City of Ryde

Water Quality Monitoring Report

Autumn 2022

This report was produced by Sydney Water Monitoring Services™
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Cover image: Archers Creek (Core Site, CR2) upstream at Maze Park

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Executive summary

This report presents the findings of water quality monitoring conducted in Autumn 2022. The survey area included the Archers, Buffalo, Porters, Shrimptons and Terrys Creek catchments. The results of the current season were found to be generally comparable to the macroinvertebrate and chemical data trends observed during the previous season (Autumn 2021) as well as when compared with the historical dataset.

Macroinvertebrate and water quality sampling was conducted on the 13th of April 2022. During the month of April, rainfall was variable with a range between 0 and 84 mm.

Freshwater Macroinvertebrate analysis was conducted at the five core sampling sites. For each site average SIGNAL SF scores were calculated. Values calculated for this current period of sampling were observed to be consistent with the results of previous sampling seasons and historical averages. For the Autumn 2022 sampling season the site with the highest SIGNAL SF score was Porters Creek (4.3), while the lowest recorded score was observed at Shrimptons Creek (3.6). This mirrored the results from the previous season (Autumn 2021) where Porters Creek also the highest score (4.2) and Shrimptons Creek the lowest (3.4).

Average Macroinvertebrate Family Taxa Richness scores were also calculated for each of the five core sites. The diversity of the Macroinvertebrate community at a site can be used as an indication of waterway health, with a greater diversity of families often indicative of higher water quality. The Taxa Richness results of Autumn 2022 were generally lower than the score from Autumn 2021, aside from Shrimptons Creek which had the same result for both seasons (9.5). Porters Creek also had a score of 9.5 which was the lowest recorded for the season. The highest score was observed at Archers Creek (11.5).

For each of the 14 sampling sites, chemical water quality data was collected using both in-field and laboratory analyses. Water quality results were compared with thresholds outlined in the ANZECC guidelines (2000). Generally, water quality results for parameters including dissolved oxygen, turbidity, conductivity, and total nutrient concentrations were consistent between sampling seasons and when compared with historical averages.

The previous sampling season (Autumn 2021) saw high results for faecal coliforms with exceedances at most sites. The current season observed lower results more comparable with historical averages and results fell back within ANZECC guideline thresholds at several sites.

1 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 is a simplified version of the reports produced from 2004-2019. 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.

2 Study Area

The City of Ryde is located 12 km North-West of central Sydney with a local government area of 40.651 km². It consists primarily of 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.

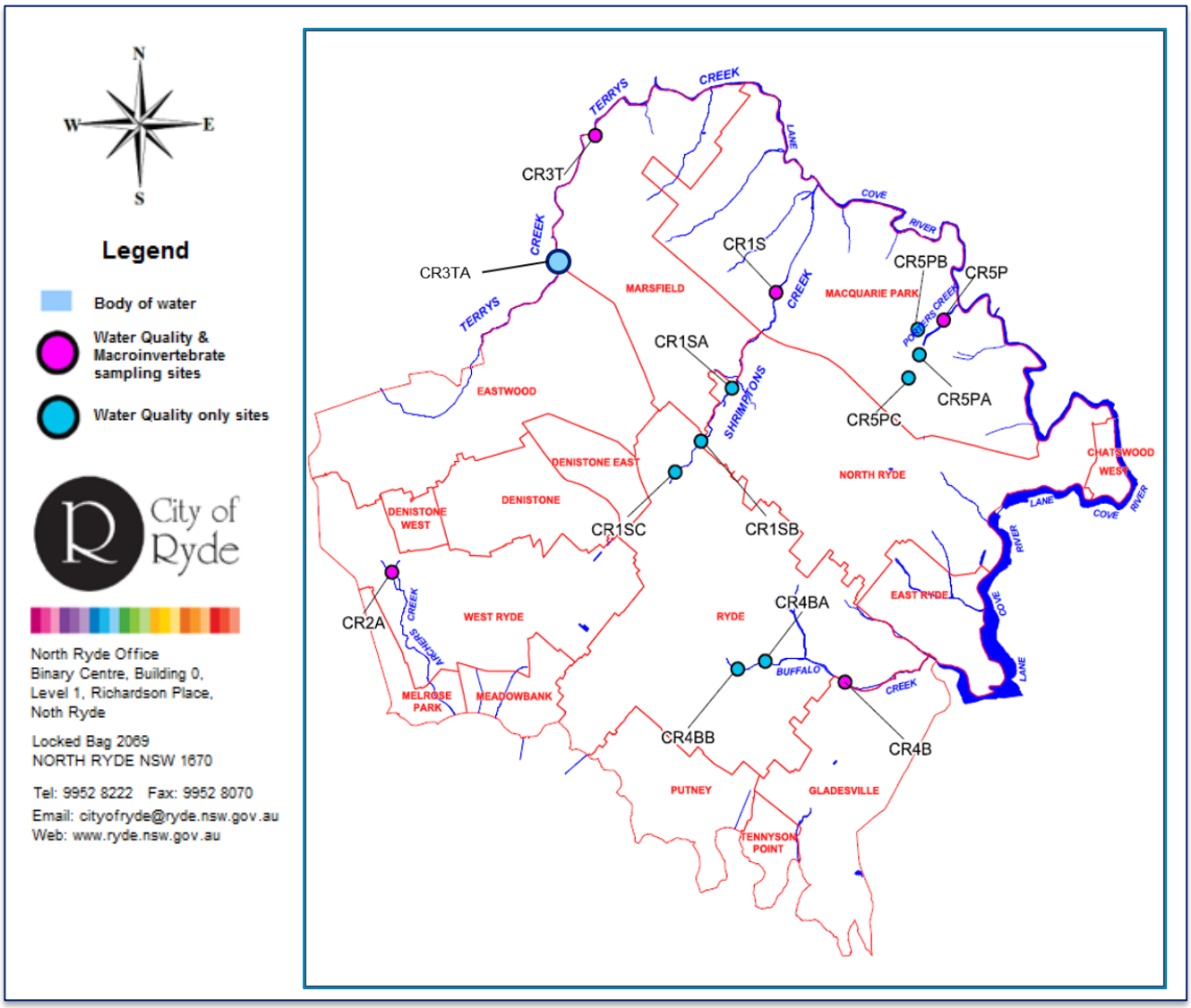

Figure 1 City of Ryde Water Quality Management Program Sites Map of sites for chemical and ecological monitoring across five creeks.

3 Sites

For each of the catchments there is a core site where macroinvertebrates, instream and water quality are assessed and additional water quality only sites.

Table 1 Survey sites for monitoring chemical and ecological attributes.

Site	Location	Water Quality (wet & dry weather)	Macroinvertebrates
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	✓	

**Indicates a new site added to the program in Spring 2017*

4 Method descriptions

4.1 Macroinvertebrates

Aquatic macroinvertebrates are small (>1 mm), 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.

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.

Figure 2 Collecting macroinvertebrates from Buffalo Creek (Autumn 2019)

They are picked from the debris and preserved for lab-based identification and enumeration.

4.1(i) 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

4.1(ii) 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 Macroinvertebrate collection; this water bug is a backswimmer (Notonectidae)

4.2 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.

Figure 5 Collecting water samples for analysis

Water quality samples were collected at the same time as the macroinvertebrates to ensure the data was accurate for comparison.

Water quality samples are collected at all 14 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.

Water quality results are then compared to the Australian and New Zealand Environment and Conservation Council (ANZECC) guidelines. These 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. The analytes measured during this project are summarised in Table 2.

Figure 6 In-field water quality testing

Table 2 Water Quality parameters measured

Parameter Measured	Examples
Physicochemical	Temperature, Dissolved Oxygen, pH, Turbidity, Conductivity, Alkalinity
Nutrients	Ammonia, Total Nitrogen, Total Kjeldahl Nitrogen, Oxidised Nitrogen, Total Phosphorus
Metals	Total Magnesium, Total Calcium, Total Hardness
Biological	Faecal Coliforms

5 Rainfall and Sampling

The volume and frequency of rain has a significant impact on the diversity and abundance of aquatic macroinvertebrates. Rainfall also has a direct influence on chemical water quality parameters such as dissolved oxygen, turbidity, and nutrient concentrations.

Daily, monthly, and cumulative rainfall for the sampling period is summarised in Figure 7.

March 2022 had the highest cumulative monthly rainfall of 572 mm.

Macroinvertebrate collection and physicochemical water quality testing were conducted on the 13th of April 2022. The cumulative rainfall during the month of April was 199 mm. Rainfall during this month was highly variable with a range between 0 – 84 mm for the duration of the month.

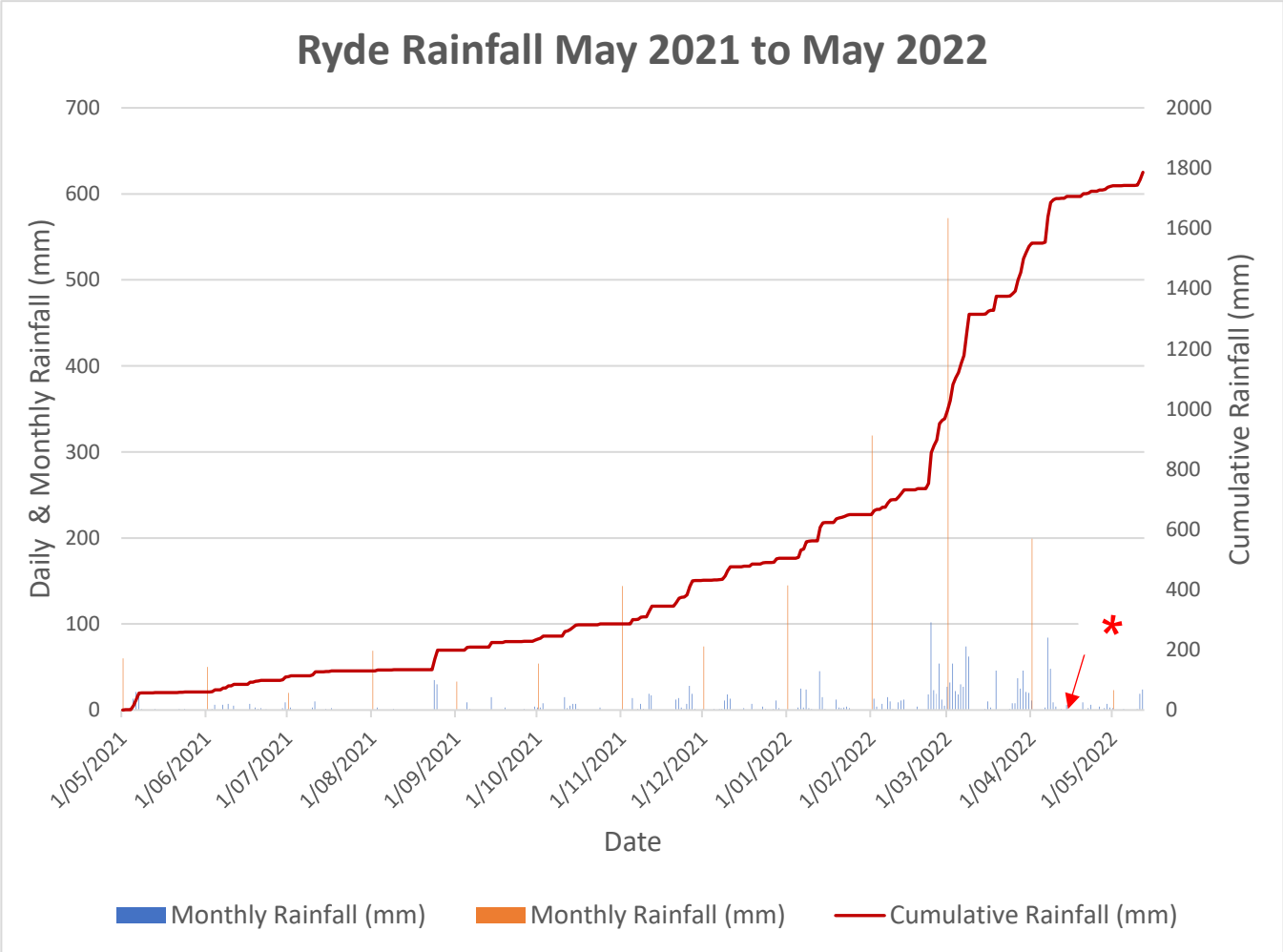

Figure 7 Rainfall and Autumn 2022 sampling event. Note cumulative rainfall scale is on the right.

* - Signifies date of sampling (13/04/2022)

6 Shrimptons Creek

6.1 Site Profile

The Shrimptons Creek catchment contains three water quality sites and one core site (macroinvertebrate, water quality and riparian assessment).

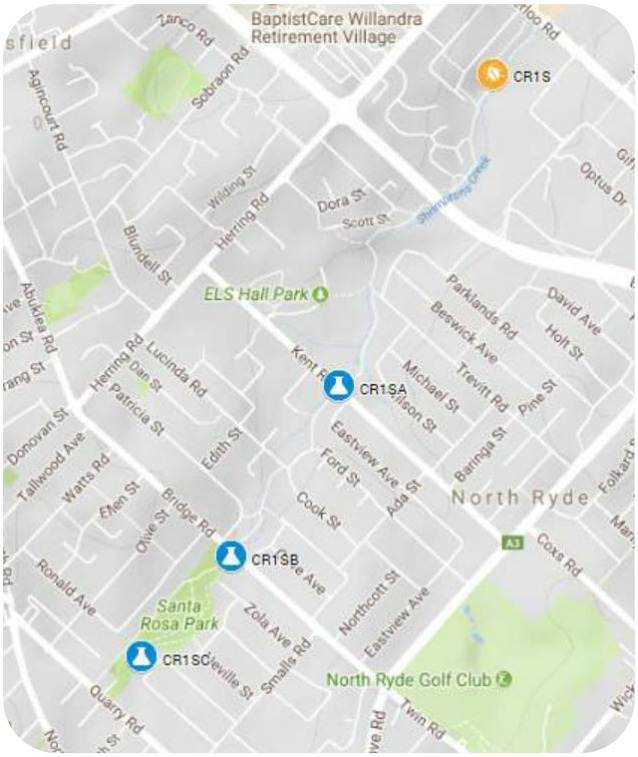

Figure 8 Shrimpton Creek Catchment Area

CR1S Shrimptons Creek (core site)

The Shrimptons Creek core site is located within Wilga Park in the suburb of Macquarie Park. Land use in this area is primarily 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 9 Shrimptons Creek (core site) looking downstream

Figure 10 Shrimptons Creek (core site) looking upstream

CR1SA Shrimptons Creek at 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.

Figure 11 Shrimptons Creek at Kent Rd facing downstream

CR1SB Shrimptons Creek at 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.

Figure 12 Shrimptons Creek at Bridge St facing downstream 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.

Figure 13 Shrimptons Creek at Quarry Rd facing downstream

6.2 Results and Interpretation

Macroinvertebrates

SIGNAL SF

The average SIGNAL score for Autumn 2022 (3.6, Figure 14) was slightly higher than that of the previous season (3.4, Autumn 2021) and comparable to the historical average (3.9).

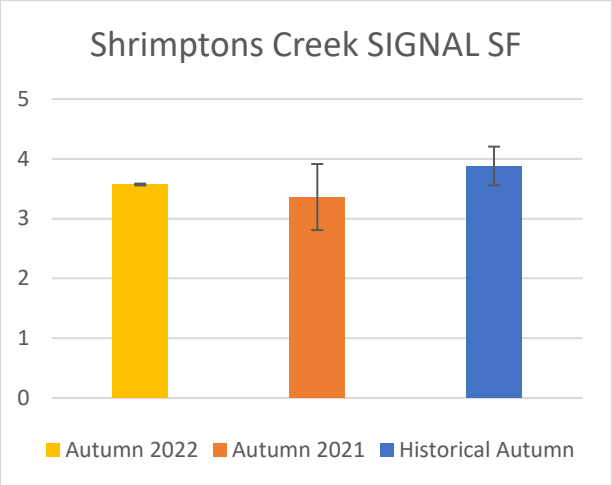

Figure 14 SIGNAL SF results for Shrimptons Creek

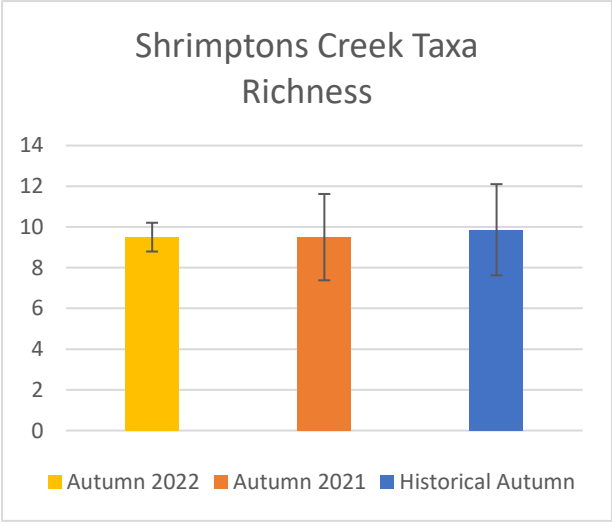

Figure 15 Taxa Richness results for Shrimptons Creek

Taxa richness

The taxa richness result for Autumn 2022 was the same as that for Autumn 2021 (9.5, Figure 15). Both were only slightly lower than the historical average for this site (9.9). Shrimptons Creek core site was dominated by Aquatic snails. Other prominent macroinvertebrate families included Dragonflies, Aquatic Annelids and Flatworms.

Macroinvertebrates summary

SIGNAL SF result for Autumn 2022 was slightly higher than Autumn 2021 and was consistent with the historical average

Taxa Richness results were consistent between recent seasons and when compared to historical data

Water Quality

CR1S (Core Site)

- For Autumn 2022, Shrimptons Creek had a dissolved oxygen result of 6.25 mg/L. This was comparable with the results of the previous season (4.78 mg/L, 2021) and the historical average.
- A turbidity result of 10.6 NTU was consistent with the average results observed at this site and far lower than the result of the previous autumn; highest recorded result of 367 NTU
- Conductivity result for this season was comparable to Autumn 2021; 498 and 478 µS/cm respectively and the historical average for this site (368 µS/cm).

- Total magnesium and Total calcium results were comparable to the previous season.
- Alkalinity result was slightly lower than the previous season at 88 and 104 mg CaCO3/L respectively, but comparable to the historical average (66.9 mg CaCO3/L).
- Autumn 2022 faecal coliform result was more than 10 times less than that observed during the previous season; ~1200 CFU/100 mL, as compared to ~22000 CFU/100 mL in 2021. Although remains slightly higher than ANZECC guideline threshold (1000 CFU/100mL).
- Total Nitrogen result was slightly higher than the previous season (940 and 800 µg/L respectively). Conversely, Total Phosphorus result for this season (63 µg/L) was lower than the previous (282 µg/L).
- pH result was consistent with results of the previous season and when compared with historical values.

CR1SA

- Dissolved oxygen result was consistent with previous results for this site.
- Conductivity result was slightly higher than the previous season
- Turbidity result for this season (8.66 NTU) were lower than that of Autumn 2021 (23.4 NTU).
- The Autumn 2022 faecal coliform result; ~780 CFU/100mL was far lower than the previous season (~12000 CFU/100mL) and within the ANZECC guidelines threshold limit.
- Total Nitrogen result was consistent with the previous season. Total Phosphorus for Autumn 2022 (35µg/L) was lower than Autumn 2021 (80µg/L).

CR1SB

- Dissolved oxygen result was consistent with previous seasons. Turbidity result was slightly lower for this season as compared to Autumn 2021.
- As with other Shrimptons Creek sites, conductivity was higher this season (569 µS/cm) when compared to Autumn 2021 (165.8 µS/cm).
- Alkalinity result was higher for this season (89 mg CaCO3/L) compared with Autumn 2021 (21 mg CaCO3/L).
- This season saw a substantial reduction in the faecal coliform concentration for this site. The current result of ~800 CFU/100mL was much lower than Autumn 2021 (~34000 CFU/100mL).
- Ammonia result was higher during the current season (60 NH3 -N µg/L) as compared to the previous (<10 NH3 -N µg/L). Total Nitrogen result was consistent with the previous season.
- Total Calcium (37.1 mg/L) and Total Magnesium (10.2 mg/L) results were comparable to those of the previous season; (Calcium – 23.5 mg/L, Magnesium – 8.62 mg/L).

CR1SC

- Dissolved oxygen and turbidity results were similar for Autumn 2022 and Autumn 2021 for this site.
- The conductivity result for this season (575 µS/cm) was higher than that of the previous season (234 µS/cm)

- Total Magnesium (10.8 mg/L) and Total Calcium (37.2 mg/L) were consistent with historical averages (13.05 mg/L) and 34.7 mg/L respectively).
- The faecal coliform result for this current season (~1200 CFU/100mL) was much lower than Autumn 2021 (~76000 CFU/100mL), following the trend of the other Shrimpton Creek sites.
- Total Nitrogen result was comparable between Autumn 2022 (1040 µg/L) and Autumn 2021 (1400 µg/L), while Total Phosphorous result for this season (35 µg/L) was lower than Autumn 2021 (119 µg/L).

Water quality summary

In general, results were consistent with historical results, conductivity results were slightly higher than Autumn 2021

Lower turbidity and faecal coliform results from previous season

7 Archers Creek

7.1 Site Profile

CR2A Archers Creek (core site)

This site is located in Maze Park, West Ryde and is upstream of the Victoria Rd crossing (Figure 17). 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, Figure 18). The vegetation within and around the creek is a mix of native and introduced species.

Figure 16 Archers Creek Catchment Area

Figure 17 Archers Creek looking downstream

Figure 18 Archers Creek looking upstream

7.2 Results and Interpretation

Macroinvertebrates

SIGNAL SF

The SIGNAL SF score for Archers Creek was 4.3 which was higher than the average result for Autumn 2021 (3.9) and comparable to the historical average for this site (Figure 19).

Taxa richness

The average Taxa Richness result for Archers Creek for Autumn 2022 was 11.5 (Figure 20) which was lower than both the result from the previous season (13.0, Autumn 2021) and the historical average for this site (14.7). Families of the True Flies order dominated this site.

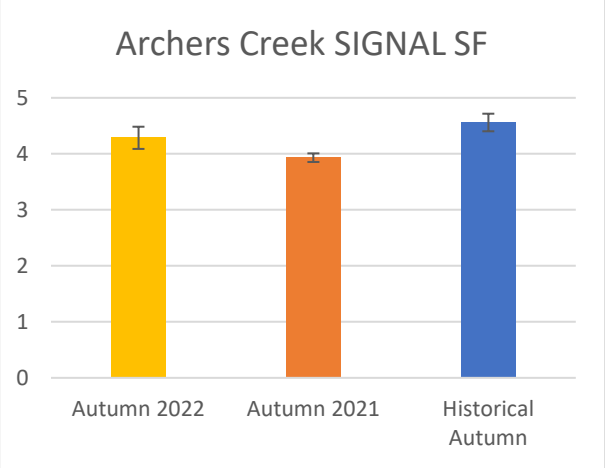

Figure 19 Archers Creek SIGNAL SF

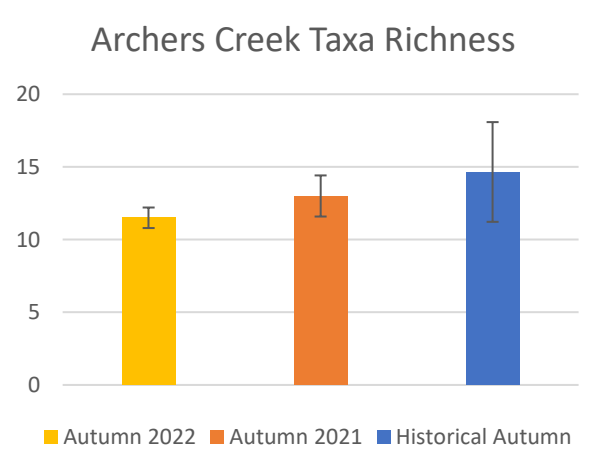

Figure 20 Archers Creek Taxa Richness

Macroinvertebrates summary

SIGNAL SF result for Autumn 2022 was higher than the previous season

Taxa Richness result was lower than the previous season and the historical average

Water Quality

CR2A (Core Site)

- The dissolved oxygen result for Autumn 2022 (8.88 mg/L) was consistent with the previous season and slightly higher than the historical average (6.1 mg/L)
- Autumn 2022 had a higher conductivity result (502 µS/cm) as compared with Autumn 2021 (391 µS/cm) but was still within recommended ANZECC guidelines (125-2500 µS/cm).
- The faecal coliform concentration value declined from 2900 CFU/100mL in Autumn 2021 to ~770 CFU/100mL in Autumn 2022.
- The Total Nitrogen result for this season (1970 µg/L) was higher than Autumn 2021 (930 µg/L). The Total Phosphorus result was consistent between both seasons (28 µg/L and 21µg/L).
- Total Magnesium and Total Calcium results were consistent with the previous season and the historical average for both parameters.
- Turbidity and pH results were similar between seasons and comparable to historical averages.

Water quality summary

In general, results were consistent with previous Autumn and historical averages

Faecal coliform concentrations reduced from the previous Autumn season

8 Terrys Creek

8.1 Site Profiles

CR3T Terrys Creek (core site)

This site is located within Somerset Park under the M2 overpass in the suburb of Epping (Figure 21). 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.

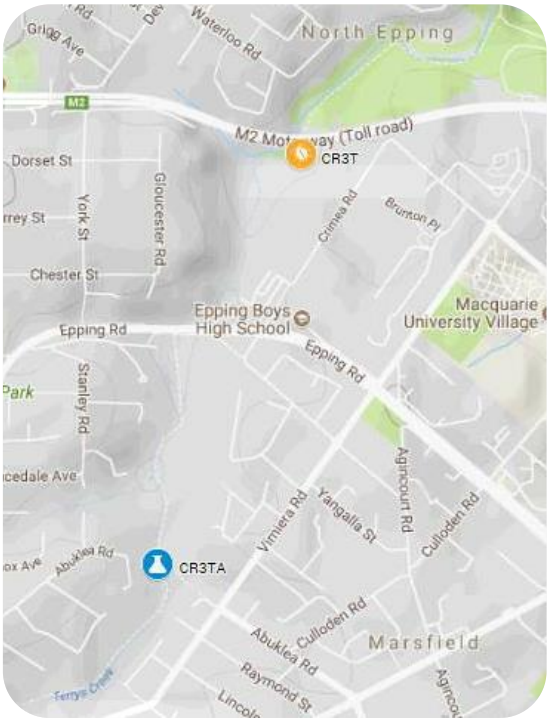

Figure 21 Terrys Creek Catchment Area

CR3TA 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.

Figure 22 Terrys Creek (core site) looking downstream

Figure 23 Terrys Creek (core site) looking upstream

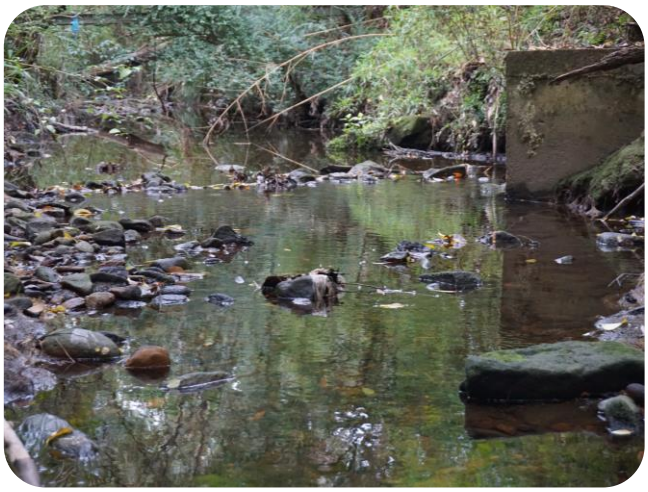

Figure 24 Terrys Creek at Foresters Park facing upstream

8.2 Results and Interpretation

Macroinvertebrates

SIGNAL SF

The SIGNAL SF score for Terrys Creek in Autumn 2022 (4.0, Figure 25) was comparable to the historical average for this site (4.2) and higher than that of the previous season (3.4, Autumn 2021).

Taxa richness

The Autumn 2022 taxa richness score for this site was comparable Autumn 2021: scores of 10.0 and 11.0 respectively (Figure 26). The score for Autumn 2022 was lower than the historical seasonal average for this site. Aquatic snail, Dragonfly and Flatworm families dominated at this site.

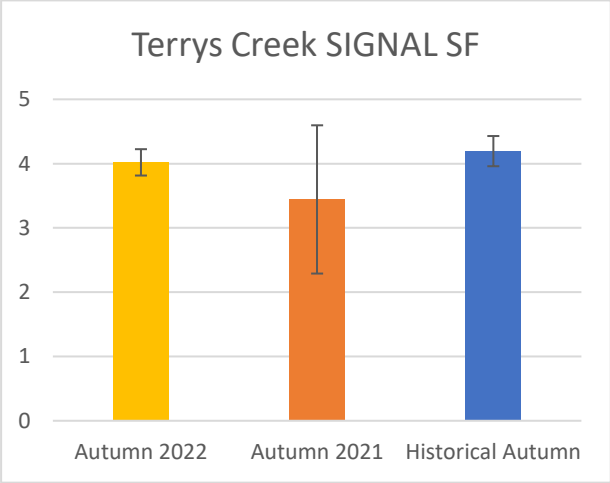

Figure 25 Terrys Creek SIGNAL SF

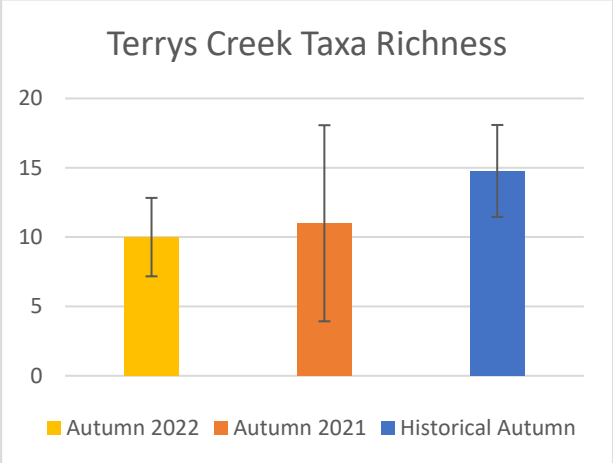

Figure 26 Terrys Creek Taxa Richness

Macroinvertebrates summary

SIGNAL SF score was consistent with historical results and Autumn 2021

Taxa Richness value was comparable to the previous Autumn and the historical dataset for this site

Water Quality

CR3T (Core Site)

- Current dissolved oxygen result was comparable with the previous Autumn; 8.64 mg/L and 7.01 mg/L respectively.
- An observed conductivity value of 482 µS/cm was comparable with historical seasonal data for this site (417 µS/cm).
- Faecal coliform concentration rose from ~700 CFU/100mL in Autumn 2021 to ~930 CFU/100mL in Autumn 2022, although the value was still within ANZECC guidelines (1000 CFU/100mL).
- Turbidity and pH values for Autumn 2022 were consistent with the previous season as well as historical values.
- Alkalinity result was comparable between Autumn 2022 (91 mg CaCO3/L) and Autumn 2021 (83 mg CaCO3/L) although higher than the historical average (65.4 mg CaCO3/L).
- Nutrient results (Total Nitrogen and Total Phosphorous) were consistent between Autumn 2022 and Autumn 2021 and historical averages for this site.

CR3TA

- Dissolved oxygen results were consistent between Autumn 2022 and Autumn 2021 seasons (8.09 mg/L and 8.6 4mg/L) and were within the range of historical data.
- Turbidity result for this season (6.43 NTU) was lower than those reported during Autumn 2021 (25.1 NTU).
- Conductivity declined from 702 µS/cm (2021) to 591 µS/cm (2022) but was still comparable to the historical average.
- Strong decline in faecal coliform concentration from ~11000 CFU/100mL (Autumn, 2021) to within ANZECC threshold at ~130 CFU/100mL this season.
- Alkalinity and pH values were consistent between seasons and historical averages.
- Total Nitrogen values were similar between the two seasons: Autumn 2022 (1030 µg/L) and Autumn 2021 (1100 µg/L).
- Total Phosphorous result fell from 97 µg/L (2021) to 41 µg/L (2022) and was lower than the historical average for this site (75 µg/L).

Water quality summary

Chemical parameter results were consistent between sampling seasons and historical averages

Slight increase in faecal coliforms at core site (CR3T)

Coliform counts declined at site CR3TA from Autumn 2021 to Autumn 2022

9 Buffalo Creek

9.1 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.

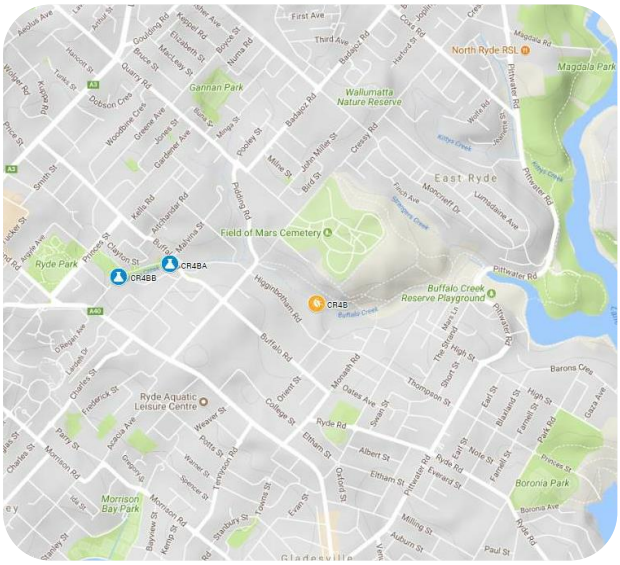

Figure 27 Terrys Creek Catchment Area

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 28 Buffalo Creek core site looking downstream

Figure 29 Buffalo Creek core site looking 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 30 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 Road 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.

Figure 31 Buffalo Creek Upstream of Burrows Park

9.2 Results and Interpretation

Macroinvertebrates

SIGNAL SF

The SIGNAL SF score for Autumn 2022 was 4.14 (Figure 32). This was similar to the results of the previous season (4.18, Autumn 2021) and the historical average for this site (4.1).

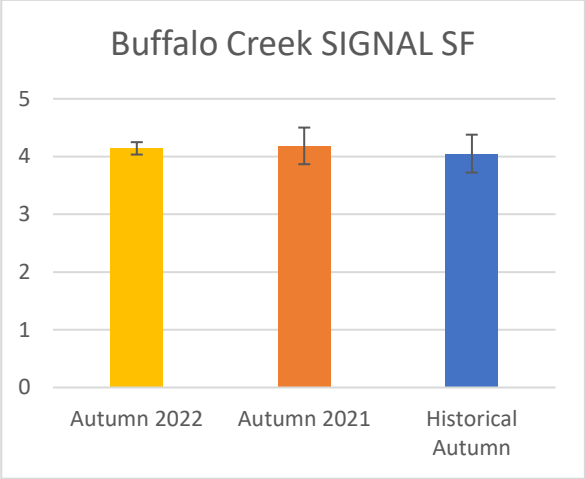

Figure 32 Buffalo Creek SIGNAL SF

Taxa richness

The average Taxa richness result declined from 13.5 in Autumn 2021 to 11.0 in the current season (Figure 33). This was lower than the historical average of 13.9 for this site. Aquatic snail and Dragonfly families dominated the site this season.

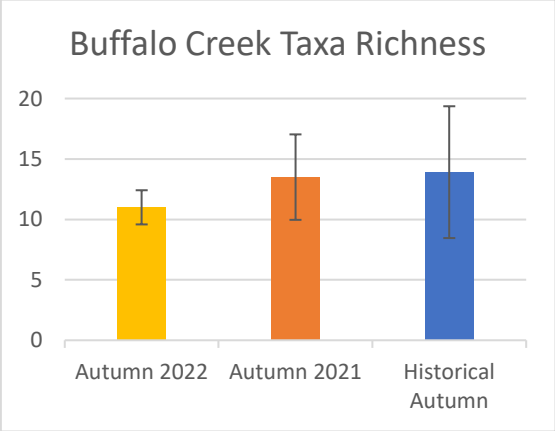

Figure 33 Buffalo Creek Taxa Richness

Macroinvertebrates summary

SIGNAL SF results were consistent between seasons

Taxa Richness Autumn 2022 result was lower than that of the previous season and when compared with historical averages

Water Quality

CR4B (Core Site)

- Dissolved oxygen and turbidity results were comparable between Autumn 2021, Autumn 2022 and historical averages.
- Conductivity results were similar between the sampling seasons; 584 µS/cm (Autumn 2022) and 579 µS/cm (Autumn 2021).
- Total Hardness result for this site in Autumn 2022 (160 mg CaCO3/L) was higher than that of the previous Autumn (120 mg CaCO3/L, 2021)
- Faecal coliform result was higher in Autumn 2022 (~1100 CFU/100mL) as compared with the previous Autumn (~670 CFU/100mL).
- Total Phosphorous result declined from 194 µg/L at Autumn 2021 to 42 µg/L in 2022.

CR4BA

- Dissolved oxygen, Turbidity and Conductivity results were comparable between the two seasons.

- Total Nitrogen results were comparable for both seasons, however Total Phosphorous was lower in 2022 (46 µg/L) compared to Autumn 2021 (90 µg/L).
- Faecal coliform concentration declined at this site from 5800 CFU/100mL in Autumn 2021 to 2900 CFU/100mL in Autumn 2022.
- Alkalinity results were comparable between both seasons and when compared to the historical average of 92.5 mg CaCO3/L.

CR4BB

- Dissolved oxygen values for both seasons were consistent with the historical average for this site (8.1 mg/L), as were the Turbidity results (10.6 NTU, historical average).
- Conductivity result from Autumn 2022 (573 µS/cm) was similar to Autumn 2021 (522 µS/cm).
- Faecal coliform result for Autumn 2022 (~11000 CFU/100mL) was higher than that of Autumn 2021 (~8700 CFU/100mL).
- Total Calcium result for Autumn 2022 (37.2 mg/L) was similar to Autumn 2021 (30.5 mg/L), as was the case with Total Magnesium (11.1 mg/L and 8.65 mg/L, respectively)

Water quality summary

Dissolved oxygen, turbidity and conductivity values were comparable between current and previous seasons

Coliform concentration results at sites CR4B and CR4BB increased slightly in Autumn 2022. Conversely, the result at CR4BA result was lower for this season

10 Porters Creek

10.1 Site Profiles

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

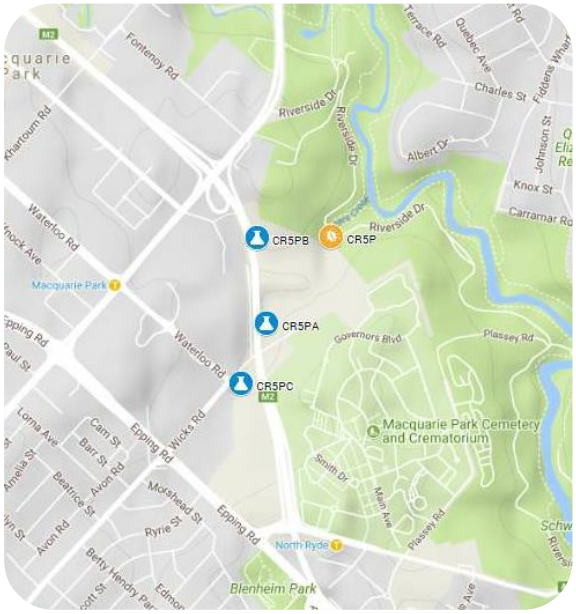

Figure 34 Porters Creek Catchment Area

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 35 Porters Creek Core Site looking downstream

Figure 36 Porters Creek Core Site looking upstream

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.

Figure 37 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.

Figure 38 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 39 Porters Creek @ Wicks Road

10.2 Results and Interpretation

Macroinvertebrates

SIGNAL SF

Porters Creek SIGNAL SF score for Autumn 2022 was 4.3 (Figure 40). This was similar to the result of the previous season (4.24) as well as the historical average for this site of 4.4

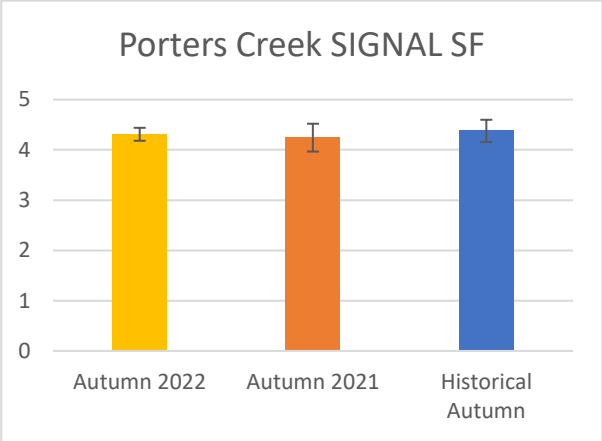

Figure 40 Porters Creek SIGNAL SF

Taxa richness

Porters Creek Taxa Richness result for Autumn 2022 was 9.5 (Figure 41). This was lower than both the result from the previous season (16.0, Autumn 2021) and the historical Autumn average (13.8). During Autumn 2022, the macroinvertebrate families that dominated this site included the True Flies, Aquatic snails, and Dragonflies.

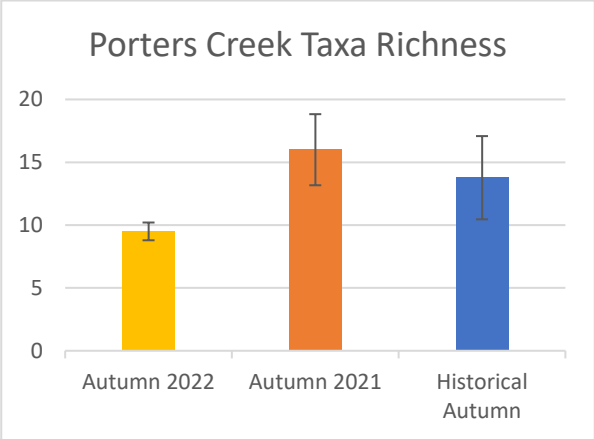

Figure 41 Porters Creek Taxa Richness

Macroinvertebrates summary

SIGNAL SF result for Autumn 2022 was similar to Autumn 2021 and the historical average for this site

Taxa Richness value for Autumn 2022 was lower than both the previous season and the historical average

Water Quality

CR5P (Core Site)

- Dissolved oxygen result for Autumn 2022 (7.77 mg/L) was comparable to Autumn 2021 (8.43 mg/L).
- Turbidity result was much lower in Autumn 2022 (16.4 NTU) compared to Autumn 2021 (79.1 NTU). Conversely, Conductivity was higher in the current season (746 µS/cm) when compared to the previous (311 µS/cm).
- The faecal coliform concentration result for Autumn 2022 was 2600 CFU/100mL which was far lower than the result of the previous season (~100000 CFU/100mL).
- Autumn 2022 had a higher Alkalinity result (215 mg CaCO3/L) compared to Autumn 2021 (73 mg CaCO3/L).

CR5PA

- The Autumn 2022 dissolved oxygen result was 3.05 mg/L which was comparable to the Autumn 2021 result of 6.64 mg/L.

- Autumn 2022 turbidity result (13.6 NTU) was similar to Autumn 2021 (15.5 NTU).
- The conductivity result for the current season (890 µS/cm) was lower than that of Autumn 2021 (1149 µS/cm).
- The Autumn 2022 faecal coliform result was higher than the previous Autumn; (~220 CFU/100mL and 30 CFU/100mL) although still within the ANZECC guideline threshold.

CR5PB

- Dissolved oxygen results were similar for this current season (8.14 mg/L) and the previous (7.74 mg/L, 2021).
- Turbidity value was slightly lower during this season (1.23 NTU) when compared with the Autumn 2021 result (5.59 NTU).
- Conductivity results from Autumn 2022 and Autumn 2021 were similar; 373 µS/cm and 385 µS/cm, respectively.
- Autumn 2022 faecal coliform concentration result was ~170 CFU/100mL which was less than half the concentration observed during Autumn 2021 sampling (320 CFU/100mL).
- Total Nitrogen result for Autumn 2022 (410 µg/L) was lower than the previous season (610 µg/L). Total Phosphorus results were similar across both seasons; 26 µg/L and 36 µg/L, respectively.

CR5PC

- Turbidity result for this season (2.69 NTU) was lower than Autumn 2021 (33.9 NTU).
- Autumn 2022 conductivity result increased from 116.3 µS/cm in Autumn 2021 to 492 µS/cm in Autumn 2022.
- Faecal coliform concentration declined at this site from ~80000 CFU/100mL in Autumn 2021 to 5500 CFU/100mL in Autumn 2022.
- The current Total Nitrogen result was 1120 µg/L which was a decline from 2300 µg/L in Autumn 2021. The Autumn 2022 Total Phosphorous result (54 µg/L) was less than half the result of Autumn 2021 (136 µg/L).
- Total Calcium result was higher during Autumn 2022 (43.2)

Water quality summary

In general, water quality trends for Autumn 2022 and Autumn 2021 were similar.

Faecal coliform concentration trends fluctuated between seasons; most sites had lower results compared to Autumn 2021 aside from site CR5PA

11 Conclusion

11.1 Macroinvertebrates

For each of the five core sites, SIGNAL SF and Taxa Richness data were used to observe trends in Macroinvertebrate community assemblages. The highest SIGNAL SF score was seen at Porters Creek site (CR5P), as was the case with the previous season (Autumn 2021). This site, located within the Lane Cove National Park has a diversity of native vegetation and a creek substrate of bedrock, cobbles, boulders and sand. Complexity in creek structure and vegetation can provide essential habitat for Macroinvertebrate species. Shrimptons Creek had the lowest SIGNAL SF score, this was consistent with previous trends. This site is in the Wilga Park area close to residential and commercial activities. The proximity of the sampling site to industry and the less complex environment of the creek (mainly bedrock and silt) may explain this lower score.

In Autumn 2022 there was a trend of decline in Taxa Richness across each of the five core sites from the scores of the previous season. However, the Shrimptons Creek Taxa Richness result was the same. A decline in scores may be the result of the influence of sustained rainfall during the period of sampling. Flushing events in the narrow creek channels can impact communities by damaging habitat, reducing refuges for Macroinvertebrates. For this season, Archers Creek had the highest Richness score (11.5) which was slightly lower than the previous season (13.0). This season saw a lower diversity among Dragonfly and Trichopteran families. The Taxa Richness score at Porters Creek fell from 16.0 (Autumn 2021) to 9.5. This current season saw a reduced presence of Dragonfly and True Bug families at the site.

11.2 Water Quality

Water quality data for the current season was collected through field measurements and laboratory analysis. The most significant trend observed during this season was that most sites saw a sharp decline in turbidity and faecal coliform counts when compared to Autumn 2021 data. Prior to Autumn 2021 sampling, an extreme weather event brought heavy rain and significant localised flooding influencing these higher results. Although the current season has also experience sustained rainfall, it was not at such a high and concentrated volume as Autumn 2021.

The four Porters Creek sites often had both the highest and lowest values for several chemical parameters. For example, the Porters Creek site CR5PA had the lowest dissolved oxygen result as well as the highest conductivity and metals (Calcium and Magnesium) results. This site is in the SUEZ Ryde Resource Recovery Centre. The low-flow and ponded conditions may account for this. In contrast, Porters Creek site CR5PB had the lowest Total Magnesium and low coliform results. This site is at the convergence of several stormwater lines and experiences low flow. Terrys Creek site (CR3TA) had the lowest coliform results for this season. This site is a complex creek environment bordered by dense vegetation. Adjacent vegetation can often act as a physical barrier to creek environments, reducing the impact of contaminants.

12 Recommendations

- At each of the established sampling sites, continue to monitor:
    - i) Macroinvertebrate communities (SIGNAL SF and Taxa Richness indices)
    - ii) Chemical water quality parameters
    - iii) Riparian condition
- Continue Gross Pollutant Trap maintenance and rubbish removal
- Consider collecting pre-and post-work water quality data on any Council projects that aim to improve water quality

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.
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.

Item	Meaning
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)