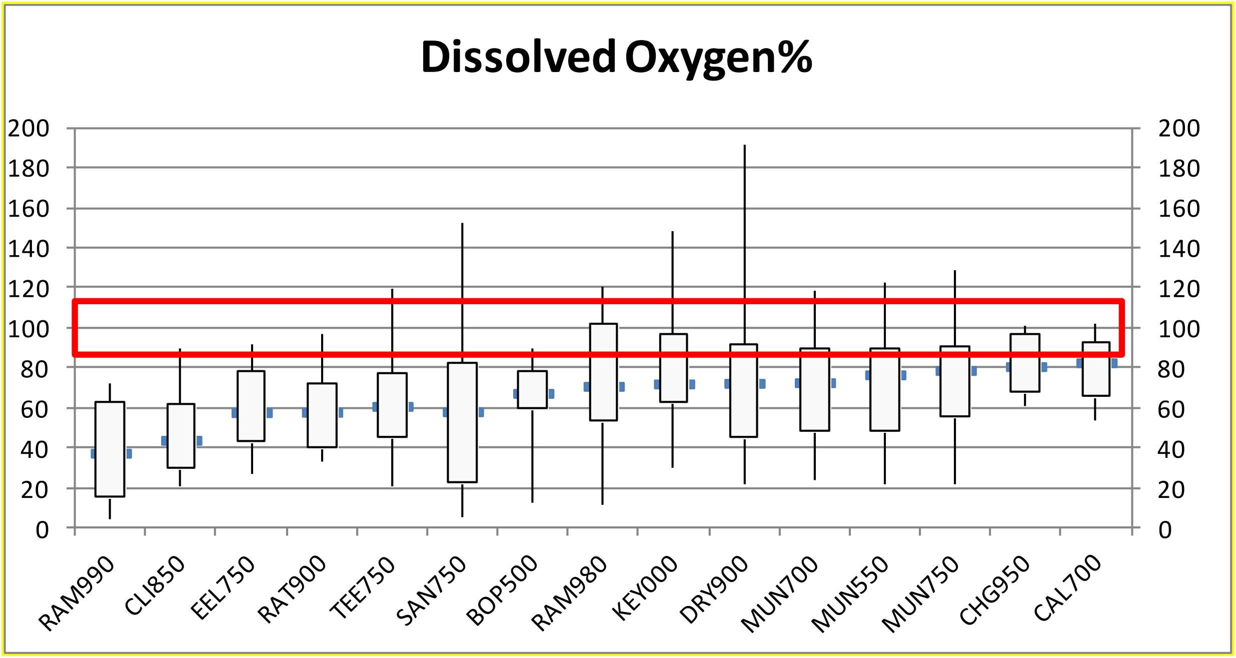
For each site on the graph:

- The vertical line (whiskers) shows the range between the maximum and minimum values recorded at the site.
- The vertical boxes show the range between the 20th and 80th percentiles at each site.
- The horizontal bars show the median value (50th percentile) for each site.

This comparison is useful for identifying sites that are unusually variable or have generally higher or lower values than other sites in the network.



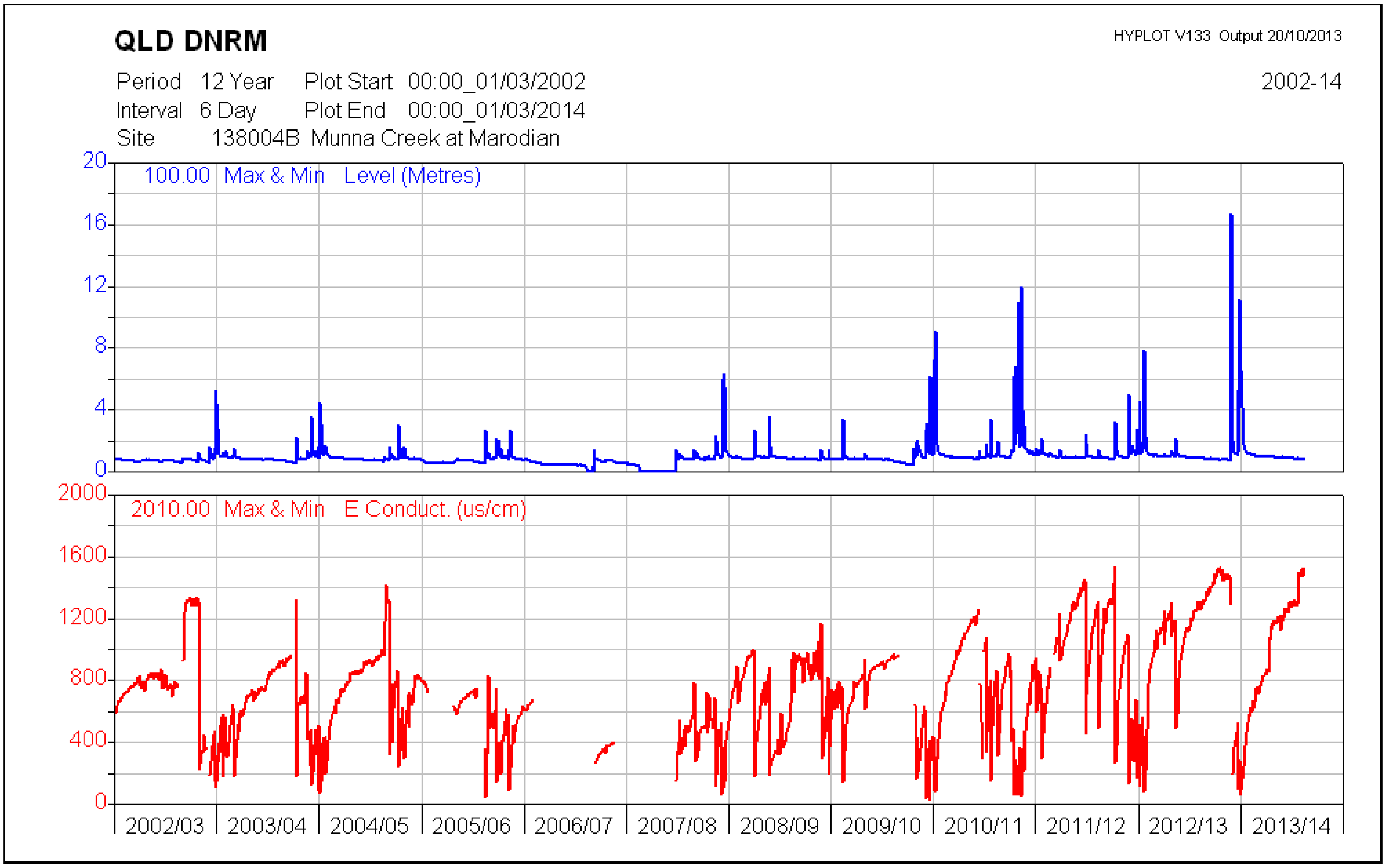
Long-term inter-site comparison of dissolved oxygen levels (all data collected)



- This graph illustrates all the long-term data collected from each site, not just the last three year's data
- Dissolved oxygen levels can change remarkably over the course of a day. In disturbed systems with high nutrient and light levels dissolved oxygen can vary over a wide range during the day, e.g. 30% to 150%. In more undisturbed and regularly flowing systems the oxygen levels generally maintained within a smaller range eg. the guidelines for the Mary Catchment are 85% to 110%.
- Generally all creeks within the network display large dissolved oxygen fluctuations due to intermittent flows over the monitoring period. Oxygen levels are generally lower than the scheduled guideline values. This is not unusual compared to other creeks elsewhere in the Mary Basin, particularly those which high inputs of organic carbon and good riparian shade.

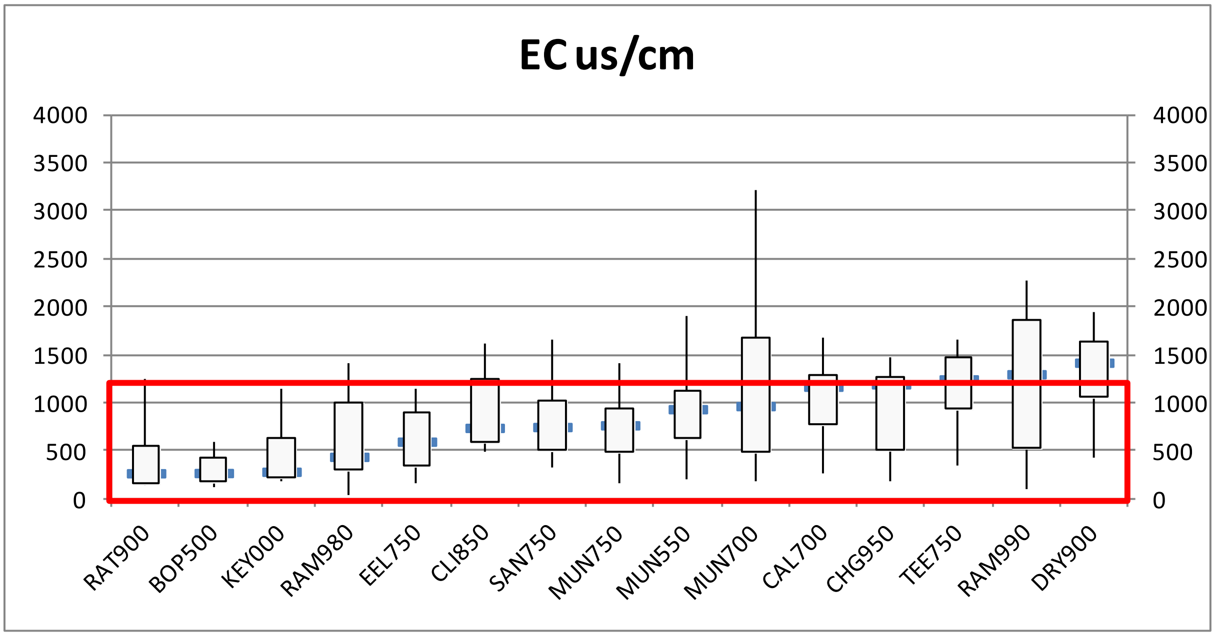
Maryborough CBD, Adelaide St near Catholic Church

Flow History and Electrical Conductivity

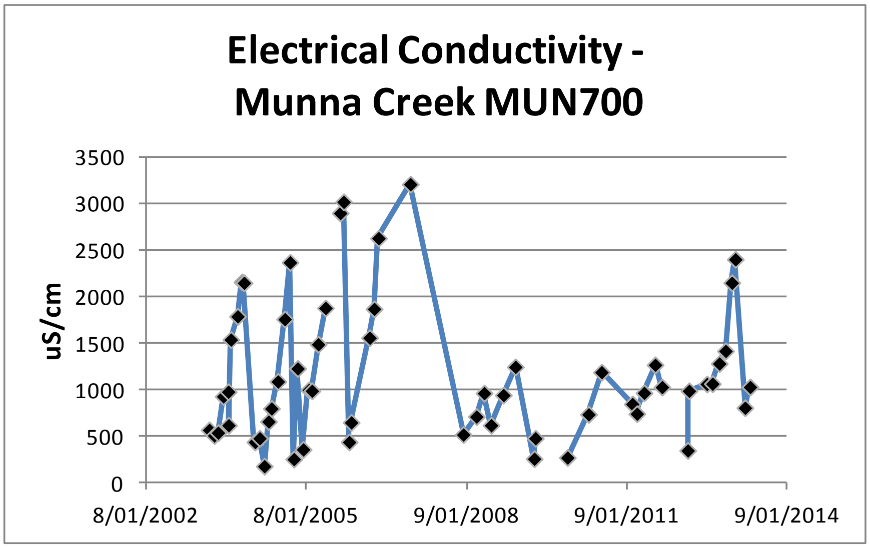


- This graph illustrates the flow history at the Marodian stream gauge during the period of time that the Munna waterwatch network has been operating. .
- Overall Electrical Conductivity (salinity) levels in this network are generally inversely correlated with flows, ie. increasingly saltier in dry conditions. This is characterized by a baseflow with high EC (ie salty groundwater feeding into the surface water in some areas), which is diluted by rainwater during times of high flow.

Long-term inter-site comparison of electrical conductivity (salinity)

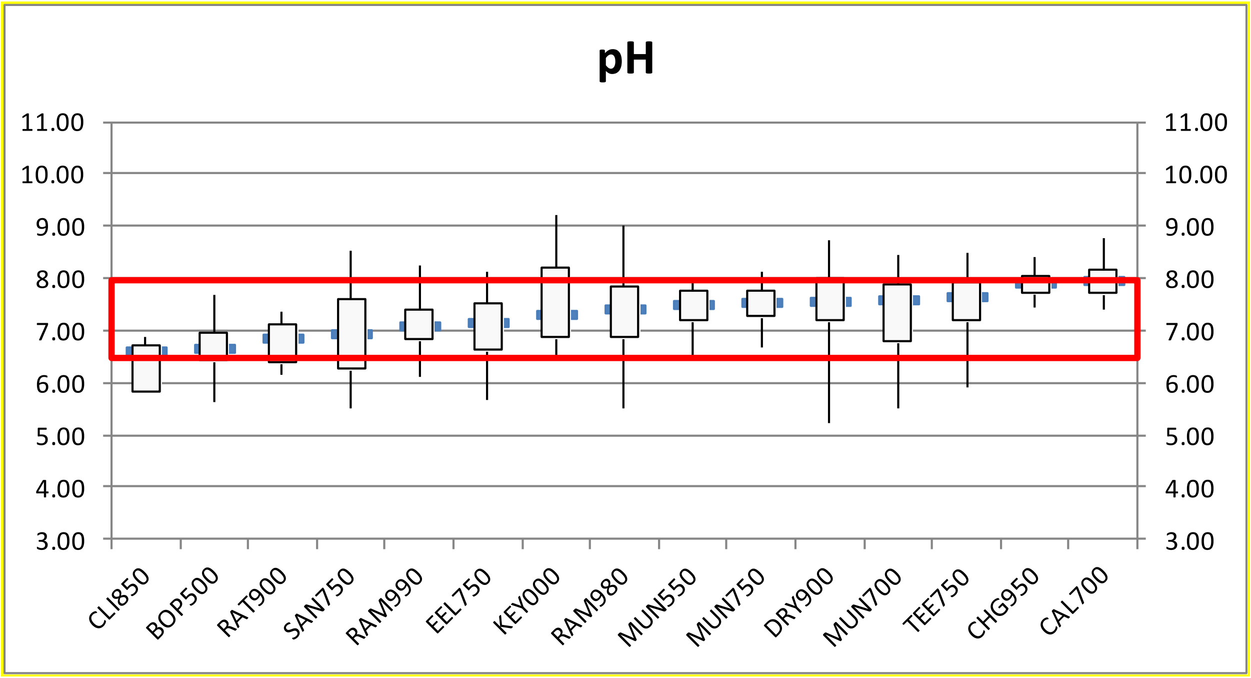


- This graph illustrates all the long-term data collected from each site, not just the last year's data
- These graphs reflect the variation in conditions experienced at these sites over the time the water quality data has been collected. Data at some of these sites has been collected over a long time (ie. many years), which includes a long period of drought and subsequent low flows. However sites that have only been recently included in the network does not include these long drought periods
- The highly variable EC at MUN700 is a good example of the interaction between EC levels and flows in the network, where a very salty tributary flows in from the east just upstream of this site. When there are good flows from further upstream in Munna Creek, the input from this tributary is diluted.



- The difference between RAM980 and RAM990 is also the influence of a very salty drainage line that flows into Ramsey Creek between these two sites.

Long term inter-site comparison of acidity

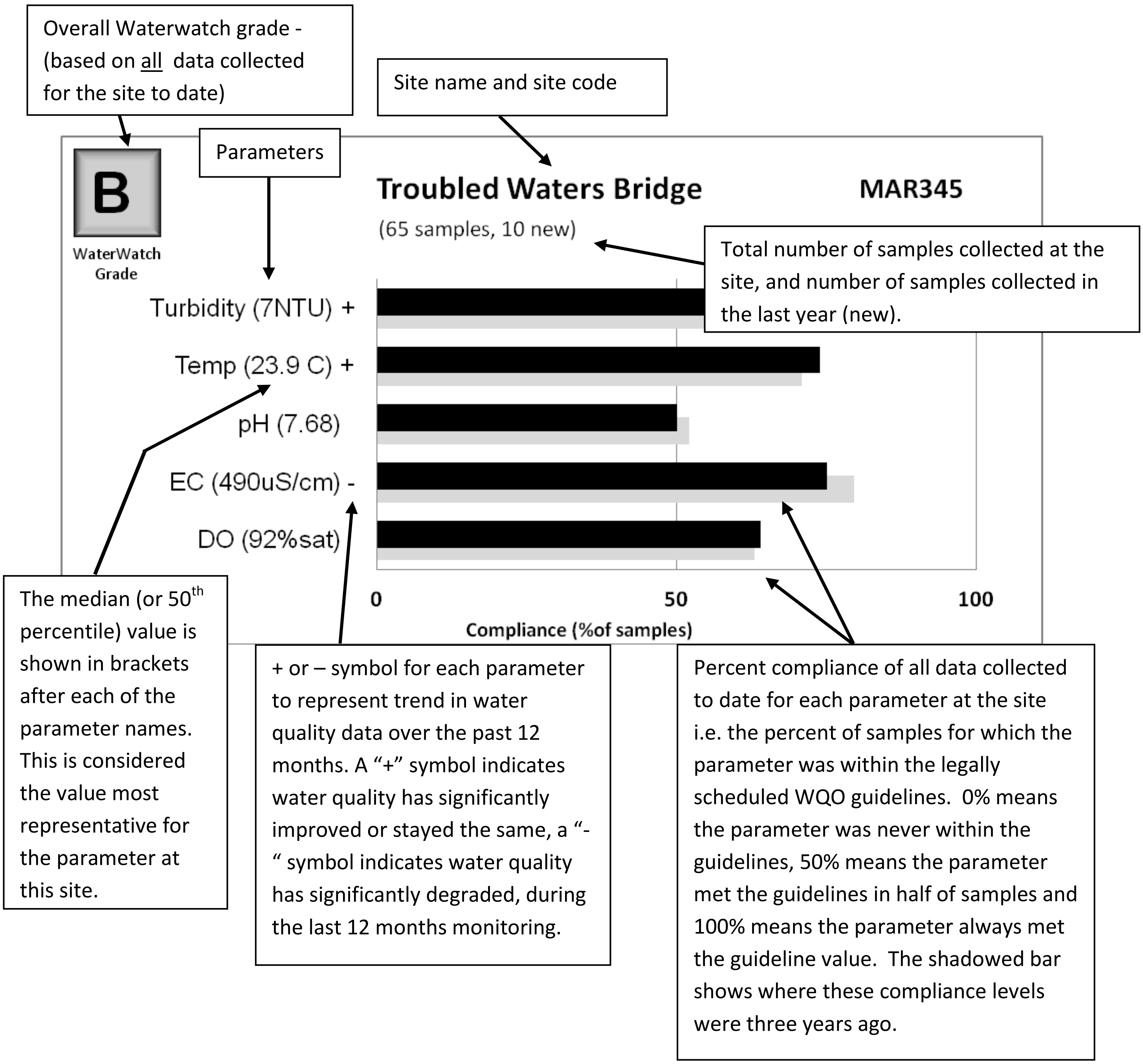


- This graph illustrates all the long-term data collected from each site, not just the last year's data
- All sites show generally good compliance with pH guidelines, but are tending to be alkaline (more than 80% of the measurements are greater than 7).
- Clifton Creek may be more acidic than the rest of the sites in this network, although there only a relatively small number of samples from this site.
- Surface water in the Calgoa Creek sub-catchment (CHG950 and CAL700) seems to be significantly more alkaline with less variable pH than the rest of the sites in this network. When considered along with the high EC recorded at these sites, this may be indicative of local geochemical feature (such as limestone aquifers), rather than saline groundwater.

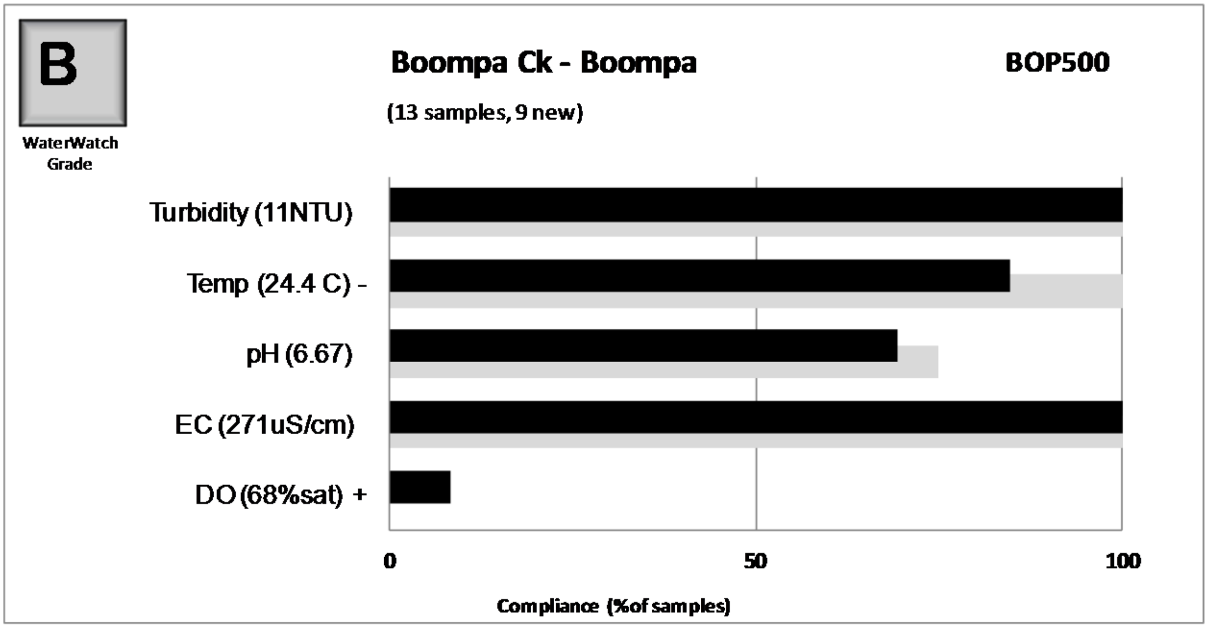
Maryborough, Kent Street CBD flooding

Results - site report cards

The long-term data from each site is analysed and presented as a graphical report card. These graphs present the long-term median value of each parameter and the level of compliance with the relevant guidelines across all the individual samples from that site. The illustration and descriptions below show where this information can be found on the report cards and how to interpret the graphs.

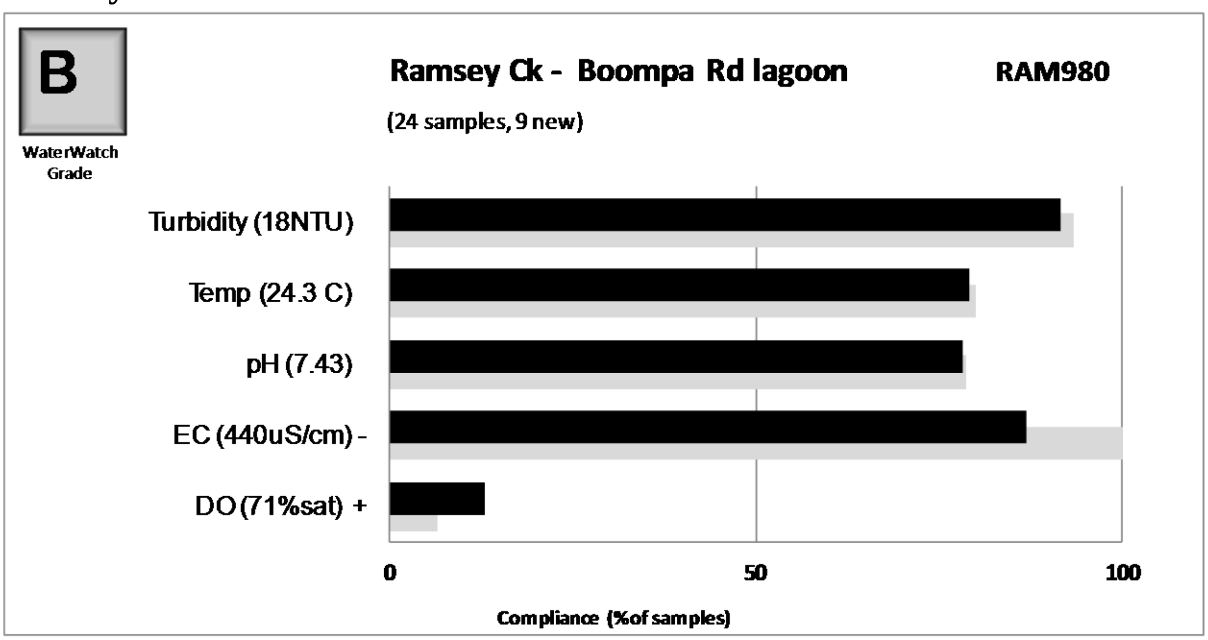


Boompa Creek

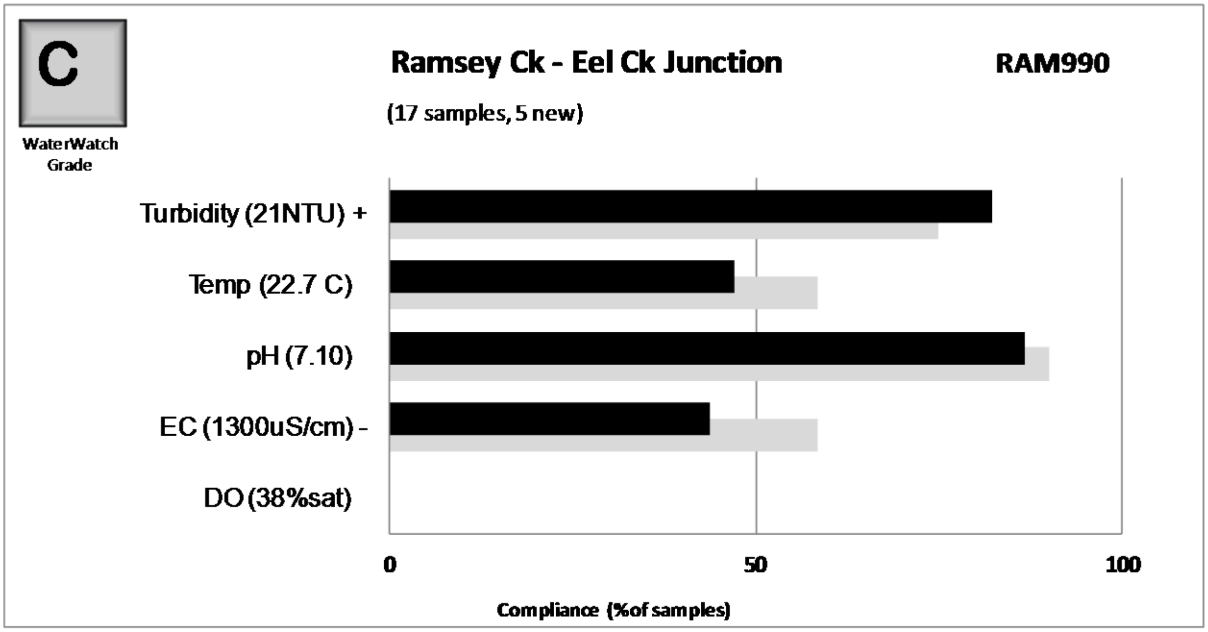


- Excellent electrical conductivity (salinity) compliance, with a very low median EC value – lowest median EC level in the Munna Waterwatch network.
- Very low overall pH value (acidic) – lowest pH values in the Munna Waterwatch network

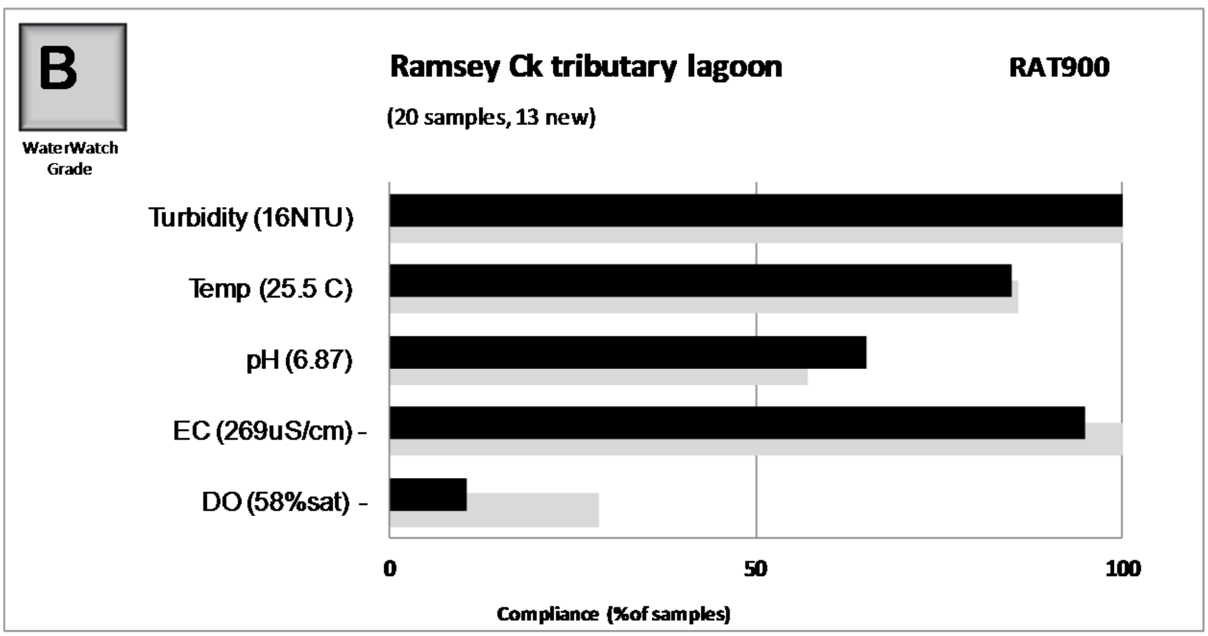
Ramsey Creek



- Significant improvement in dissolved oxygen over the past 3 years
- Significant decline with electrical conductivity (salinity) compliance levels over the past 3 years, although still good compliance with EC guidelines
- Maintaining an overall grade of B (2010 Waterwatch Grade = B)

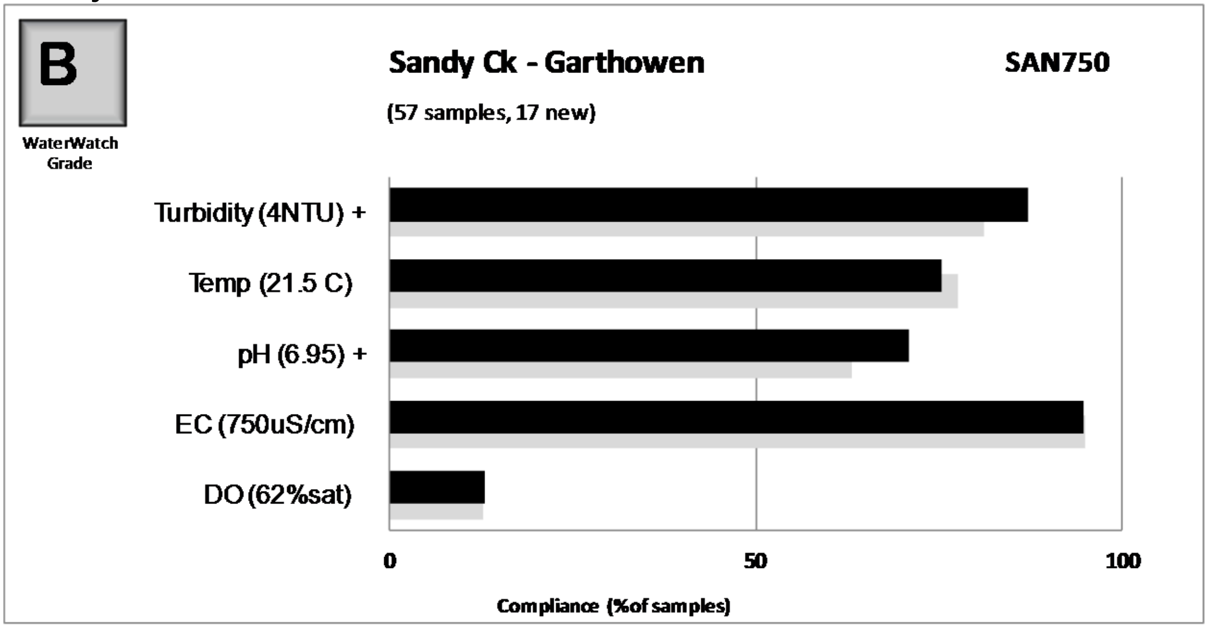


- Significant decline with electrical conductivity (salinity) compliance levels over the past 3 years
- Significant improvement in turbidity over the past 3 years
- Maintaining an overall grade of C (2010 Waterwatch Grade = C)



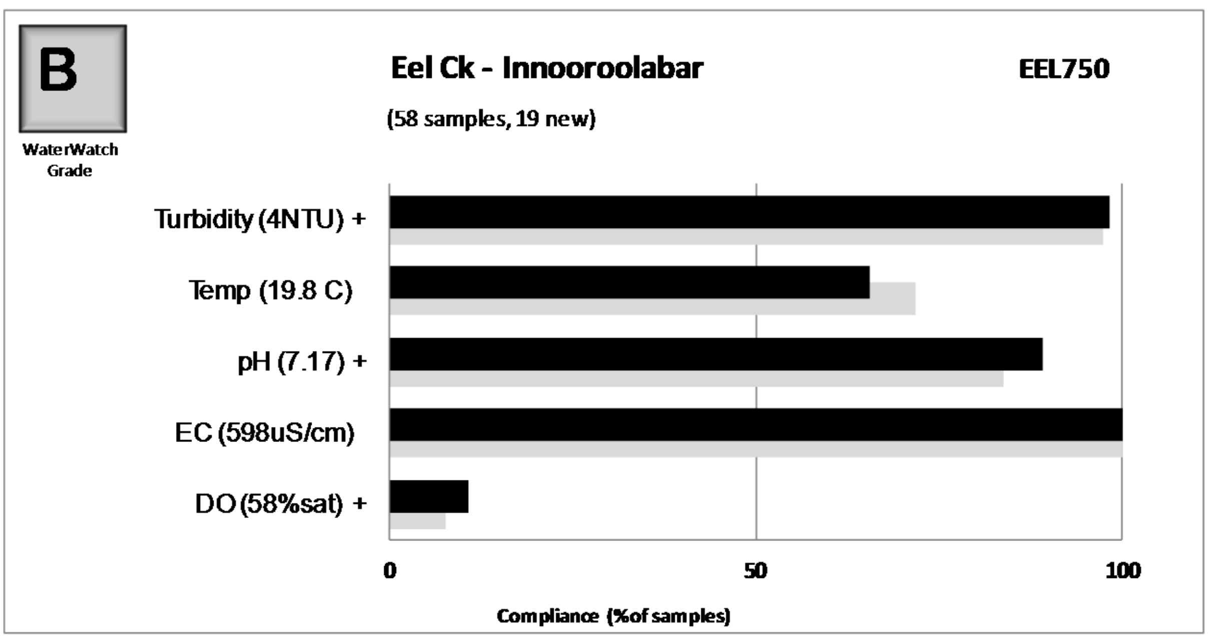
- overall grade of B in this lagoon site
- Good compliance with electrical conductivity (salinity) guidelines, with very low median EC values, over the past 3 years.
- Low overall pH value (acidic)
- Significant decline in dissolved oxygen compliance levels over the past 3 years.

Sandy Creek – Neerdie Road



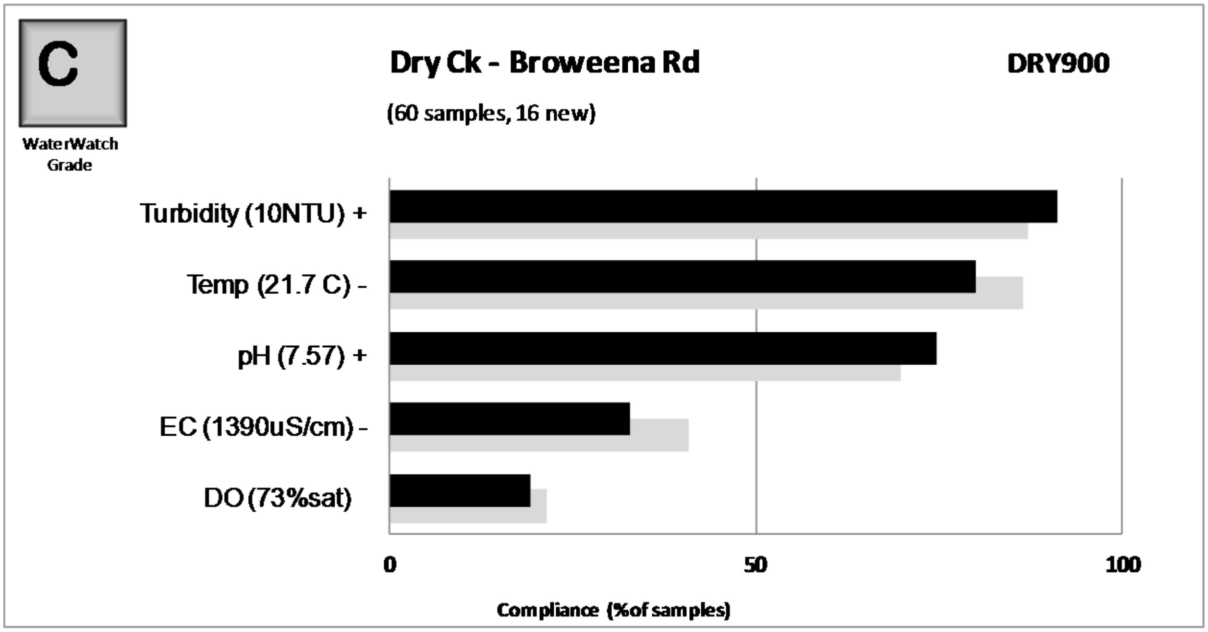
- Good sample size
- Significant improvement in turbidty compliance over the past 3 years
- Significant improvement in compliance with pH over the past 3 years
- Maintaining an overall grade of B (2010 Waterwatch Grade = B)

Eel Creek



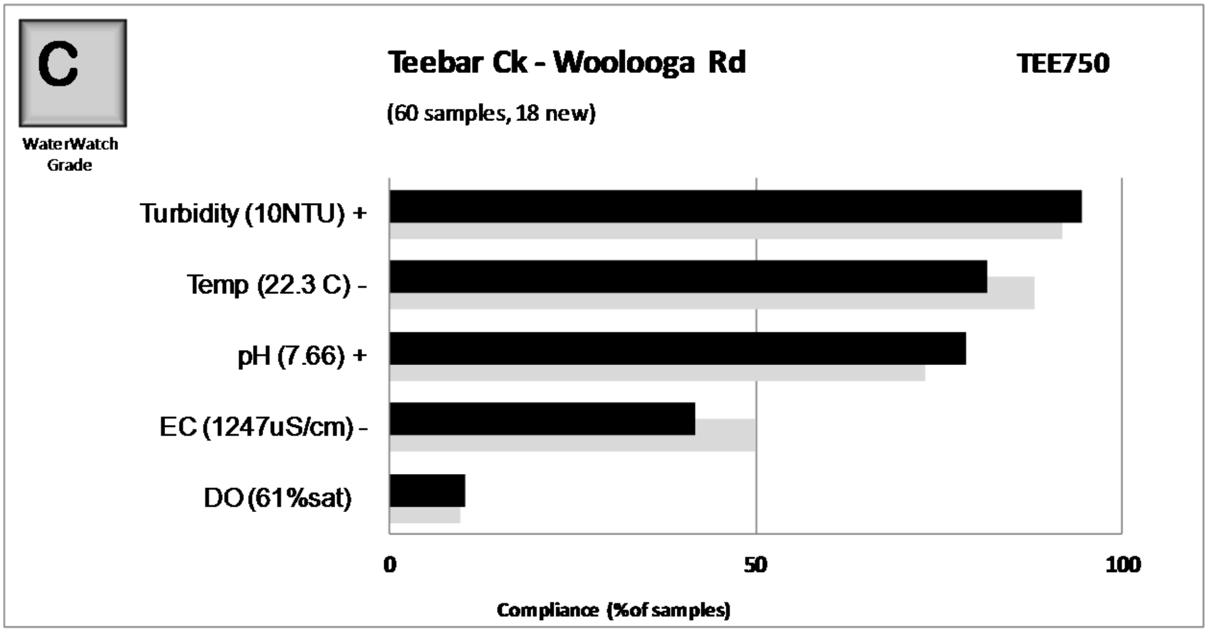
- Good sample size
- Significant improvement in pH, dissolved oxygen and turbidity compliance over the past 3 years
- Excellent compliance with electrical conductivity compliance levels
- Maintaining an overall grade of B (2010 Waterwatch Grade = B)

Dry Creek– Woolooga Brooweena Road



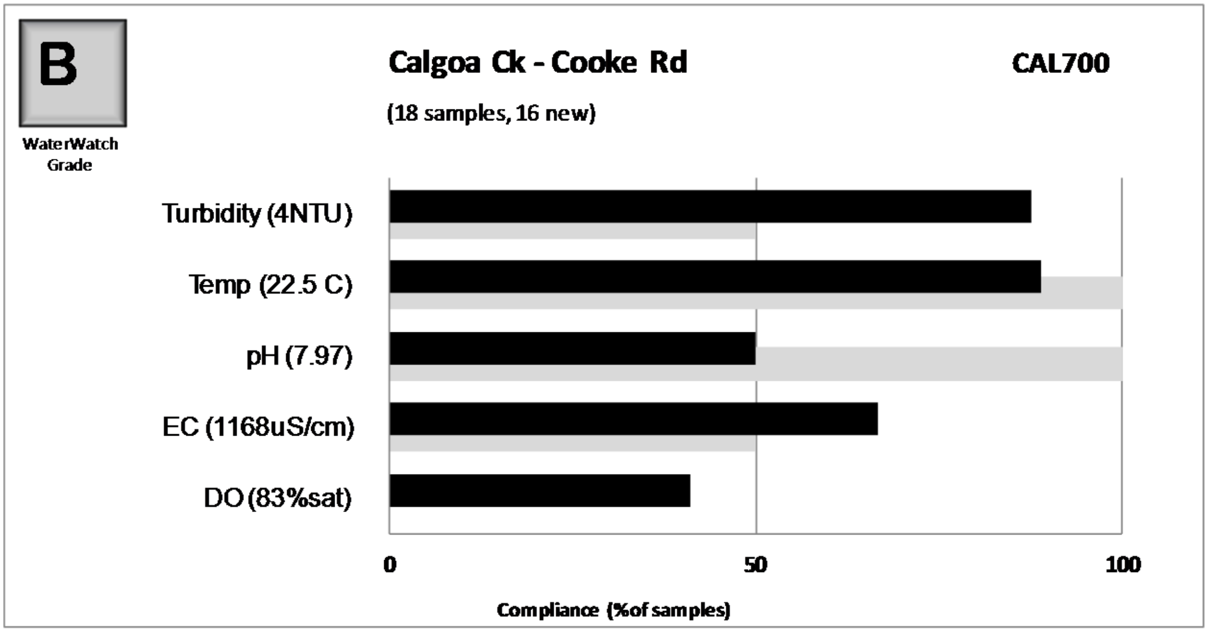
- Good sample size
- Significant improvement in turbidity compliance over the past 3 years
- Significant improvement in pH compliance over the past 3 years
- Significant decline in electrical conductivity (salinity) compliance over the past 3 years. This site generally records high salinity readings, but has recorded higher readings than normal in the past 3 years.
- Significant decline in water temperature compliance over the past 3 years
- Maintaining an overall grade of C (2010 Waterwatch Grade = C)

Teebar Creek - Woolooga Brooweena Road



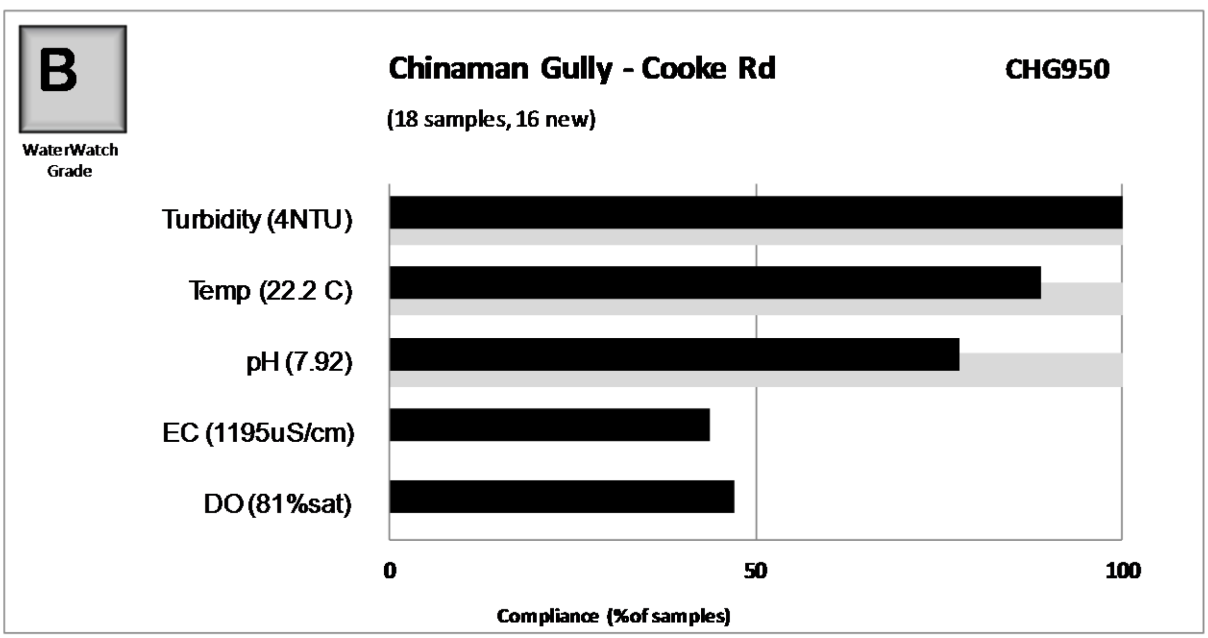
- Good sample size
- Significant improvement in turbidity compliance over the past 3 years
- Significant improvement in pH compliance over the past 3 years
- Significant decline in electrical conductivity (salinity) compliance over the past 3 years, mainly attributable to the dry period between July 2012 and January 2013
- Significant decline in water temperature compliance over the past 3 years
- Maintaining an overall grade of C (2010 Waterwatch Grade = C)

Calgoa Creek, Cooke Road, Calgoa



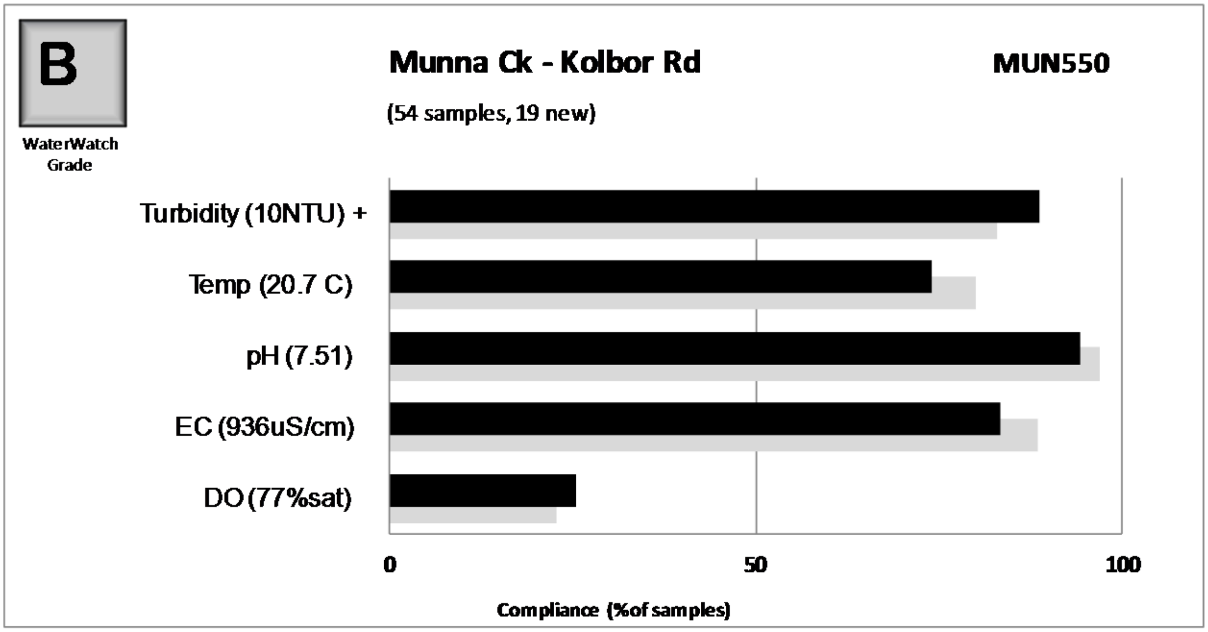
- Sample size is not large enough yet to comment definitively on water quality trends
- This waterwatch site displays consistently high pH (alkaline) levels, which could be the result limestone in the underlying geology. Limestone outcrops have been mapped in the district.
- Good compliance with turbidity guidelines.

Chinaman Gully, Cooke Road, Calgoa

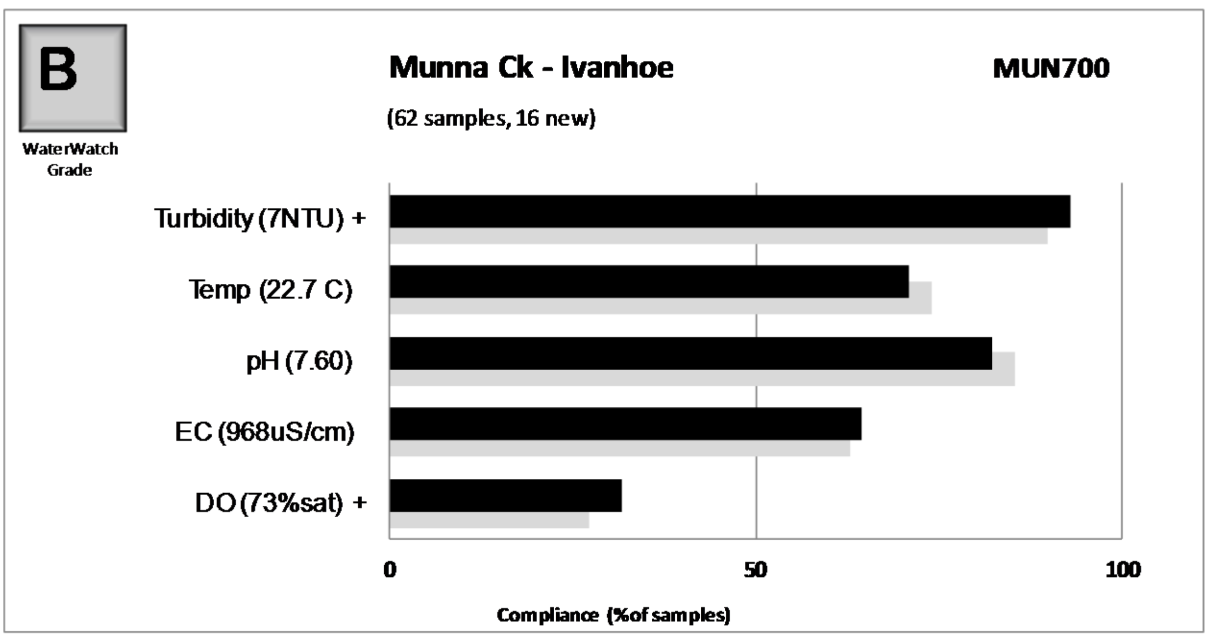


- Sample size is not large enough yet to comment definitively on water quality trends
- This Waterwatch site displays consistently high pH (alkaline) levels, which could be the result limestone in the underlying geology. Limestone outcrops have been mapped in the district.
- Excellent compliance with turbidity guidelines.

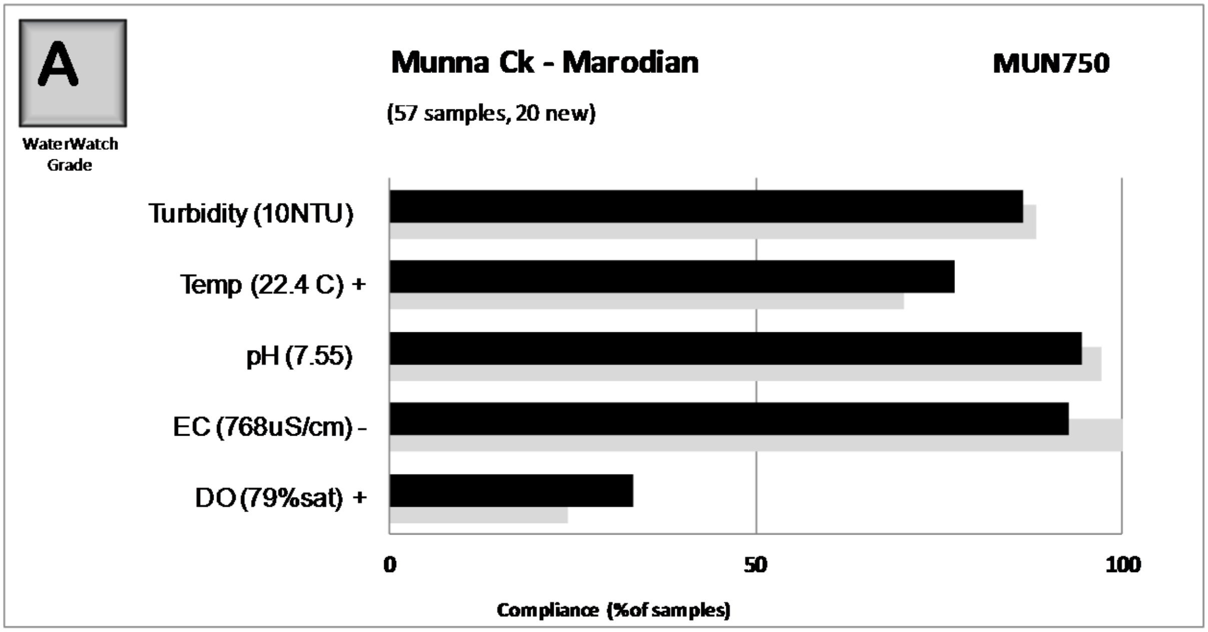
Munna Creek



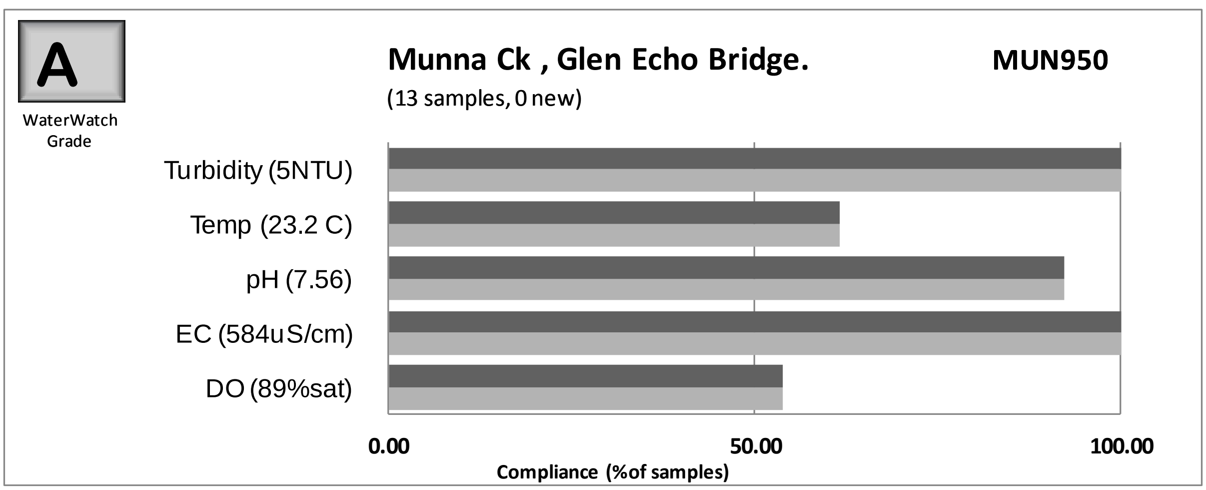
- Good sample size
- Significant improvement in turbidity compliance over the past 3 years
- Maintaining an overall grade of B (2010 Waterwatch Grade = B)



- Good sample size
- Significant improvement in dissolved oxygen and turbidity compliance over the past 3 years
- The overall water quality improved at this site to a "B" (2010 grade = C) as a result of improved compliance of electrical conductivity, dissolved oxygen and turbidity over the past 3 years.



- Good sample size
- Significant improvement in dissolved oxygen and water temperature compliance over the past 3 years
- Significant decline in electrical conductivity (salinity) compliance in the past 3 years, mainly attributable to the dry period between July 2012 and January 2013, but overall still good compliance with guidelines.
- The overall water quality improved at this site to a “A” (2010 grade = B) as a result of improved compliance of water temperature and dissolved oxygen over the past 3 years.



- Sample size is not yet sufficient to make definitive comments on trends.
- Excellent EC compliance, an interesting comparison with sites further upstream on Munna Creek.
- Dissolved oxygen just complying with guidelines, with a median value of 89% saturation.

Appendices
2013 flood heights from gauging stations

Gauging Station	February 2013 Peak Height	January 2013 Peak Height	Ranking
Bellbird – Mary River (downstream of Conondale)	6.18m 26/2/13 1.50am	8.775m	Jan'13 - 6th highest since gauging commenced in 1959 Record peak – 1989 – 11.0m, 329 097 meg/day
Kenilworth Homestead – Mary River	8.37m 26/2/13 4.19am	10.57m	
Moy Pocket – Mary River (downstream of Kenilworth)	13.60m 26/2/13 5.01am	15.266m	Jan '13 - 10th highest peak since gauging commenced in 1963 Record peak – 1999 – 16.87m, 312 336 meg/day
Fishermans Pocket – Mary River (downstream of Gympie)	19.46m 27/2/13 4.30am	20.954m	Record peak – 1999 – 23.68m
Miva - Mary River	17.69m 27/2/13 3.20pm	20.536m	Jan'13 - 2nd highest peak since gauging commenced in 1910 Record peak – 1974 – 20.8m, 641 606 meg/day
Home Park – Mary River	17.97m 27/2/13 7.00pm	23.565m	Jan'13 – New highest peak since gauging commenced in 1982
Maryborough – Mary River	8.10m 28/2/13 11.00am	10.7m 29/1/13 8.00am	
Wide Bay Ck - Kilkivan	4.63m 26/2/13 1.12am	8.971m	Jan'13 - 2nd highest peak since gauging commenced in 1974 Record peak – 2011, 8.975+ m
Wide Bay Ck – downstream of Woolooga (Brooyar)		13.78m	Jan'13- New highest peak since gauging commenced in 1909 Previous peak – 2011, 12.937m
Munna Creek - Marodian	11.12m 27/2/13 1.00am	16.713 m	Jan'13 - New highest peak since gauging commenced in 1955 Previous peak – 1955 – 16.24m, 274,492 meg/day
Glastonbury Creek	5.18m 25/2/13 9.00pm	8.331m	Jan'13 - New highest peak since gauging commenced in 1955 Previous peak – 1955 @ 81 129 meg/day
Kandanga Ck – Hygait	6.49m 26/2/13 12.20am	8.49m	Jan'13 – 3rd highest peak since gauging commenced in 1970 Record peak – 1989 – 8.77m, 114 566 meg/day
Tinana Ck – Goomboorian	?6.96m+ 25/2/13 12.50pm		Gauging station failed early in February'13 flood
Tinana Ck - Bauple	13.23m 27/2/13 3.00pm	13.043m	Record peak – 2012 – 14.14m, 91 219 meg/day
Six Mile Ck – Cooran	10.35m 26/2/13 6.00am	10.581m	Record peak – 1992 - 11.94m
Amamoor Creek	7.78m 25/2/13 11.04pm	9.67m	Jan'13 - 4th highest peak since gauging commenced in 1984 Record peak – 1989 – 10.96m
Obi Obi Ck – Maleny	1.31m 25/2/13 10.30pm	1.812m	2011 peak – 2.006m Record peak – 2.566m
Deep Creek – Cedar Pocket dam spillway	1.33m over spillway 25/2/13 6.35pm		
Yabba Creek – Borumba Dam spillway	2.96m over spillway 26/2/13 4.50am		Approx. 6 metres over spillway in January 2013

Bureau of Meteorology significant flood heights of the Mary River catchment

River height station	Feb 1893	Mar 1955	Jan 1968	Jan 1974	Apr 1989	Feb 1992	Feb 1999	Jan 2011
Kenilworth Bridge	-	13.67	11.28	12.00	12.06	9.80	11.90	-
Imbil	-	11.73	6.50	9.75	8.80	8.90	10.70	8.20
Cooran	10.69	8.66	8.81	9.58	9.15	10.25	9.65	10.22
Gympie	25.45	21.44	18.75	20.73	19.65	21.40	21.95	19.45
Woolooga	12.04	9.75	4.95	7.54	9.15	5.28	7.40	-
Miva	23.08	21.84	18.92	20.80	18.30	20.45	20.65	19.80
Marodian	-	16.08	9.12	12.36	3.51	9.31	2.55	11.99
Tiaro	21.95	20.75	17.78	20.62	15.95	18.60	18.10	17.10
Bauple East	-	-	15.54	14.88	8.42	14.37	12.73	10.25
Maryborough	12.27	11.23	9.25	10.95	6.60	9.50	8.75	8.20
n.b. this table is a combination of river height (flood) stations and flow gauging stations								

Bridge flood heights in the Mary River catchment	**Flood height**
Kenilworth bridge, Kenilworth (Mary R)	11.2m
Cooroy, Lake Macdonald Drive (Six Mile Ck)	4.95m
Imbil, town bridge (Yabba Creek)	6.1m
Cooran, Victor Giles bridge (Six Mile Creek)	7.2m
Gympie, Six Mile Ck bridge, Bruce Highway	17.96m
Gympie, Inglewood Bridge, Bruce Highway (Deep Ck)	13.56m
Gympie, Pengellys bridge, Brisbane Road (Deep Ck)	15.82m
Gympie, Normanby bridge (Mary R)	15.92m
Gympie, Kidd bridge (Mary R)	9.23m
Bell's bridge, Wide Bay Highway (Mary R)	13.10m
Miva, Dickabram bridge (Mary R)	22m
Tiaro, Tiaro bridge (Mary R)	6.6m
Maryborough, Lamington bridge (Mary R)	5.5m

Data analysis

This year's report contains the MRCCC's Waterwatch Report Card assessment based on all data collected for each site. Using the Waterwatch data, MRCCC has developed a report card grade from an A to F for each of the Waterwatch sites. The report card grade is derived from the physical and chemical parameters monitored by the Waterwatch volunteers and is not a grade that represents the holistic health of the site or stream. To obtain a more comprehensive rating of waterway health the collection of data such as nutrients, macroinvertebrate assemblages, fish populations and riparian zone health to name just a few, is required. This is a future goal of the MRCCC, however the MRCCC Waterwatch Report Card Grade provides us with an excellent general rating of the water quality of our sites.

The Report Card grade for each site has been determined by comparing the Waterwatch data results with the Queensland Water Quality Objectives (WQO's) developed by the Environmental Protection Agency. For the parameters pH, dissolved oxygen (DO), electrical conductivity (EC) and turbidity, the number of times the parameter complied with the WQO's was determined. This was then converted to a percentage providing "percent compliance" for each parameter at each site. For example if 100 pH samples were taken, and 85 of them were within the accepted limits of the WQO guidelines, the site would score 85 percent compliance for pH. For temperature, a percent compliance was calculated by comparing the results with data from an Upper Obi Obi Creek reference site, where separate Summer and Winter ranges had been derived.

A weighted average of percent compliance of the 5 measured parameters was calculated. DO was given only half weighting due to the variable nature of spot DO measurements. Turbidity was also given half weighting, as this parameter is more informative if regular records are collected throughout high flow events. The average compliance for each site is converted to an A, B, C or F according to the following:

A – Greater than 80 percent compliance. The water quality at this site is within the accepted WQO guidelines more than 80% of the time, and is considered to have **excellent water quality** compared to a reference site in excellent condition.

B – Between 66 and 80 percent compliance. The water quality at this is within the accepted WQO guidelines more than two thirds of the time, and is considered to have **good water quality** compared to a reference site in excellent condition.

C – Between 50 and 66 percent compliance. The water quality at this site was within accepted WQO guidelines more than half of the time, and is considered to have **average water quality** compared to a reference site in excellent condition.

F – Less than 50 percent compliance. The water quality at this site was *below* the accepted WQO guidelines more than half of the time, and is considered to have **poor water quality** compared to a reference site in excellent condition.