City of Ryde

Water Quality Monitoring Report

Spring 2017- Autumn 2018

This report was produced by Sydney Water Monitoring Services™
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Spring 2017 & Autumn 2018

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Cover image: Porters Creek @ Wicks Rd, West Ryde

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Executive Summary

This report presents the findings of water quality monitoring carried out in Spring 2017 and Autumn 2018. The survey area included the Archers, Buffalo, Porters, Shrimptons and Terrys Creek catchments.

Overall water quality was consistent with historical data with high concentrations of total nitrogen, ammonia and total phosphorus across all sites. This, coupled with low dissolved oxygen continues the categorisation of the creeks as highly disturbed ecosystems.

Macroinvertebrate results varied amongst and between sites for both SIGNAL SF and Taxa Richness. Shrimptons, Archers, Terrys and Porters creeks had SIGNAL SF values that are consistent with historical data. This is a good sign that the sensitivity of the macroinvertebrates has not declined in Spring 2017 and Autumn 2018. The exception to this was Buffalo Creek which had lowest historical value in Autumn 2018.

Taxa Richness varied between seasons in Archers, Buffalo and Porters creeks, with no clear seasonal trend. Shrimptons and Terrys creeks were lower than the historical averages. There were also three historical lows in Autumn 2018 at Shrimptons, Archers and Buffalo creeks. This may be linked to extended dry periods leading to reduced flow and habitat for macroinvertebrates.

Rapid Riparian Assessments were introduced to the monitoring program in Spring 2017. They were carried out at the same time as macroinvertebrate and water quality sampling to add more information about the in-stream features, surrounding land use and general condition of the five creeks monitored. All sites fell into the *Fair* and higher categories, which is consistent for urban creeks. Porters Creek was the best performer with a score of *Good* in Spring 2017 and *Excellent* in Autumn 2018. This is mainly due to the site being located in a National Park, with high scoring vegetation communities and land use.

Glossary

Item	Meaning
Abundance	The total number of individual specimens; in a sample, community, ecosystem etc.
Algae	Comparatively simple chlorophyll-bearing plants, most of which are aquatic and microscopic in size.
Alkalinity	The ability of a solution to neutralise acid (or buffer).
Ammonia	A colourless gas. In the aquatic environment, it exists in the relatively harmless form ammonium (NH4) and the toxic form ammonia (NH3).
Analyte	The physical and chemical parameters (indicators) to be measured.
Anthropogenic	Impacts on an environment that are produced or caused by humans
ANZECC	ANZECC is a forum for member governments to develop coordinated policies about national and international environment and conservation issues.
Catchment	The area that is drained by a river, lake or other water body.
Community	Assemblage of organisms characterised by a distinctive combination of species occupying a common environment and interacting with one another.
Concentration	The quantifiable amount of a chemical divided by the total volume of a mixture.
Conductivity	The measure of salt content in soil or water; it refers to the ability of the substance to transfer an electrical charge.
Dissolved Oxygen	The measurement of the concentration of oxygen that is dissolved in a water body.
Diversity (Biological)	The measure of the number and/or degree of available organisms in an environment.
Eutrophication	Enrichment of a water body with nutrients that results in increased aquatic plant growth and low oxygen levels.
Faecal Coliforms	Bacteria which inhabit the intestines of humans and other vertebrates and are present in faeces. Used as a primary indicator of sewage pollution in the environment.
Guideline (water quality)	Concentration limit or narrative statement recommended to support and maintain a designated water use.
Habitat	The place where a population lives and its surroundings, both living and non-living.
Indicator	A parameter (chemical, biological or geological) that can be used to provide a measure of the quality of water or the condition of an ecosystem.

Item	Meaning
Macroinvertebrate (Aquatic)	Animals without backbones that when mature are greater than 1 millimetre; live in the water column, on the water surface or on the bottom of a waterway.
Nitrogen (Aquatic)	An element that is essential for plant and animal growth, it occurs in three forms Nitrate, Nitrite and ammonium.
Nutrients	Compounds required for growth by plants and other organisms. Major plant nutrients are phosphorus and nitrogen.
pH	A measure of the degree of acidity or alkalinity; expressed on a logarithmic scale of 1 to 14 (1 is most acid, 7 neutral and 14 most alkaline).
Phosphorus	Is an element that is essential for plant and animal growth, excess concentrations can lead to eutrophication.
Physico-Chemical (Aquatic)	The measure and relationship between the physical and chemical identities of a water body.
Sensitive organism	An organism that's survival is highly susceptible to shifts in environmental conditions.
Sewage	The waste water from homes, offices, shops, factories and other premises discharged to the sewer. Is usually 99% water.
SIGNAL SF	SIGNAL (Stream Invertebrate Grade Number Average Level) is a biotic index using aquatic macroinvertebrates to assess stream health.
Stormwater	Rainwater that runs off the land, frequently carrying various forms of pollution such as litter and detritus, animal droppings and dissolved chemicals. This untreated water is carried in stormwater channels and discharged directly into water bodies.
Stormwater system	The system of pipes, canals and other channels used to carry stormwater to bodies of water, such as rivers or oceans. The system does not usually involve any significant form of treatment.
Tolerant organism	Is an organism that can survive in highly variable environmental conditions.
Turbidity	A measure of the amount of suspended solids (usually fine clay or silt particles) in water and thus the degree of scattering or absorption of light in the water.

Acronyms and abbreviations

Acronyms/ Abbreviation	Meaning
ANZECC	Australian and New Zealand Environment and Conservation Council
CFU	Colony Forming Unit
mg/L	Milligrams per litre
NTU	Nephelometric Turbidity Units
SIGNAL SF	Stream Invertebrate Grade Number Average Level – Sydney Family
µg/L	Micrograms per litre
µS/cm	Micro-siemens per centimetre (unit of conductivity)

Background

Water quality monitoring is carried out by the City of Ryde to inform environmental management and development decisions. The aims of this report are:

- assess physical and chemical water properties of five major creeks (Shrimptons, Archers, Terrys, Buffalo and Porters creeks) within the City of Ryde local government area during dry and wet weather conditions
- assess diversity and abundance of macroinvertebrate communities at five creeks within the study area
- analyse environmental and ecosystem health data which will assist in monitoring the impact of future developments, creek restoration, stormwater management, bushland rehabilitation and general anthropogenic activities and incidents within the catchment
- provide on-going information to assist the direction of future water quality monitoring plans
- provide an easy to interpret report for the community
- report any relevant environmental initiatives carried out by City of Ryde

Biological and chemical monitoring enables the City of Ryde to:

- build on baseline data that enables the temporal evaluation and analysis of the health of the catchments of the strategy
- identify and track new and existing impacts affecting the catchments
- provide direction and monitor potential infrastructural works within the LGA, i.e. in-stream or riparian rehabilitation and stormwater treatment projects
- build on the known taxa list for each catchment and to aid in the identification of key indicator taxa

The format and style of this annual report differs to previous years. The aim was to broaden the audience range and improve accessibility. It is a simplified version of the technical reports produced from 2004-2017. The technical details for the methods used, quality procedures, accreditation and journal references are the same as previous years and can be found in previous reports. The data tables, additional graphs, and method details for newly added Rapid Riparian Assessment and wet weather sampling have been reported in a separate document.

Study Area

The City of Ryde local government area is 40.651 km² and is located 12 km north west of central Sydney. It is dominated by residential housing and is comprised of 16 suburbs and 14 separate stormwater catchments. It includes several important commercial and industrial sectors.

Limited areas of natural bushland border urban infrastructure, including several significant natural bush corridors and areas of open space that support recreation and sporting activities. There are small sections of Lane Cove National Park present on the eastern and northern borders of Shrimptons, Porters and Buffalo creeks. All five creeks drain into the greater Parramatta River catchment. Archers Creek enters Parramatta River directly and the remaining creeks through the Lane Cove River catchment.

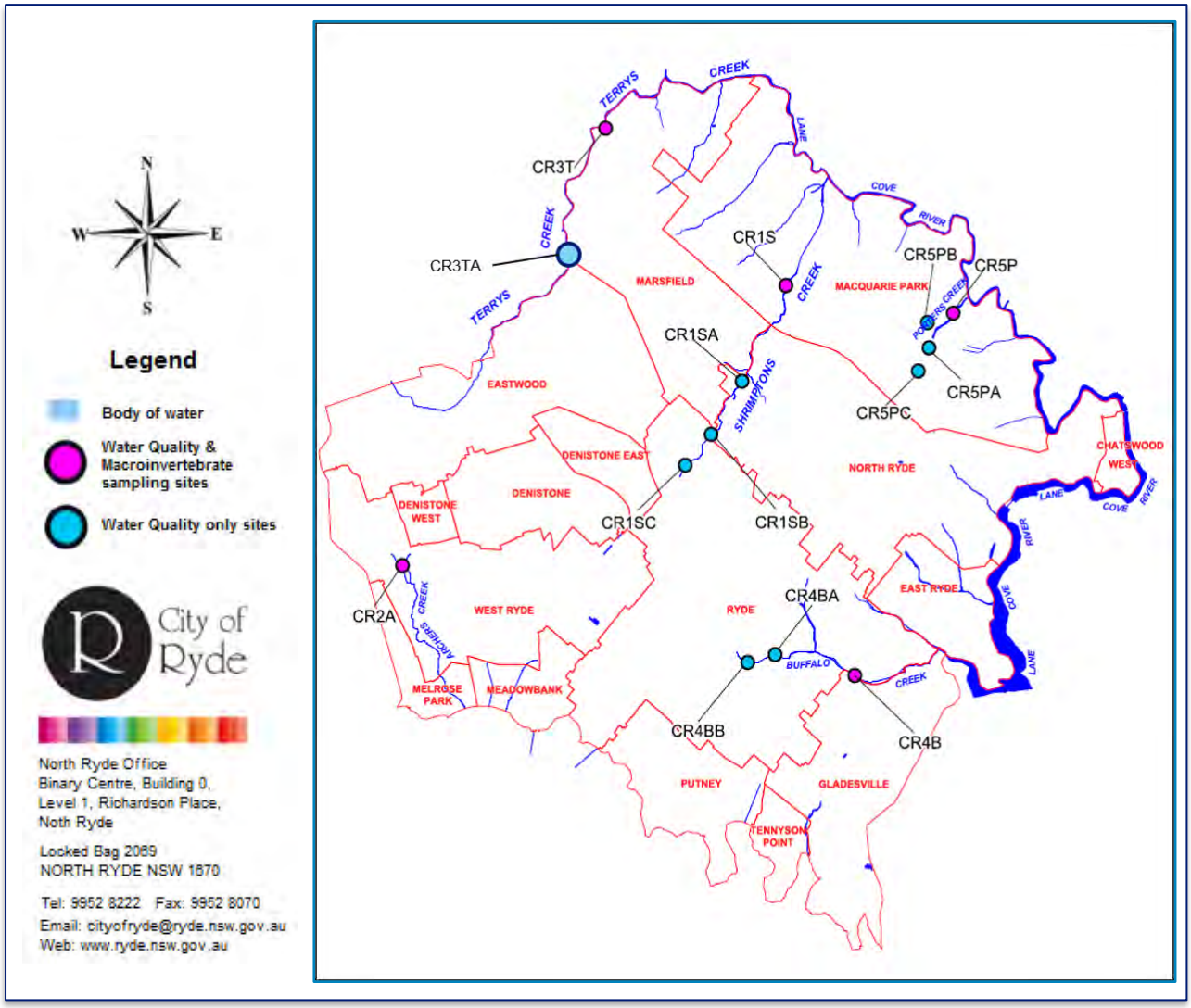

Figure 1 City of Ryde Water Quality Management Program Sites Map of sites for chemical and ecological monitoring across five creeks.

Sites

For each of the catchments there is a core site where macroinvertebrates, instream and riparian features, and water quality are assessed and additional water quality only sites (Table 1). Refer to the method description section for method information.

Table 1 Survey sites for monitoring chemical and ecological attributes.

** indicates a new site added to the program in spring 2017*

Site	Location	Water Quality (wet & dry weather)	Macroinvertebrates	Rapid Riparian Assessment
CR1S	Shrimptons Creek at Wilga Park	✓	✓	✓
CR1SA	Shrimptons Creek at Kent Rd	✓		
CR1SB	Shrimptons Creek at Bridge St	✓		
CR1SC	Shrimptons Creek at Quarry Rd	✓		
CR2A	Archers Creek at Maze Park	✓	✓	✓
CR3T	Terrys Creek at Somerset Park	✓	✓	✓
*CR3TA	Terrys at Foresters Park	✓		
CR4B	Buffalo Creek	✓	✓	✓
CR4BA	Buffalo Creek d/s Burrows Park	✓		
CR4BB	Buffalo Creek u/s Burrows Park	✓		
CR5P	Porters Creek d/s of depot	✓	✓	✓
CR5PA	Porters Creek main branch	✓		
CR5PB	Porters Creek spur branch	✓		
CR5PC	Porters Creek at Wicks Rd	✓		

Method descriptions

Macroinvertebrates

Aquatic macroinvertebrates are small (>1mm), spineless animals that naturally occur in water bodies. Macroinvertebrates are useful as bioindicators because some are more sensitive to pollution than others. As a result, a water pollution problem may be indicated if a stream is found to have a macroinvertebrate community dominated by pollution-tolerant animals and missing the more pollution-sensitive animals.

Figure 2 Collecting macroinvertebrates from Terrys Creek

They are collected from the core sites following a standard method detailed in previous reports. This involves using a fine mesh net to upwell the water and dislodge the animals. They are picked from the debris and preserved for lab based identification and enumeration.

SIGNAL SF

SIGNAL SF stands for *Stream Invertebrate Grade Number Average Level- Sydney Family.* It is a biotic index for freshwater macroinvertebrates examined at the family level to assess stream health.

This index assigns *sensitivity scores* from 1 being tolerant to poor stream health and 10 being very sensitive to poor stream health for each individual family.

Figure 3 Preserved macroinvertebrates

Taxa Richness

This is the total number of different types of animals collected. Generally, in healthier ecosystems, there will be higher diversity, which is higher taxa diversity.

Figure 4 Collecting freshwater macroinvertebrates from a stream, this water bug is a backswimmer (Notonectidae)

Water Quality

Physical, chemical and biological conditions of the five main catchments in the City of Ryde local government area were assessed following the same methods as previous years. This provides information that can create a snapshot of what was happening in the creek at that point in time.

Water quality samples were collected at the same time as the macroinvertebrates to ensure the data was accurate for comparison. These are the *dry weather* sampling events

and occur when <10mm of rainfall has fallen in the catchments. *Wet weather* sampling was also conducted once there was ≥10mm of rain followed by 24 hours of no rain.

Wet weather sampling was added to this monitoring program as a one-off sampling event. Wet weather events can cause an influx of pollutants from stormwater and run-off, as well as changing the physical characteristics. Higher dissolved oxygen levels would be common in wet weather events due higher water flow.

Figure 5 Collecting water samples for analysis

Water quality samples are collected at all 15 sites. Several analyses are conducted in the field and additional water is collected for lab analysis. The lab analysis is performed at the Sydney Water Laboratory located in West Ryde.

The results are then compared back to the Australian and New Zealand Environment and Conservation Council (ANZEC) guidelines. The ANZECC (2000) water quality guidelines outline a framework for assessing water quality in terms of whether the water is suitable for a range of environmental and community values. Exceedances of the ANZECC guidelines may indicate environmental disturbance.

Historical data is used during result analysis to compare the current results over what would be expected. As there is no historical data for wet weather, the results were compared to the dry weather sampling historical data.

The analytes assessed are:

Physico-chemical

Temperature, dissolved oxygen, pH, turbidity, conductivity

Alkalinity & hardness

Total magnesium, total calcium, hardness, alkalinity

Biological & nutrients

Faecal coliforms, ammonia, total nitrogen, total kjeldhal nitrogen, oxidised nitrogen, total phosphorus

Wet weather

Additional analytes of suspended solids, Enterococci, total copper, zinc and lead.

Rapid Riparian Assessment

Rapid Riparian Assessments were added to the monitoring program in Spring 2017 to cover the areas of data, such as stream features, that aren't covered in macroinvertebrate and water quality sampling.


Figure 6 Shrimptons Creek core site surrounded by riparian vegetation

The riparian zone is the area where a body of water or stream, meets the land. The Rapid Riparian Assessment provides information on and assessment of the features of the stream and the vegetation community surrounding the stream.

Ku-ring-gai and Willoughby councils use these types of assessment. The methods used were originally developed by Ku-ring-gai Council and researchers from Macquarie University.

The main categories assessed are:

- Site features
- Channel features
- Depositional features
- Erosional features
- Riparian vegetation
- Vegetation structure

Each variable within these categories are scored and form a score that will fall into an overall riparian health category.

Table 2 Rapid Riparian Assessment Categories

Category	Score range	Colour code
Excellent	≥60	
Good	27 to 59.99	
Fair	-6 to 26.99	
Poor	-39 to -6.99	
Very Poor	-72 to -39.99	

Rainfall

Rainfall plays a key role in the water quality of streams. The stream flow can be greatly altered during a high rainfall event, which can cause bank erosion, increased turbidity, nutrients and other pollution.

This can directly impact the macroinvertebrate community through loss of habitat and decreased water quality. The water quality results may also exceed the recommended guidelines because of increased stormwater input.

Seasonal rainfall, particularly extended low levels of rain can benefit both macroinvertebrates and water quality. Flowing water will flush out the stream and provide the conditions to avoid algae build up and oxygen depletion.

The rainfall data used is from the Sydney Water rain gauge located at West Ryde.

Figure 7 Water flowing over rocks at Terrys Creek water quality site

Rainfall & Sampling

Daily, monthly and cumulative rainfall for the sampling period is presented below. Rainfall was general low and sporadic throughout the sampling period. The highest monthly rainfall was in June 2017 (193 mm). Smaller rainfall events occurred in October 2017 (55 mm), February 2018 (111 mm) and March 2018 (86 mm). The cumulative rainfall figure shows that 593 mm fell between 1 June 2017 and 17 May 2018.

Spring sampling occurred on November 11th, which included macroinvertebrate, Rapid Riparian Assessments and water quality sampling, which was slightly later in the season due to high rainfall.

Wet weather sampling occurred on March 28th, which was water quality sampling at all sites.

Autumn sampling 2018 occurred on May 10th, which included macroinvertebrate, Rapid Riparian Assessments and water quality sampling. There was very low rainfall leading up to this sampling event.

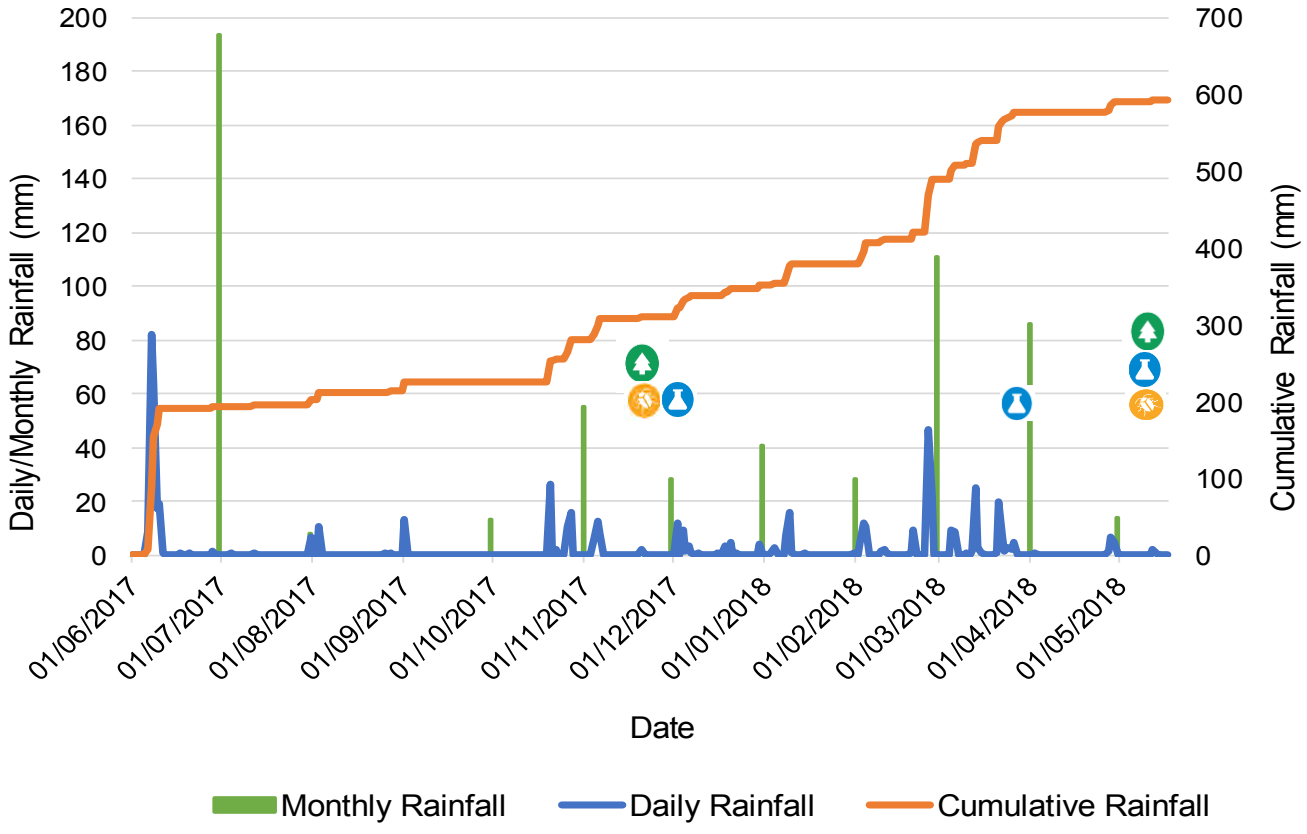

Figure 8 Rainfall and sampling events for Spring 2017 and Autumn 2018. Note cumulative rainfall scale is on the right.

Shrimptons Creek

Site Profiles

Within the Shrimpton's Creek catchment there are three water quality sites and one core site (macroinvertebrates & water quality).

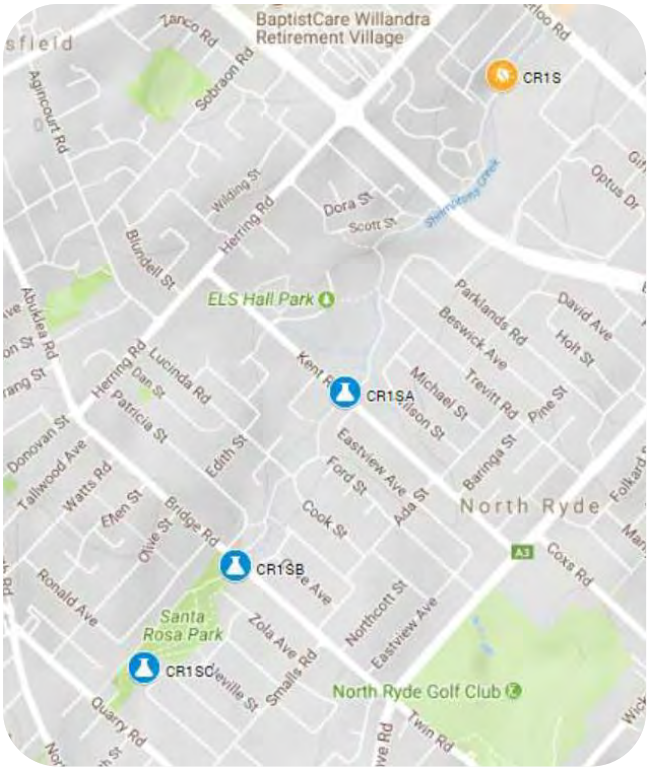

Figure 9 Shrimpton Creek Catchment Area

Within the last 12 months there have been numerous works by City of Ryde in the catchment to aid in water quality improvement. This includes:

- establishing 173 metres of riparian and corridor planting within Shrimptons Creek
- creation of three instream riffle structures to enhance water quality directly within Shrimptons creek at Wilga park. Debris islands were removed and general trash removal also conducted
- ongoing gross pollutant trap cleaning quarterly at the core site

CR1S Shrimptons Creek (core site)

The Shrimptons Creek core site is located within Wilga Park in the suburb of Macquarie Park. The surrounding land use is a mix of residential, commercial and light industrial.

The creek flows through a thin riparian corridor, which is a mix of native and exotic species. The creek bed is predominately bedrock and sand/silt.

Figure 10 Revegetation and bank works

Figure 11 Shrimptons Creek core site facing downstream

CR1SA Shrimptons Creek @ Kent Road

The Kent Road site is situated amongst a residential area and is lined by a thin section of riparian vegetation that completely shades the creek and comprises a mix of native and exotic species.

There is a grose polluntant trap located within the site which was cleaned out regularly in the last 12 months. In Spring 2017 & Autumn 2018 there was moderate to high rubbish observed at the site. In Autumn 2018 a slight odour and low flow were observed during sampling.

Figure 12 Shrimptons Creek @ Kent Road facing downstream

CR1SB Shrimptons Creek @ Bridge Street

This site is located at the downstream section of Burrows Park, just before it flows under Bridge St and is surrounded by residential areas. The revegetation of the riparian area is now established adding to bank stabilisation, physical buffer and filtration. Low flow, low rubbish and high density of aquatic plants were observed in Autumn 2018.

Figure 13 Shrimptons Creek @ Bridge Street facing downstream

CR1SC Shrimptons Creek at Quarry Road

The Quarry Road site is located at the upstream section of Burrows Park, at the point where Shrimptons Creek emerges from the underground stormwater system. This site has sandstone blocks around the drain for bank stabilisation.

Odour, oil and scum was observed on the water surface in Spring 2017, Autumn 2018 and historically.

Figure 14 Shrimptons Creek @ Quarry Road facing downstream

Results & Interpretation

Macroinvertebrates

SIGNAL SF

The SIGNAL SF value for Spring 2017 was slightly higher than Autumn 2018, which is common due to seasonal variability of macroinvertebrates. Both seasons were within the historical average range, meaning the macroinvertebrate present have not changed significantly.

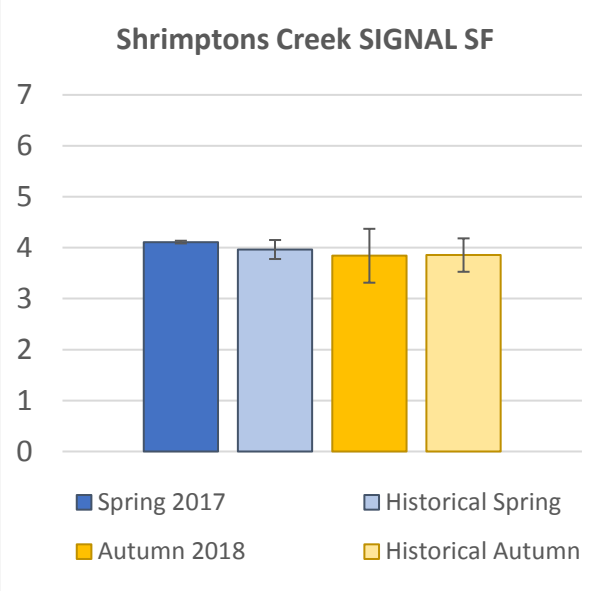

Figure 15 SIGNAL SF results for Shrimptons Creek

Taxa Richness

Spring 2017 Taxa Richness was consistent with the historical range for Shrimptons Creek. It is slightly above average but still within the standard deviation range.

Autumn 2018 Taxa Richness fell outside of the historical data, making it the lowest result. This was the lowest result of the 2017/2018 period. This autumn decrease is similar to the low value seen in Autumn 2017, which may indicate some seasonality to the Taxa Richness in Shrimptons Creek.

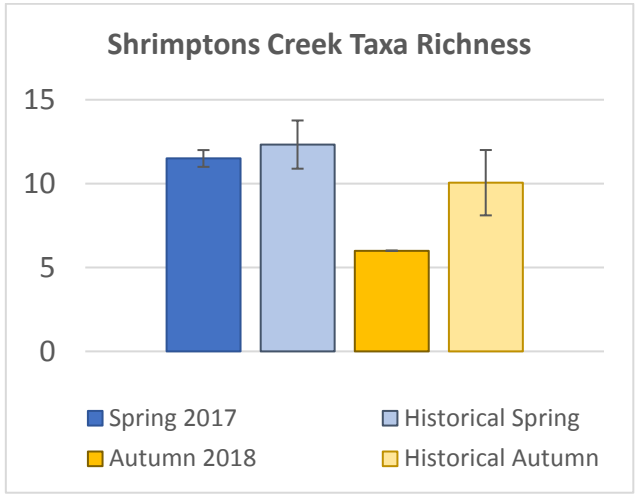

Figure 16 Taxa Richness results for Shrimptons creek

Macroinvertebrates summary

SIGNAL Spring 2017 & Autumn 2018 where consistent with historical data

Taxa Richness has decrease again in Autumn 2018 to a historical low

Water Quality

- Dissolved oxygen (DO) saturation levels were below the ANZECC (2000) guideline on all sampling occasions for CR1S, CR1SA, and CR1SB with wet weather level generally higher than routine sampling levels due to increased flows. DO saturation levels for CR1SC were within the guideline range on the three sampling occasions, and were all higher than the historical median of 75.8%
- Turbidity, pH and conductivity levels were all within the recommended ANZECC (2000) guidelines
- Most total calcium and total magnesium results were comparable to the historical

median concentrations. The exception to this was CR1SB which had results lower than the median for both ions on the three sampling occasions

- Hardness and alkalinity results were similar to historical median concentrations, except for CR1SB which had lower hardness concentrations on the three sampling occasions
- Faecal coliform results were mostly below the ANZECC (2000) guideline. The exception was for CR1SC where results were above the guideline with the highest result of 200,000 CFU/100mL from 10 May 2018
- Most ammonia, total nitrogen and total phosphorous results were above the respective ANZECC (2000) guideline
- Most oxidised nitrogen results were below the ANZECC (2000) guideline. The exception was for CR1SC where results were above the guideline with the highest result of 2,900 µg/L from 10 May 2018
- Total copper, zinc lead suspended solids and Enterococci were collected during the wet weather sampling on 28 March 2018. Results for copper were lower than the historical medians while results for zinc were higher than the dry weather historical medians. Lead results were similar to the dry weather historical medians.
- Total suspended solids results were low at the four sites
- Enterococci concentrations exceeded the ANZECC guideline at all sites except CR1SB, however this is typical for wet weather sampling and results were not high enough to trigger action

Water quality summary

Overall water quality was consistent with previous years

Of note are the particularly elevated faecal coliform and nutrient results for CR1SC on 10 May 2018 which indicate contamination has occurred. There were no visible signs of contamination noted during sampling.

Rapid Riparian Assessment

The overall riparian health scores were very similar for both sampling seasons, -0.4 (Spring 2017) and -2.5 (Autumn 2018).

Moderate to high weed infestation was recorded that the Shrimptons Creek core site (CR1S) for both sampling periods. These contributed to a lower score, as high weed infestation equates to -10 points from the overall score.

Rapid Riparian Assessment score

Fair (-6 to 26.99)

Spring 2017

Autumn 2018

Archers Creek

Site Profile

Archers Creek has only one site, CR2A Archers Creek core site.

Figure 17 Archers Creek Catchment Area

CR2A Archers Creek (core site)

This site is located in Maze Park, West Ryde and is upstream of the Victoria Rd crossing. The upstream surrounding land use is residential and a golf course is present downstream. The bank was relined in the past with sandstone blocks. The creek bed is mostly bedrock with banks of sediment (sand, silt and organic matter). The vegetation within and around the creek is a mix of native and introduced species.

Figure 18 Archers Creek Core Site facing downstream

Results & Interpretation

Macroinvertebrates

SIGNAL SF

The SIGNAL SF values for both Spring 2017 and Autumn 2018 were equal to or above the historical average.

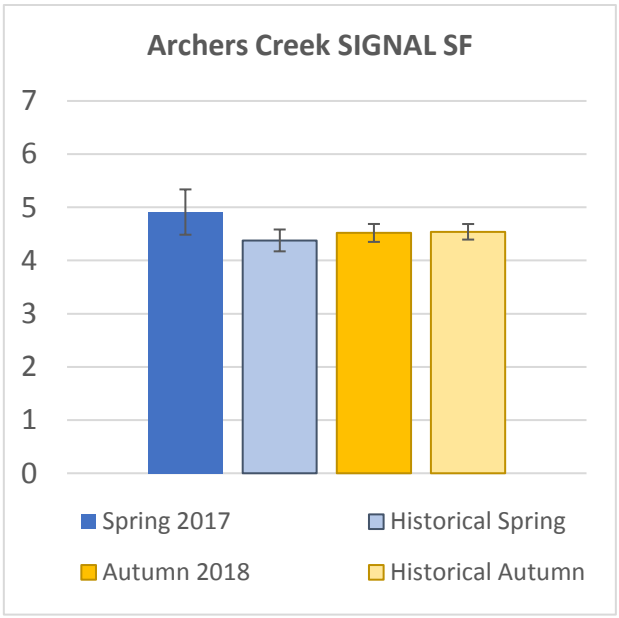

Figure 19 Archers Creek SIGNAL SF results

Taxa Richness

Spring 2017 had higher than historical average results for Taxa Richness. This was the second highest result recorded since the program began. The Autumn 2018 results were significantly lower than the historical average. This was the lowest value recorded in this program.

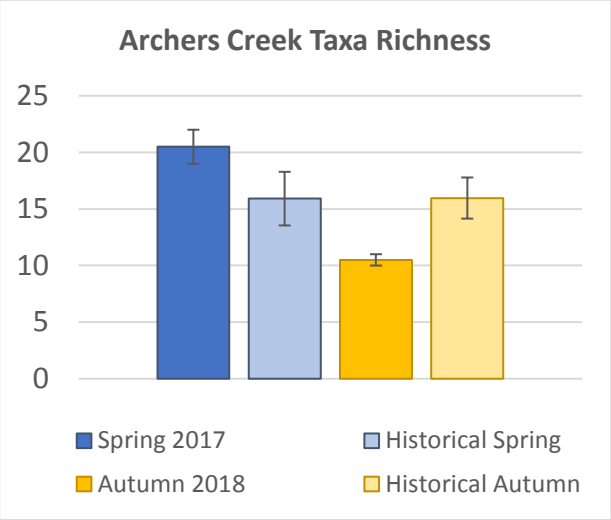

Figure 20 Archers Creek Taxa Richness results

Macroinvertebrates summary

SIGNAL SF both seasons were consistent with the historical average

Taxa Richness second highest result for Spring 2017, record low for Autumn 2018

Water Quality

- The dissolved oxygen saturation level was between the ANZECC (2000) guideline on the 22 November 2017, but fell below the guideline on the two other sampling occasions
- Turbidity, pH and conductivity levels were all within the recommended ANZECC (2000) guidelines
- Total magnesium, calcium, hardness and alkalinity results were below the historical medians on each sampling occasion
- Faecal coliform results were below the guideline on two of the three sampling occasions
- Nutrient concentrations exceeded the respective guidelines on all sampling occasions
- Total copper, zinc lead suspended solids and Enterococci were collected during the wet weather sampling on 28 March 2018
- The suspended solid result was low
- Total copper, zinc lead levels were slightly lower than historical medians
- The enterococci result slightly exceeded the ANZECC (2000) guideline and did not warrant further investigation

Water quality summary

Overall water quality was consistent with previous years

Faecal coliform and nutrient results were slightly elevated at CR2A in May 2018. There were no visible signs of contamination at the time of sampling.

Rapid Riparian Assessment

Archers Creek had quite different Rapid Riparian Assessment scores in both seasons, 21.2 in Spring 2017 and in 14.25 Autumn 2018. These are both in the higher end of the *Fair* range for overall assessment results.

Higher weed infestation was recorded in Autumn compared to Spring, which explains variation in the results. All other areas of the were consistent between seasons.

Rapid Riparian Assessment score

Fair (-6 to 26.99)
Spring 2017
Autumn 2018

Terrys Creek

Site Profiles

Historically there was only the core sampling site in the Terrys Creek catchment. In Spring 2017, a water quality only site, CR3TA Terrys Creek @ Foresters Park, was added to the monitoring program.

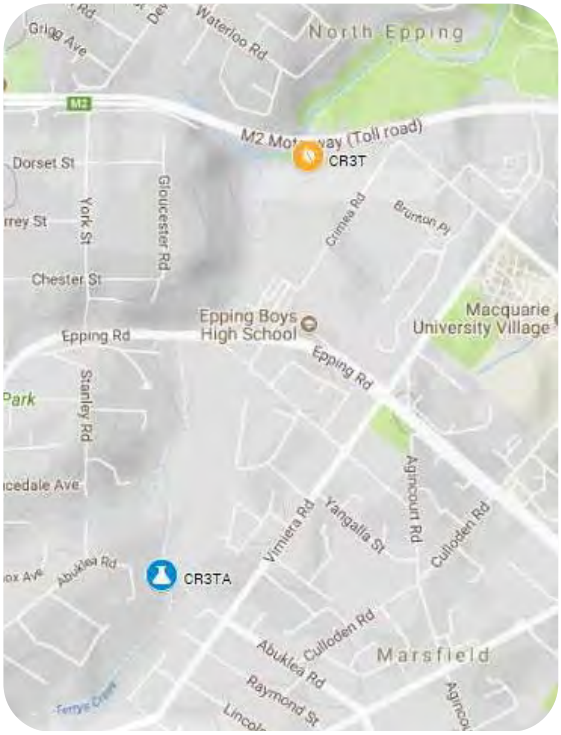

Figure 21 Terrys Creek Catchment Area

CRT3 Terrys Creek (core site)

This site is located within Somerset Park under the M2 overpass in the suburb of Epping. The surrounding land use is residential, and the creek flows through a bushland corridor. The surrounding riparian area and bank edge is a mix of native and exotic plant species. The creek bed is predominately bedrock, gravel and sand.

There were no observations that differed from standard conditions for this site in 2017/18.

Figure 22 Terrys Creek Core Site facing downstream

CRT3A Terrys Creek @ Foresters Park

This site is located downstream of Terrys Creek Waterfall, which is an area surrounded by bushland. Dense vegetation covers both banks and consists of a mixture of native and introduced species. The bank is comprised of sediment (mostly sand and silt) and river rocks, which create areas of broken water.

It was first sampled in Spring 2017 and an echidna was observed upstream of the site.

Figure 23 Shrimptons Creek @ Foresters Park facing upstream

Results & Interpretation

Macroinvertebrates

SIGNAL SF

The SIGNAL SF scores for both Spring 2017 and Autumn 2018 were above the historical average. The results between seasons were very similar.

This was one of the most consistent results between seasons compared to the historical average out of the five creeks.

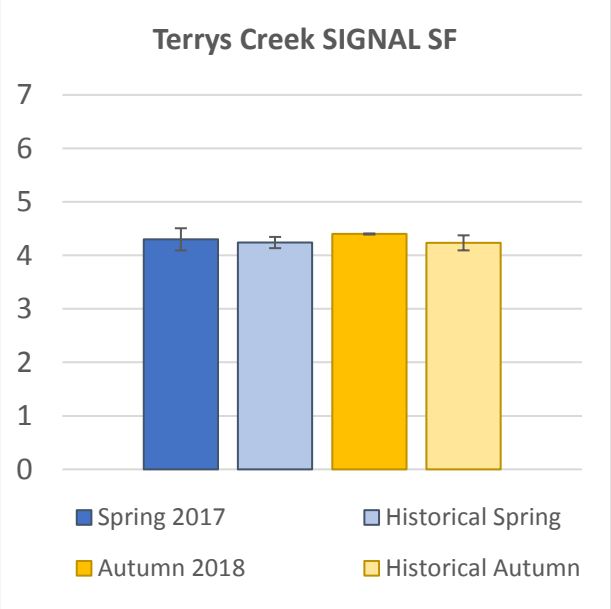

Figure 24 Terrys Creek SIGNAL SF results

Taxa Richness

Taxa Richness was similar for both seasons, with Autumn 2017 having a slightly higher result. Both seasons were lower than the historical average, but within the standard deviation range.

Similar to the SIGNAL SF results, Taxa Richness was very consistent between seasons and compared to historical averages. Terrys Creek was one of only two sites that had this type of consistency in results.

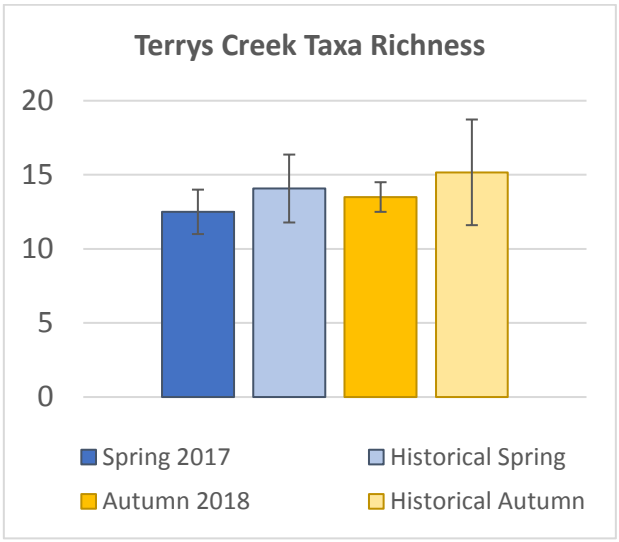

Figure 25 Terrys Creek Taxa Richness results

Macroinvertebrates summary

SIGNAL SF slightly higher than historical average

Taxa Richness slightly lower than historical average but within the standard deviation

Water Quality

- Dissolved oxygen saturation levels were below the guideline range at CR3T on the three sampling occasions, and at CR3TA on 22 November 2017. Results were only slightly low with the lowest level recorded at 62.2% (CR3T November 2017)
- Turbidity, pH and conductivity levels were all within the recommended guidelines
- Total calcium, magnesium, hardness and alkalinity results were comparable to the historical median concentrations for CR3T. At CR3TA (a new site) the results for 10 May were slightly elevated compared to those of November 2017 and March 2018.

- Faecal coliform results were generally low, except for the wet-weather sample collected from CR3T on the 28 March 2018 which exceeded the guideline (1,100 CFU/100mL)
- Total nitrogen, oxidized nitrogen and total phosphorous results exceeded the respective guidelines at both sites on all sampling occasions
- Total copper, zinc and lead were collected for the wet weather sampling. Results were similar to the historical dry weather medians for CR3T. Results for CR3TA were similar to those of CR3T
- Suspended solids results were very low
- Enterococci results were below the recommended guideline

Water quality summary

Overall water quality was consistent with previous years

Rapid Riparian Assessment

Spring 2017 had a slightly higher score (23.6) compared to Autumn 2018 (19.4). These are both within the *Fair* range and are in the upper section of that range.

Both seasons had very similar scores, with litter and erosion contributing to the lower score in Autumn.

Rapid Riparian Assessment score

Fair (-6 to 26.99)

Spring 2017

Autumn 2018

Buffalo Creek

Site Profiles

Buffalo Creek catchment has one core site and two water quality sites. In creek trash removal was carried out at Laurel Park wihtin the Buffalo Creek Catchment by City of Ryde.

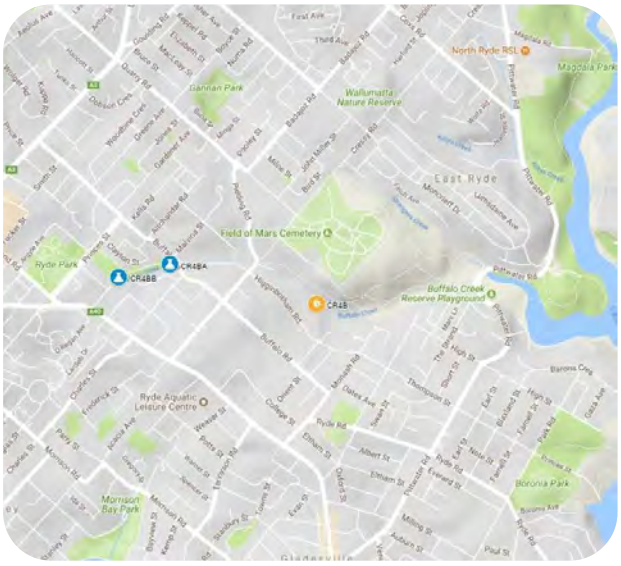

Figure 26 Buffalo Creek Catchment Area

CR4B Buffalo Creek (core site)

The Buffalo Creek core sampling site is in a bush corridor in the suburb of Gladesville and is accessed through private property. The surrounding land use is a mix of residential, light industry/commercial and reserves. The surrounding vegetation is a mix of native and exotic species, with exotic species dominating. The southern bank is mostly residential lawns.

The creek bed has a mix of sand, silt and gravel. There is usually some macrophyte growth, *Egeria* and *Potamogeton*, and little algal growth has been observed. Sedimentation has occurred periodically, along with a significant amount of organic debris and domestic rubbish

Figure 27 Buffalo Creek Core Site facing upstream

CR4BA Buffalo Creek Downstream of Burrows Park

The downstream Burrows Park site is accessed off Buffalo Rd and is positioned just before the creek flows under the road. The surrounding land use is residential and Burrows Park consists mostly of a bush corridor. There are usually obvious signs of bird activity around this site, including extensive bird droppings.

Figure 28 Buffalo Creek Downstream of Burrows Park Facing upstream

CR4BB Buffalo Creek Upstream of Burrows Park

The upstream Burrows Park site is about 300 metres upstream of Buffalo Rd, and lies in the middle of a bush corridor. The site is surrounded by vegetation that completely shades the creek. The creek is shallow at this point and has little flow. The site is positioned just downstream from a stormwater tributary/pipe. There has been little observable change at this site throughout the survey periods.

Figure 29 Buffalo Creek Upstream of Burrows Park facing upstream

Results & interpretation

Macroinvertebrates

SIGNAL SF

Spring 2017 had results in the same range as the historical average but Autumn 2018 was below. Autumn 2018 had the lowest SIGNAL SF score for Buffalo Creek across time.

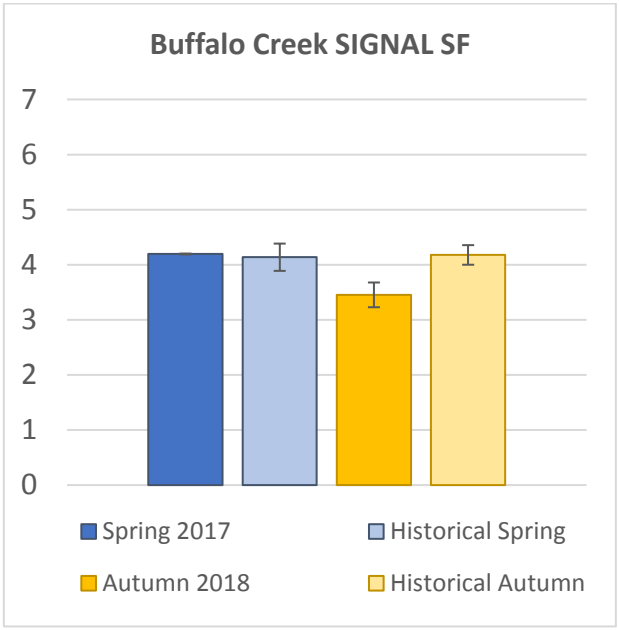

Figure 30 Buffalo Creek SIGNAL SF results

Taxa Richness

Spring 2017 Taxa Richness was consistent with the historic average whilst Autumn 2018 had results lower than the historical average. Spring 2017 was still within the standard deviation of the historical average, whilst Autumn 2018 was not. That result was the lowest recorded for Buffalo Creek. Autumn 2018 had very low rainfall leading up to the sampling event.

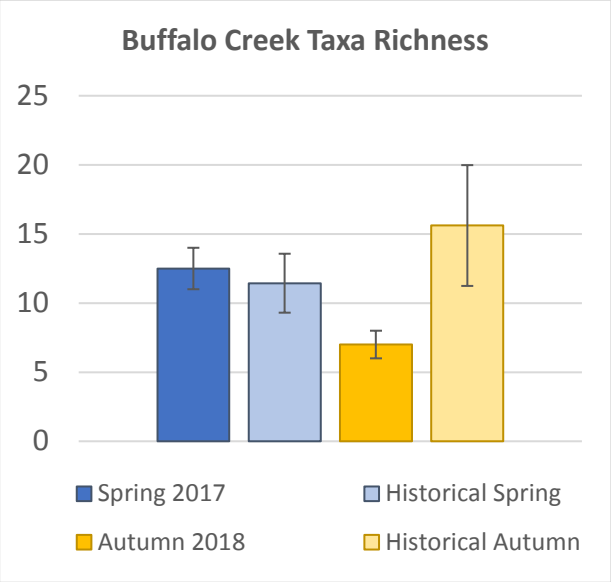

Figure 31 Buffalo Creek Taxa Richness results

Macroinvertebrates summary

SIGNAL SF Spring 2017 was consistent with historical data, Autumn 2018 had a historical low

Taxa Richness Spring 2017 was within the historical range, whilst Autumn 2018 had a historical low

Water Quality

- Dissolved oxygen saturation levels were below the guideline at the three sites on the dry weather sampling occasions. Wet weather levels were higher and within the guideline range at the three sites
- Turbidity, pH and conductivity levels were all within the recommended guidelines
- Faecal coliform results were generally below the guideline recommendation, the two exceptions were from CR4BA in March and May 2018
- All total nitrogen, oxidised nitrogen and total phosphorous results were above the respective guidelines but were consistent with the historical medians
- The wet weather results for total copper, zinc and lead were similar to the dry weather historical medians, with the exception of total lead at CR4BA which was elevated
- Total suspended solids results were low
- Enterococci levels were slightly elevated above the guideline at CR4BA and CR4BB

Water quality summary

Overall water quality was consistent with previous years

Rapid Riparian Assessment

Buffalo Creek had the most similar results between seasons of the five catchments. Spring 2017 was 25.2 and Autumn 2018 was 25.9. This result was very close to the *Good* range, which begins at a score of 27.

Spring had a high litter result (>20 pieces of litter), which has a score of -3. Autumn had moderate litter (6-20 pieces), which has a score of -2. Litter may be easier to control in sites with gross pollutant traps at water discharge points. But there aren't any directly in the sampling area. This may be an area to focus on to move from the *Fair* range to the *Good* range, assuming all other areas of the assessment remain similar.

Rapid Riparian Assessment score

Fair (-6 to 26.99)

Spring 2017

Autumn 2018

Porters Creek

Site Profiles

There is one core site and three water quality only sites within the Porters Creek Catchment.

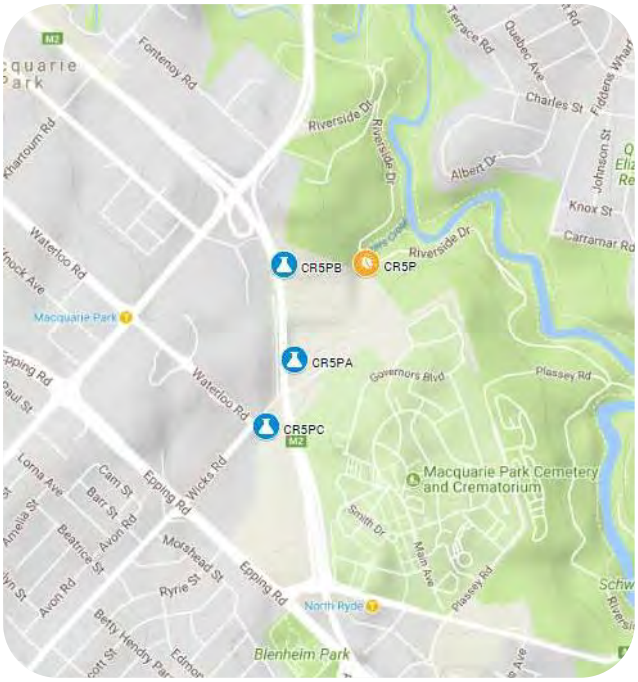

Figure 32 Porters Creek Catchment Area

CR5P Porters Creek (core site)

This site is located on the eastern boundary of the SUEZ Ryde Resource Recovery Centre, where Porters Creek emerges after flowing mostly underground in its upper section. Water quality samples were collected within the Centre close to where Porters Creek drains from an underground system. Macroinvertebrates were collected within the boundaries of the Lane Cove National Park just downstream of the depot and the bridge for the main park access road.

The surrounding riparian area is dominated by native plants with a small amount of exotic species. The creek bed is mostly bedrock with some cobble, boulder and sand. No macrophyte growth has been observed at the site however there has been varying levels of algal growth present.

Figure 33 Porters Creek Core Site facing downstream

CR5PA Porters Creek @ Main Branch

This site is located on the western boundary of the centre and consists of an open concrete channel. Samples are collected from the retention basin at the end of the channel. Extensive algal growth and scum was observed on the surface in both Spring 2017 and Autumn 2018. This is consistent with historical observations. Access prevented sampling in the past. This was resolved in Spring 2017.

Figure 34 Porters Creek @ Main Branch facing downstream

CR5PB Porters Creek @ Spur Branch

This site is in the north-western corner of the centre in an underground drainage pit where several underground stormwater lines meet before joining and draining to the main Porters Creek line. The exact location has changed over the years due to access issues. Algae was present in Spring 2017 and less algae in Autumn 2018.

Figure 35 Porters Creek @ Spur Branch

CR5PC Porters Creek @ Wicks Road

This site is the first point that Porters Creek drains from the underground stormwater system. The site is surrounded by commercial and industrial land uses. The banks have been re-lined with sandstone and surrounding area vegetated with native plants.

Figure 36 Porters Creek @ Wicks Road facing downstream

Results & Interpretation

Macroinvertebrates

SIGNAL SF

Both Spring 2017 and Autumn 2018 had results above the historical average. The Spring result was higher than Autumn.

Similar to Terrys Creek, Porters Creek had very consistent SIGNAL SF results between seasons and compared to the historical average.

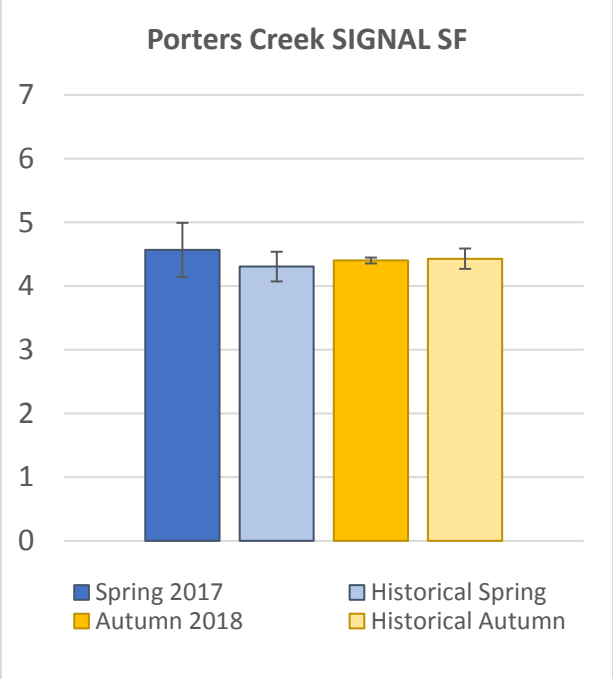

Figure 37 Porters Creek SIGNAL SF results

Taxa Richness

Both Spring 2017 and Autumn 2018 Taxa Richness results were consistent with the historical averages.

As with the SIGNAL SF results, the Taxa Richness at Porters Creek was highly consistent between seasons and historical averages

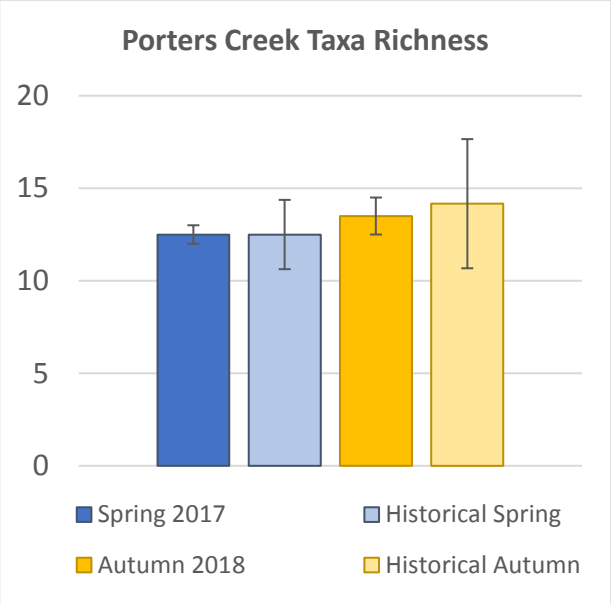

Figure 38 Porters Creek Taxa Richness results

Macroinvertebrates summary

SIGNAL SF Spring 2017 & Autumn 2018 had higher than average results

Highly consistent results between seasons

Taxa Richness Spring 2017 and Autumn 2018 were both comparable to the historical average.

Highly consistent results between seasons

Water Quality

- Dissolved oxygen saturation levels were below the guideline range at CR5P and CR5PA in May 2018. CR5PA had elevated levels in November 2017 and March 2018 exceeding the guideline range at 178% and 121% saturation.
- There was an elevated pH level recorded for CR5PC in November 2017 at 8.66 pH units
- The turbidity level for the wet weather sample at CR5P (69 NTU) was elevated above the recommended guideline level. CR5PA also had an elevated turbidity level but remained below the guideline at 33 NTU
- Total magnesium, calcium, hardness and alkalinity results were similar to the historical medians, with the exception of CR5PA where most results were elevated
- Faecal coliform results were generally good, the exceptions were for CR5PC were levels in November 2017 and March 2018 were elevated (1,100 and 4,800 CFU/100 mL)
- Most ammonia, total nitrogen, oxidized nitrogen and total phosphorous results exceeded the respective guidelines. Nitrogen forms were particularly high on 10 May 2018
- The wet weather results for total copper, zinc and lead were similar to the historical medians
- Total suspended solids results were slightly elevated at CR5P and CR5PA 12 and 13 mg/L), corresponding to the high turbidity results

- Enterococci results exceeded the guidelines at CR5PA, CR5PB and CR5PC at levels typical for wet weather, and did not require investigation

Water quality summary

Overall water quality was consistent with previous years

Of note are the elevated nutrient results for CR5P on 10 May 2018 that are indicative of a contamination event

Rapid Riparian Assessment

Porters Creek was the only site to have results in two different categories for Spring 2017 and Autumn 2018. The highest score was 72 in Autumn 2018, which falls into the *Excellent* range. Spring 2017 had a score of 59.6, which is almost the highest value in the *Good* range.

The land use, absence of a sewerline, low litter, low erosion, buffer area, vegetation community and low weed infestation all contributed to these very high results.

Rapid Riparian Assessment summary

Good (-6 to 26.99)
Spring 2017

Excellent (≥60)
Autumn 2018

Conclusions

Macroinvertebrates

The results for both SIGNAL SF and Taxa Richness varied greatly amongst and between sites in both Spring 2017 and Autumn 2018.

SIGNAL SF scores were within the historical average standard deviation for Spring and Autumn in Shrimptons and Archers creeks. Terrys and Porters creek scores were above average for both seasons. Buffalo Creek had and average score in Spring but the lowest score in the monitoring program.

Overall this is a good result, indicating that the sensitivity of animals has not decreased for four out of five sites.

Taxa Richness varied between seasons at three out of five sites, Archers, Buffalo and Porters creeks. Shrimptons and Terrys creeks were lower than historical averages for both seasons. Shrimptons, Archers and Buffalo creeks had the lowest ever recorded results for Taxa Richness during Autumn 2018.

There has been a historical trend of seasonal variability with macroinvertebrate results. This is based on the environmental and biological factors that result in higher diversity and abundance in spring compared to autumn.

During Autumn 2018 sampling, it was observed that the flow was much lower than previous years. This was particularly obvious at the Shrimptons Creek water quality sites. A reduction in flow can lead to reduced habitat for macroinvertebrates and areas of stagnant water. This may explain some of the all-time low Taxa Richness scores from Autumn 2018.

Water Quality

The five creeks sampled under the Ryde Council monitoring program are categorised as highly disturbed systems. This is due to the creeks flowing through highly urbanised systems that receive substantial road and stormwater runoff (ANZECC 2000).

Despite this, they each still retain ecological and conservation values. A realistic objective would be to maintain present water quality to retain a functional, albeit modified, ecosystem that would support the management goals assigned to it.

High faecal coliform and nutrient results for Shrimptons Creek at CR1SC indicate a pollution event occurred prior to sampling in May 2018. There were no visible signs of contamination at the time of sampling.

High nutrient results for Porters Creek at CR5P in May 2018 also indicate a pollution event.

Rapid Riparian Assessment

The aim of bringing in Rapid Riparian Assessments into the monitoring program was to collect baseline information about the physical stream features and surrounding area. This type of information was not covered in the traditional macroinvertebrate and water quality analysis.

Shrimptons, Archers, Terrys and Buffalo creeks fell within the *Fair* category for both season. Porters Creek had the highest scores with *Good* in Spring 2017 and *Excellent* in Autumn 2018.

These results are consistent with urban catchments and indicate that the systems are not degraded.

There is a possibility for several sites to move from the fair category into the *Good* category, with Buffalo Creek having a score less than 2 points away from the *Good* category.

The areas of the assessment that have the highest impact on the overall scores for the five catchments are:

- Land use
- Litter present
- Stream confinement and meanders
- Vegetation community composition
- Weed infestation

Some of these variables are likely to not change, specifically land use, sewerlines, and stream confinement and meanders. These are high scoring categories that would be difficult to change. An example of this is the M2 bridge that covers the Terrys Creek site. The land use there is road and bare earth, which score very poorly. The maintenance and strategies City of Ryde have in place, if continued, would most likely lead to similar results in future.