Biodiversity and Conservation Science

Swan Canning Catchment data report

January – December 2019

Technical Report prepared by the Department of Biodiversity, Conservation and Attractions (DBCA) Rivers and Estuaries Science Branch.

March 2022

GOVERNMENT OF WESTERN AUSTRALIA

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Preface

The Swan Canning Water Quality Monitoring Project consists of long-term routine monitoring of the Swan Canning Estuary and selected tributaries within its catchments. This has allowed for the regular reporting on water quality and the annual reporting on estuarine and catchment compliance against short and long-term management targets and/or the ANZECC guidelines for estuaries and lowland rivers.

The Project was initially designed in 1994 by the Swan River Trust and Waters and Rivers Commission (now Department of Biodiversity, Conservation and Attractions (DBCA) and Department of Water and Environment Regulation (DWER), respectively). The project currently falls under DBCA's River Protection Strategy with management transitioning in July 2019 from being jointly managed by the Aquatic Science Branch, DWER and Rivers and Estuaries Science Branch, DBCA to being managed solely by the Rivers and Estuaries Science Branch, DBCA.

Data from the monitoring program is captured in the DWER WIN database under the project codes SG-C-SWANCATCH (SWANCATCH) and SG-C-SCWQIP (SCWQIP). The catchment monitoring consists of the alternating fortnightly sampling of sixteen sites for SWANCATCH and seventeen sites for SCWQIP.

Listed below are some important historic changes to the SWANCATCH and SCWQIP projects:

- From 1 July 2019, the Swan Canning Water Quality Monitoring Project has been conducted by DBCA.
- In the 2019 Swan Canning Catchment Data Report, ANZECC trigger values for lowland rivers have been included in the plots for Total nitrogen (TN), Total oxidised nitrogen (NO_x-N), Total Phosphorous (TP) and Filterable Reactive Phosphorous (FRP).
- From September 2016, a new site was added to the SCWQIP project on Mount's Bay Main Drain at the Perth Convention Centre car park (CCDRMBRD).
- In August 2016, sampling of the Perth Airport South drain was switched from SCCIS11 to KANAV, after a period of sampling both sites (from June 2016), due to piping of the drain at the original site (SCCIS11).
- From April 2012 onwards, the SCWQIP sites list was modified and now consists of 16 sites (down from 17); four of which are new sites selected after a period of expanded monitoring where 36 sites were monitored for nine months (Aug 2011 to March 2012).
- In August 2011, the Wandoo Creek catchment site was moved downstream to WNDCK as the former site, SCCIN4, was almost always dry, even in winter.
- In May 2011, South Belmont Main Drain site moved ~100 m upstream from SWS11 (Great Eastern Hwy) to SWS13 (Severin Walk, Abernathy Rd) due to tidal influence at the old site (SWS11). The gauging station has also been moved (~750 m upstream to Cleaver Terrace).
- In April 2011, SCWQIP Claise Brook site moved from SCCIN5 to CB13.

- In March 2010, the Swan Canning Water Quality Improvement Plan (SCWQIP) monitoring project commenced to address gaps in previous monitoring (SWANCATCH) and to provide data for predictive modelling of the Swan Canning Catchment.
- In October 2006, an extra Ellen Brook site (EBAC) was added to routine sampling near the confluence with Swan River. Sampling was ceased in March 2009 due to site access issues. Site location changed to West Swan Road Bridge (SWN9) and sampling recommenced in March 2010.
- In October 2006, the Canning River site was moved ~500 m downstream from McKenzie Grove to Seaforth for better site access and to align with location of gauging station.
- In October 2006, the parameters dissolved organic nitrogen and total organic carbon were added to routine monitoring, however total organic carbon was only sampled to July 2008.
- In September 2006, the parameters dissolved oxygen and pH were added to routine monitoring as the water quality sonde was changed from a WTW to Quanta.
- In October 2001, Specific Conductivity (compensated at 25°C) was changed to uncompensated conductivity and back to Specific conductivity in September 2006.
- In 2001, the monitoring frequency was changed from weekly to fortnightly.

Table 1. SWANCATCH and SCWQIP catchment site coordinates. SWANCATH sites are identified by SWN and SWS site codes.

Swan-Canning Sub catchment	Site	Site Code	Latitude	Longitude	Flow Status
Avon River (Millendon)	Swan River, Upper Swan Bridge, Great Northern Highway	**SWN5**	-31.781685	116.022904	Continuous
Bannister Creek	Bannister Creek, Hybanthus Rd, Ferndale	**SWS2**	-32.038306	115.917321	Continuous
Bayswater Main Drain	Bayswater Main Drain, Slade St, Bayswater	**SWS10**	-31.924246	115.921949	Continuous
Bennett Brook	Bennett Brook, Brook Rd, Whiteman	**SWN12**	-31.877703	115.959526	Continuous
Bickley Brook	Bickley Brook Main Drain, Austin Ave, Kenwick	**SWS4**	-32.043205	115.976086	Ephemeral
Blackadder Creek	Blackadder Creek, Francis Street, Midland	**SWN8**	-31.876150	116.017298	Ephemeral
Bull Creek	Holmes St, Shelley	**SCCIS2**	-32.029429	115.888092	Continuous
Bull Creek	Beatrice Ave Main Drain, Shelley	**BAMDKD**	-32.035010	115.883725	Continuous
Upper Canning River	Canning River, Seaforth, Gosnells	**SWS12**	-32.092305	116.016772	Continuous
Claise Brook Main Drain	Claise Brook Fountain Lake Bridge	**CB13**	-31.952561	115.876925	Ephemeral
Ellen Brook	Ellen Brook, Almeria Pde, Upper Swan	**SWN3**	-31.751071	116.024830	Ephemeral
Ellen Brook Bridge	Ellen Brook Bridge, West Swan Road, Upper Swan	**SWN9**	-31.789477	116.003947	Ephemeral
Ellis Brook	Ellis Brook, Mills St, Maddington	**EBGS01**	-32.066042	116.001554	Ephemeral
Helena River	Helena River, Whiteman Rd, Midland	**SWN10**	-31.900081	116.007611	Ephemeral
Helm Street Drain	Helm St Drain, Maddington	**SCCIS4**	-32.056492	115.996684	Ephemeral
Henley Brook	Henley Brook, Brockman St, Millendon	**HBBROCK**	-31.804066	116.003019	Ephemeral
Jane Brook	Jane Brook, Sweeting Bridge, Great Northern Highway, Middle Swan	**SWN7**	-31.862701	116.013985	Ephemeral
Lower Canning	Cockram St Drain, Grose Av, Cannington	**SCCIS3**	-32.016435	115.942555	Continuous
Maylands	Maylands/Inglewood Main Drain	**MIMDOUT**	-31.936890	115.891175	Continuous
Mills Street Main Drain	Mills St Main Drain, Palm Place, Cannington	**SWS1**	-32.016546	115.919366	Continuous
Perth Airport North Drain	Limestone Creek, Great Eastern Hwy Bypass	**SCCIS12**	-31.920049	115.961796	Continuous
Perth Airport South Drain	Perth Airport Drain, Kanowna Ave, Ascot	**KANAV**	-31.931225	115.940908	Continuous
Saint Leonards Creek	George St access, West Swan	**SCCIN3**	-31.837107	115.997803	Ephemeral
South Belmont Main Drain	South Belmont Main Drain, Severin Walk, Abernathy Road, Belmont	**SWS13**	-31.949031	115.919732	Continuous
South Perth	Galway Rd, Manning	**SCCIS1**	-32.017333	115.883103	Continuous
South Perth	Wilson Main Drain	**WIFRD**	-32.020262	115.915023	Continuous
Southern River	Southern River, Anaconda Drive, Huntingdale	**SWS7**	-32.078355	115.978799	Continuous
Southern River	Neerigen Brook, Armadale	**AW05**	-32.152688	116.002540	Ephemeral

Susannah Brook	Susannah Brook, River Rd, Millendon	**SWN11**	-31.817712	116.014051	Ephemeral
Upper Swan	Chapman St drain, Ashfield	**CSMDREID**	-31.914643	115.949454	Continuous
Wandoo Creek	Wandoo Creek, West Swan	**WNDCK**	-31.848024	115.992263	Ephemeral
Yule Brook	Yule Brook, Brixton St, Beckenham	**SWS3**	-32.025406	115.967146	Ephemeral
Mount's Bay Main Drain	Perth Convention Centre car park (bay #1237), CBD	**CCDRMBRD**	-31.955570	115.851251	Continuous

Figure 1. The distribution of routine SWANCATCH and SCWQIP monitoring sites within the sub catchments of the Swan Canning Estuary.

Table 2. The Swan Canning catchment monitoring regime.

Parameter measured	**Swan Canning catchment sites**
Temporal pattern	All year, when flowing
Number of sites	SWANCATCH x 16, SCWQIP x 17
Spatial pattern	Fixed
Sampling frequency	Fortnightly
Total suspended solids (TSS)	Grab sample
Total nitrogen and phosphorus (TN & TP)	Grab sample
Filterable reactive phosphorus, nitrogen as ammonia, total oxidised nitrogen& dissolved organic nitrogen(FRP, NH_3-N, NO_x-N, DOrgN)	Grab sample (filtered)
Dissolved organic carbon(DOC)	Grab sample (filtered)
YSI pro DSS (dissolved oxygen, pH, temperature & Specific Conductivity)	In-situ
Field Observations (flow, weather, water Appearance and stage height at gauged sites)	All sites

Summary

The annual Swan Canning catchment data report presents the 2019 data collected from the thirty-three sites that comprise the SWANCATCH and SCWQIP catchment monitoring projects. For each site data for the following ten key analytes are presented:

- Total nitrogen (TN)
- Ammoniacal nitrogen (NH_3-N)
- Total oxidised nitrogen (NO_x-N)
- Dissolved organic nitrogen (DOrgN)
- Total phosphorus (TP)
- Filterable reactive phosphorus (FRP)
- Dissolved organic carbon (DOC)
- Total suspended solids (TSS)
- Dissolved oxygen (DO)
- Specific Conductivity

At each site, the data for these analytes are presented showing the previous five years data as monthly box plots overlain with the current year's monthly medians.

Exceptions to this approach were:

- the historical data for SCWQIP site CCDRMBD (Mount's Bay Main Drain) which is presented over the previous three years as monitoring of this site commenced in 2016; and
- no data for SWANCATCH site WNDCK was collected in 2019 due to restricted access. Boxplots of the previous five year's data are provided.

The available ANZECC trigger values for lowland rivers for TN (1.2 mg/L), NO_x-N (0.15 mg/L), TP (0.065 mg/L) and FRP (0.04 µg/L) have been incorporated on the respective plots for each site. Catchment water quality targets for total nitrogen (short term 2mg/L; long term 1mg/L) and total phosphorus (short term 0.2mg/L; long term 0.1mg/L) that were established as part of the Swan Canning Cleanup Program are not shown on these plots as compliance against these targets is discerned from a three year dataset and included in reporting against the Swan Canning River Protection Strategy.

Data are presented in monthly boxplots that display the median, 25th, 75th, 10th and 90th percentiles where adequate data exists. Background data for this report was collected between the 1 January 2014 and 31 December 2018. Data for the current reporting period was collected between 1 January and 31 December 2019.

The number of monitoring events comprising the background data (n) have been detailed on each graph and are dictated by the fortnightly monitoring frequency and the ephemeral nature of certain sites during the warmer, drier months of the year. Where data fell below the limit of reporting (LOR), the value of the LOR was halved to allow the data to be analysed and displayed graphically.

The 2019 water quality data for each site is tabulated in each section to display the monthly minimum, maximum and median values along with the number of monitoring

events (n). The monthly medians and standard deviations for each site are also tabulated in a comparison table (Table 37) toward the end of the report.

Total annual rainfall for 2019 for the Greater Perth region was below average and the lowest since 2010, largely due to a dry autumn and spring. The annual mean maximum temperature was above average, with the Greater Perth region recording one of its warmest years on record (Bureau of Meteorology annual weather summary 2019).

1. Avon River (SWN5)

SWN5 total nitrogen (TN)

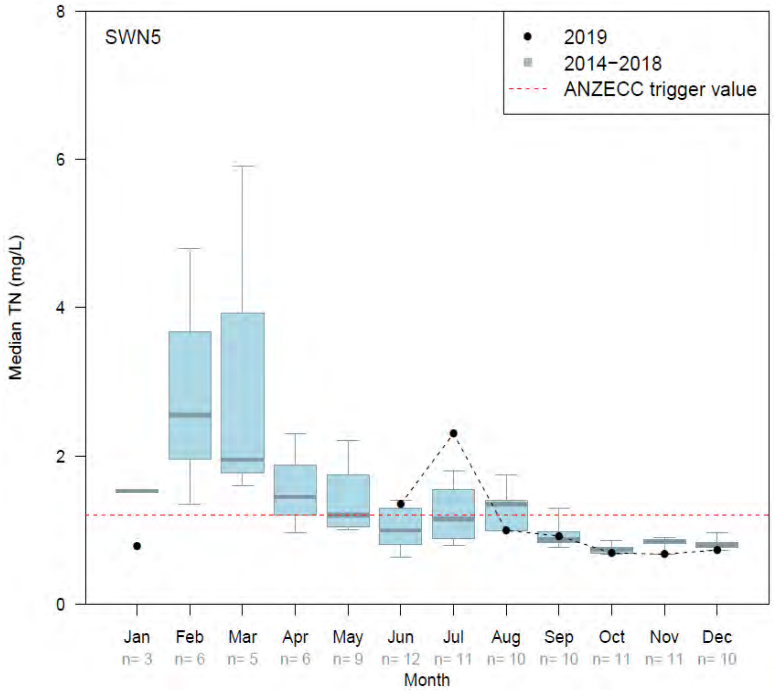

Figure 2. Monthly median total nitrogen (TN) concentrations (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN5. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

SWN5 ammoniacal nitrogen (NH_3-N)

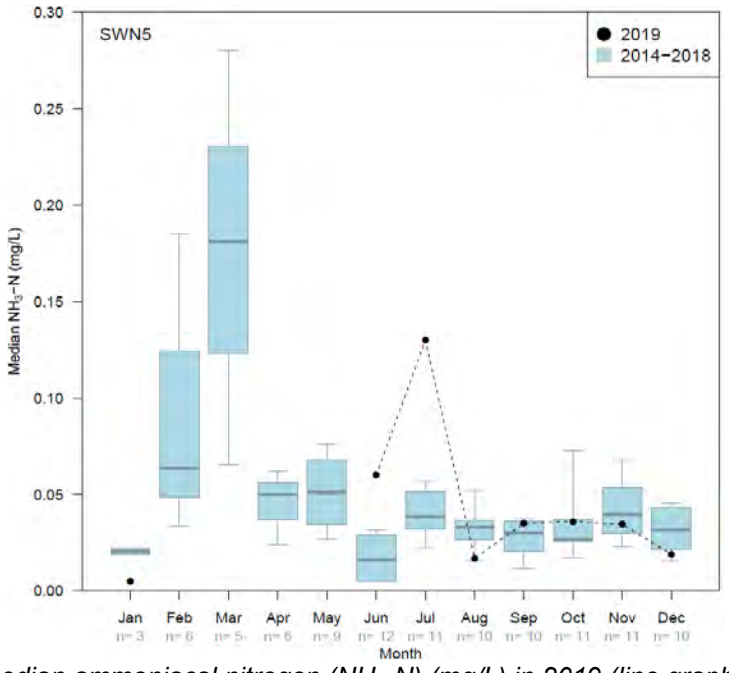

Figure 3. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN5. Number of samples (n) is provided for the historical data.

SWN5 total oxidised nitrogen (NO_x-N)

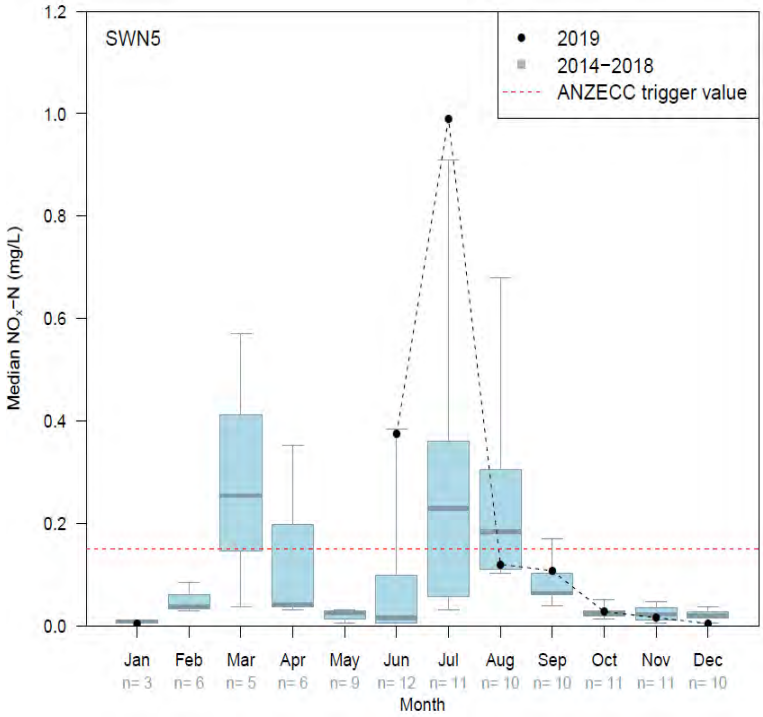

Figure 4. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN5. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

SWN5 dissolved organic nitrogen (DOrgN)

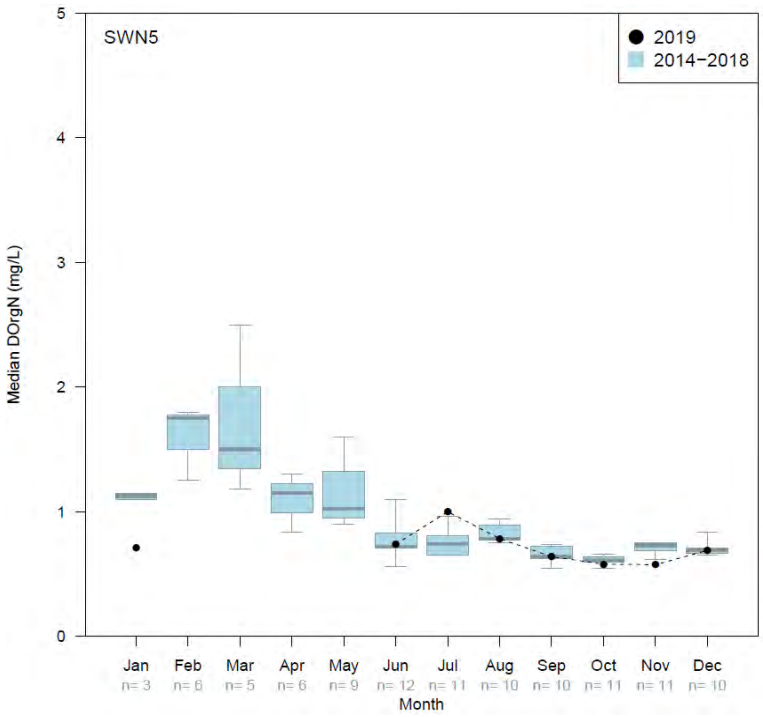

Figure 5. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN5 (Avon River). Number of samples (n) is provided for the historical data.

SWN5 total phosphorus (TP)

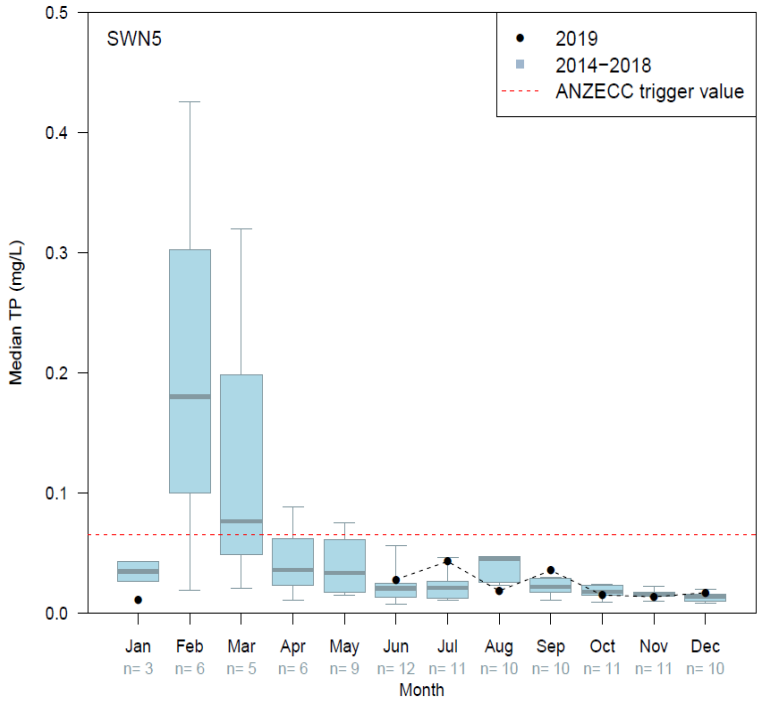

Figure 6. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN5. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

SWN5 filterable reactive phosphorus (FRP)

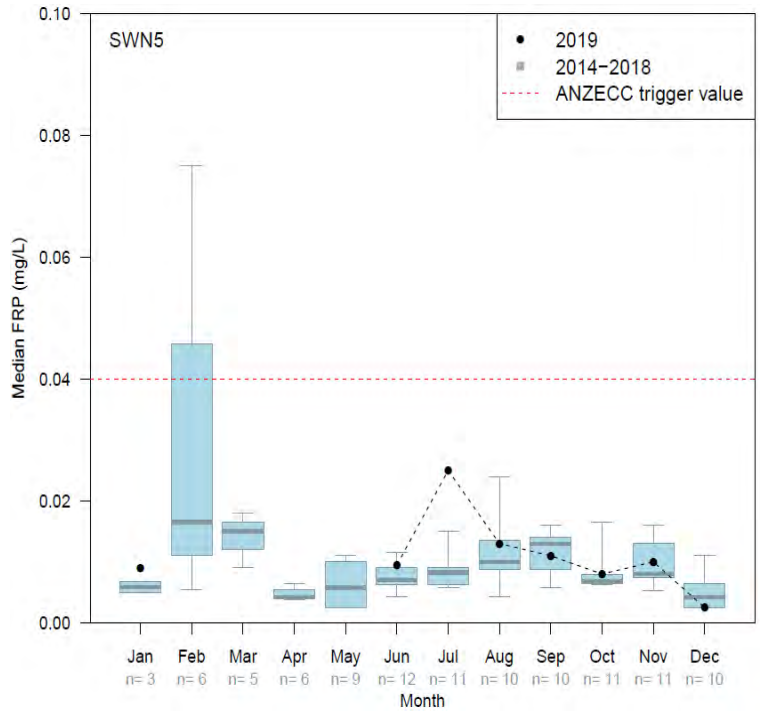

Figure 7. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN5. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

SWN5 dissolved organic carbon (DOC)

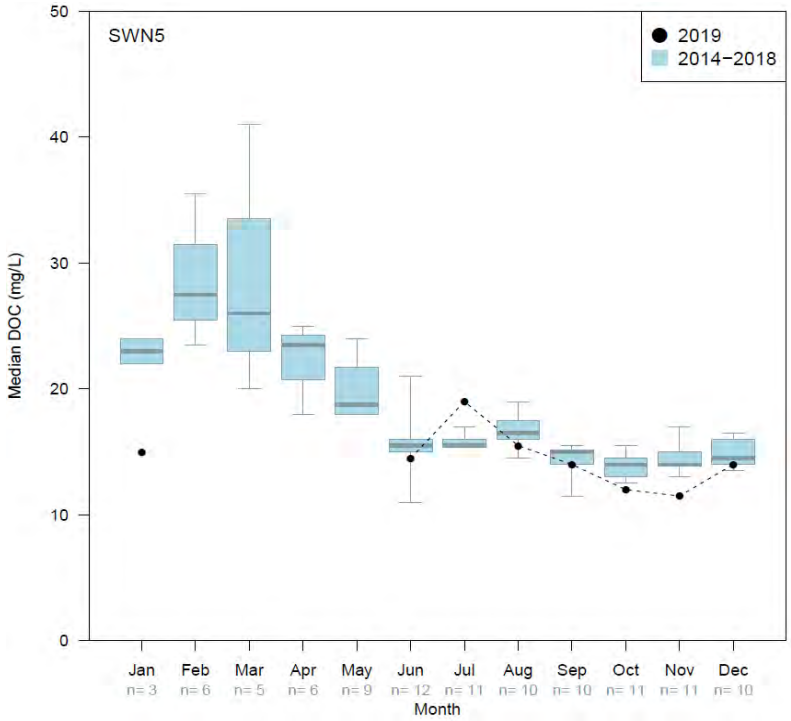

Figure 8. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN5. Number of samples (n) is provided for the historical data.

SWN5 total suspended solids (TSS)

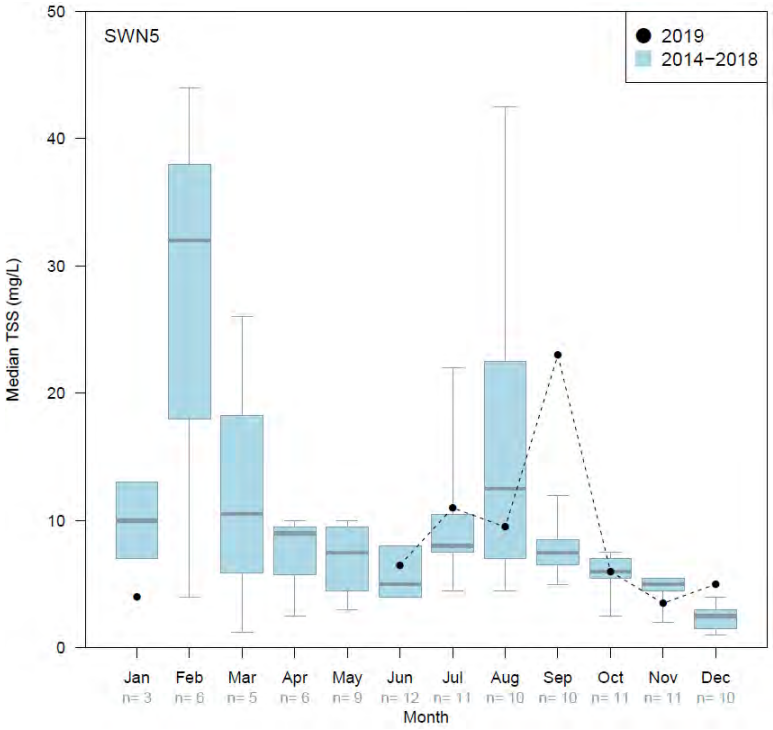

Figure 9. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN5. Number of samples (n) is provided for the historical data.

SWN5 dissolved oxygen (DO)

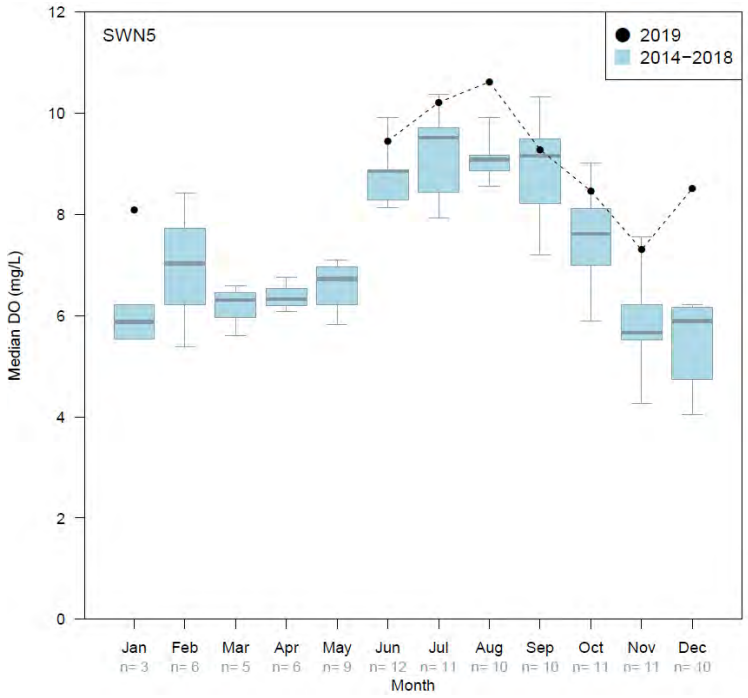

Figure 10. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN5. Number of samples (n) is provided for the historical data.

SWN5 specific conductivity (Sp. cond)

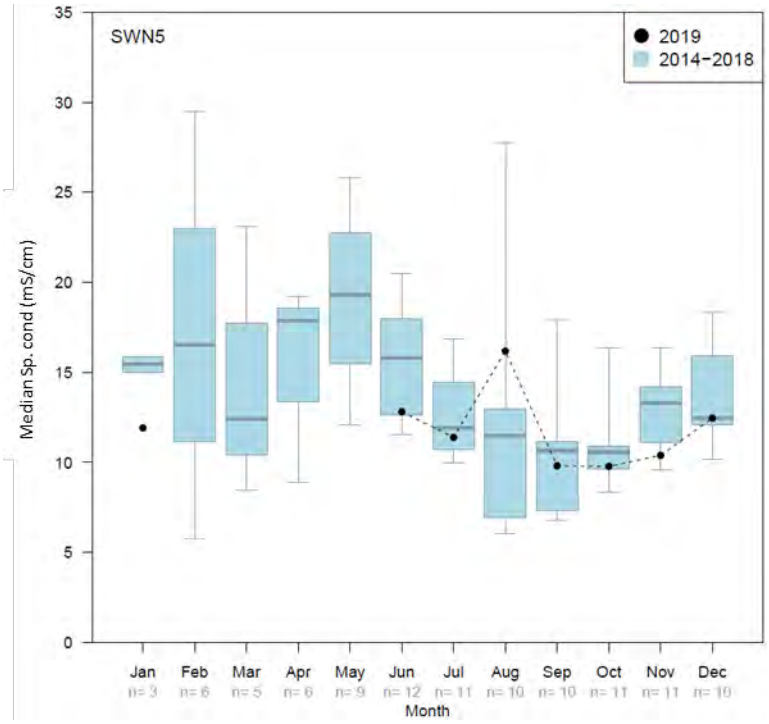

Figure 11. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN5 (Avon River). Number of samples (n) is provided for the historical data.

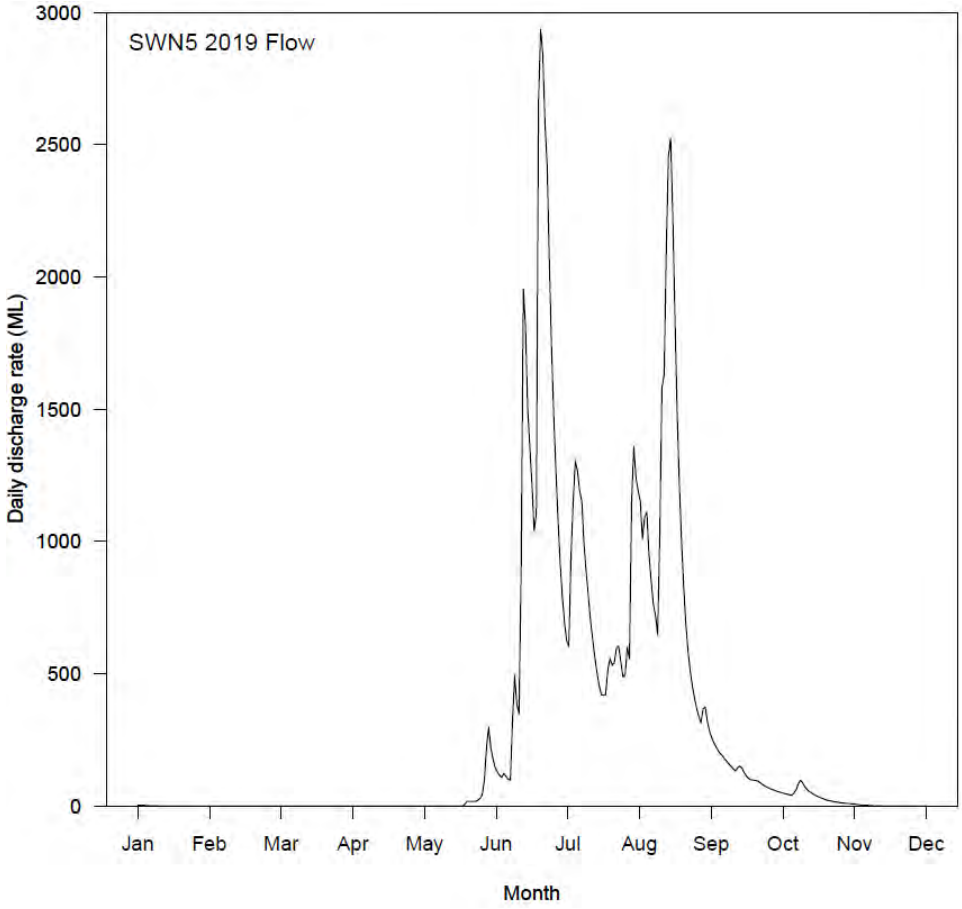

Figure 12. Daily discharge (ML) at Walyunga gauging station (616011- approx. 7km upstream of SWN5).

The Walyunga Gauging station did not register rainfall events in the Greater Perth region throughout April and May 2019 (total monthly rainfall 44.2 mm and 17.8 mm, respectively), suggesting that these events failed to provide sufficient run off from this catchment to generate flow in the Avon River.

Table 3. Number of samples (n), minimum, maximum and median concentrations for all parameters measured in each month of 2019 at site SWN5 (Avon River).

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	1	0	0	0	0	2	1	2	2	3	2	1
min	0.780					1.300	2.300	0.890	0.740	0.670	0.670	0.730
max	0.780					1.400	2.300	1.100	1.100	0.700	0.680	0.730
med	**0.780**					**1.350**	**2.300**	**0.995**	**0.920**	**0.690**	**0.675**	**0.730**
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	1	0	0	0	0	2	1	2	2	3	2	1
min	0.005					0.027	0.130	0.010	0.031	0.031	0.030	0.019
max	0.005					0.093	0.130	0.024	0.039	0.042	0.039	0.019
med	**0.005**					**0.060**	**0.130**	**0.017**	**0.035**	**0.036**	**0.035**	**0.019**
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	1	0	0	0	0	2	1	2	2	3	2	1
min	0.005					0.330	0.990	0.051	0.096	0.020	0.013	0.005
max	0.005					0.420	0.990	0.190	0.120	0.032	0.020	0.005
med	**0.005**					**0.375**	**0.990**	**0.121**	**0.108**	**0.028**	**0.017**	**0.005**
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	1	0	0	0	0	2	1	2	2	3	2	1
min	0.710					0.720	1.000	0.780	0.610	0.560	0.570	0.690
max	0.710					0.760	1.000	0.790	0.670	0.590	0.580	0.690
med	**0.710**					**0.740**	**1.000**	**0.785**	**0.640**	**0.580**	**0.575**	**0.690**
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	1	0	0	0	0	2	1	2	2	3	2	1
min	0.011					0.024	0.043	0.017	0.015	0.008	0.013	0.017
max	0.011					0.032	0.043	0.020	0.056	0.025	0.014	0.017
med	**0.011**					**0.028**	**0.043**	**0.019**	**0.036**	**0.015**	**0.014**	**0.017**
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	1	0	0	0	0	2	1	2	2	3	2	1
min	0.009					0.008	0.025	0.011	0.010	0.003	0.009	0.003
max	0.009					0.011	0.025	0.015	0.012	0.009	0.011	0.003
med	**0.009**					**0.010**	**0.025**	**0.013**	**0.011**	**0.008**	**0.010**	**0.003**
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	1	0	0	0	0	2	1	2	2	3	2	1
min	15.00					14.00	19.00	15.00	14.00	12.00	11.00	14.00
max	15.00					15.00	19.00	16.00	14.00	13.00	12.00	14.00
med	**15.00**					**14.50**	**19.00**	**15.50**	**14.00**	**12.00**	**11.50**	**14.00**
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	1	0	0	0	0	2	1	2	2	3	2	1
min	4.000					5.000	11.00	7.000	4.000	5.000	3.000	5.000
max	4.000					8.000	11.00	12.00	42.00	7.000	4.000	5.000
med	**4.000**					**6.500**	**11.00**	**9.500**	**23.00**	**6.000**	**3.500**	**5.000**
DO (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	1	0	0	0	0	2	1	2	2	3	2	1
min	8.080					9.450	10.21	10.27	8.750	7.430	6.720	8.510
max	8.080					9.450	10.21	10.96	9.800	8.600	7.880	8.510
med	**8.080**					**9.450**	**10.21**	**10.62**	**9.275**	**8.460**	**7.300**	**8.510**
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	1	0	0	0	0	2	1	2	2	3	2	1
min	11.92					11.51	11.39	14.75	9.803	8.849	9.674	12.46
max	11.92					14.11	11.39	17.62	9.823	10.57	11.12	12.46
med	**11.92**					**12.81**	**11.39**	**16.18**	**9.813**	**9.780**	**10.40**	**12.46**

NB: Flow ceased in the Avon and Upper Swan catchment from February to May 2019 and as a result no samples were collected in those months.

The elevated concentrations in TN in June and July 2019 were due largely to an increase in NH_3-N (0.13 mg/L) and NO_x-N (0.99 mg/L) and a slight elevation in DOrgN (Figures 2-5, Table 3). These variables declined in August and largely followed the trend of the background data for the rest of the year. Elevated concentrations of TP and FRP were also noticeable in July 2019, with FRP exceeding the range of the background data in that month (Figures 6 and 7).

Concentrations of TN and NO_x-N remained below the respective ANZECC trigger values for lowland rivers of 1.2 mg/L and 0.15 mg/L for most of the reporting period except for June and July. The exceedances in these months are likely attributable to seasonal winter flows and mobilisation of nutrients from the catchment. Concentrations of TP and FRP however remained below their respective ANZECC trigger values for lowland rivers of 0.065 mg/L and 0.04 mg/L throughout the entire 2019 reporting period.

The level of TSS increased slightly in July and reached a maximum median concentration of 42 mg/L in September which exceeded the range of background data (Figure 12, Table 3). These increased concentrations can likely be attributed to rainfall events in June and late August/early September, respectively (Figure 341).

Data for the remaining analytes generally followed the trends of the background data for 2014-2018. There was a drop in median DOC levels to 11.5 mg/L in November 2019 (Figure 8). Median dissolved oxygen levels indicate that the system was well oxygenated for the latter part of the reporting period (Figure 10). When flowing, specific conductivity at this site is generally brackish, with median levels ranging from 8.9-16.2 mS/cm (Figure 11) and are most likely a result of the saline headwaters of the Avon River flowing into the upper Swan River.

2. Bannister Creek (SWS2)

SWS2 total nitrogen (TN)

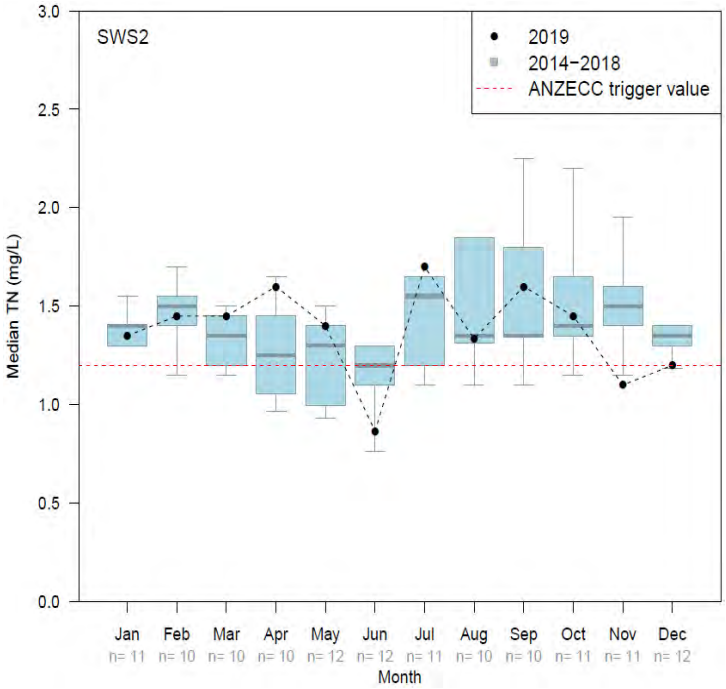

Figure 13. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS2. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

SWS2 ammoniacal nitrogen (NH_3-N)

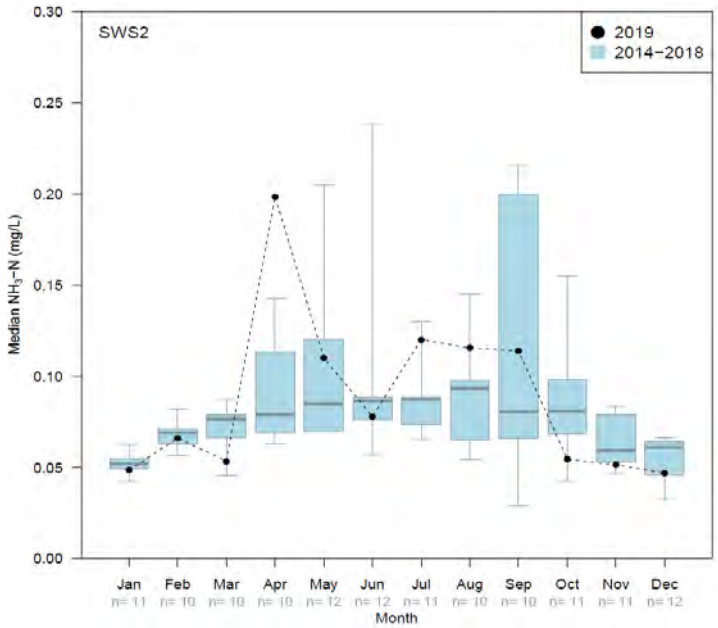

Figure 14. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS2. Number of samples (n) is provided for the historical data.

SWS2 total oxidised nitrogen (NO_x-N)

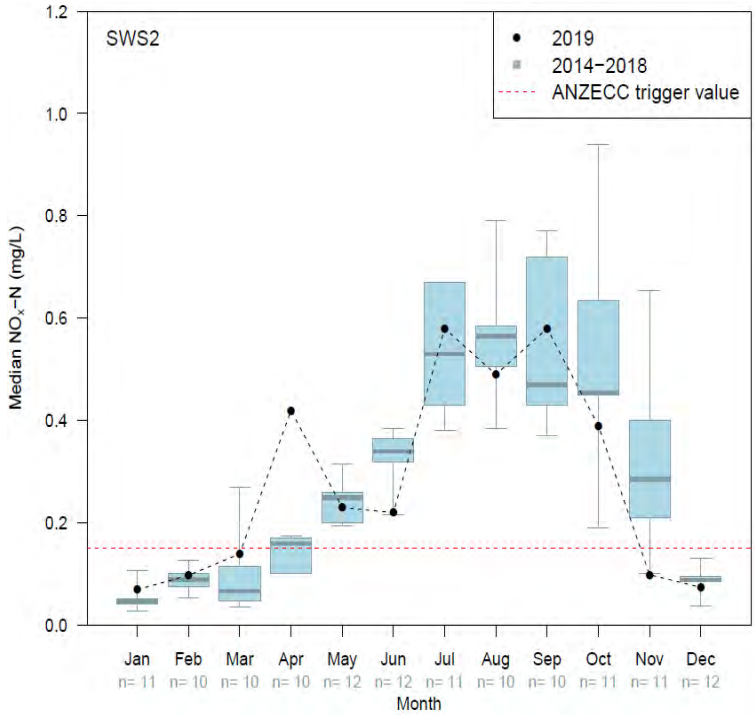

Figure 15. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS2. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

SWS2 dissolved organic nitrogen (DOrgN)

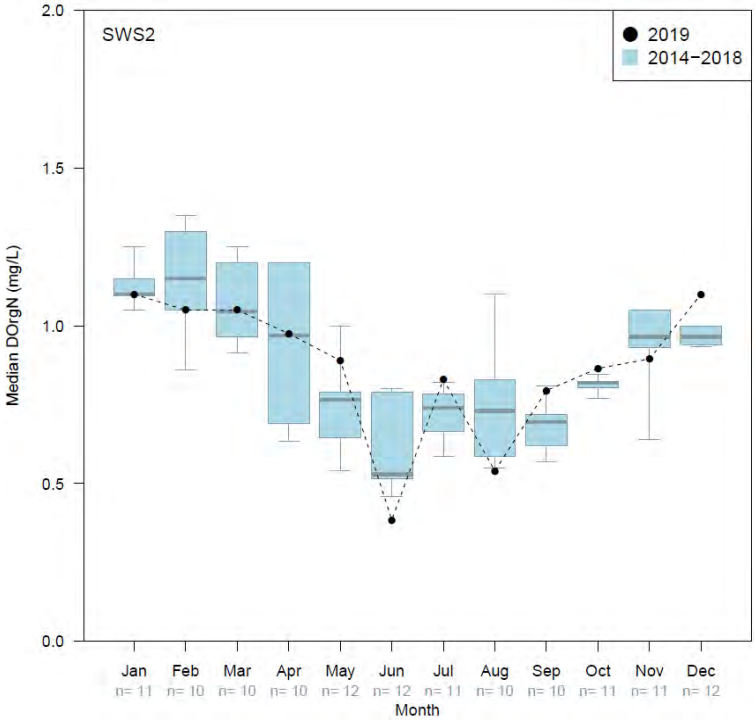

Figure 16. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS2. Number of samples (n) is provided for the historical data.

SWS2 total phosphorus (TP)

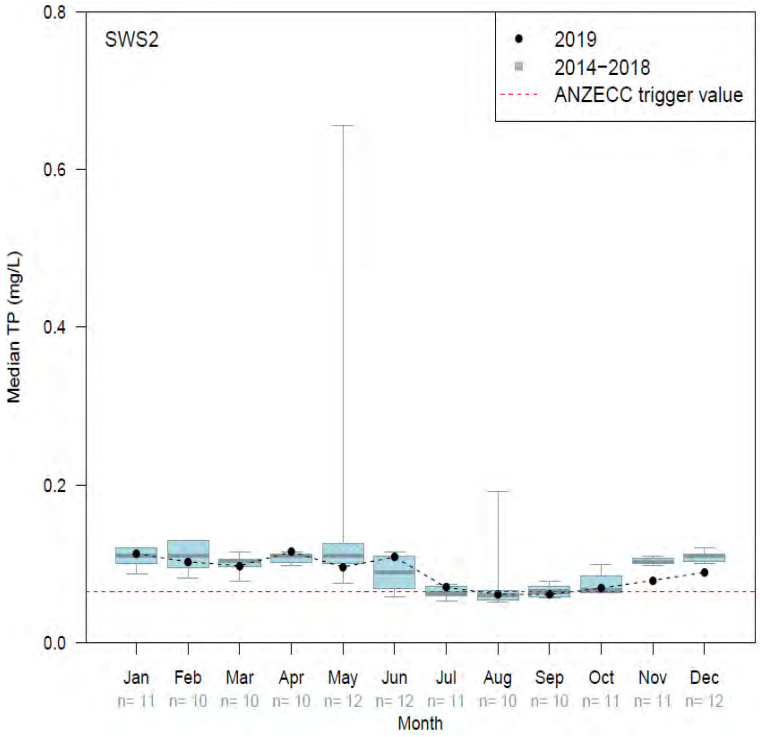

Figure 17. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS2. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

SWS2 filterable reactive phosphorus (FRP)

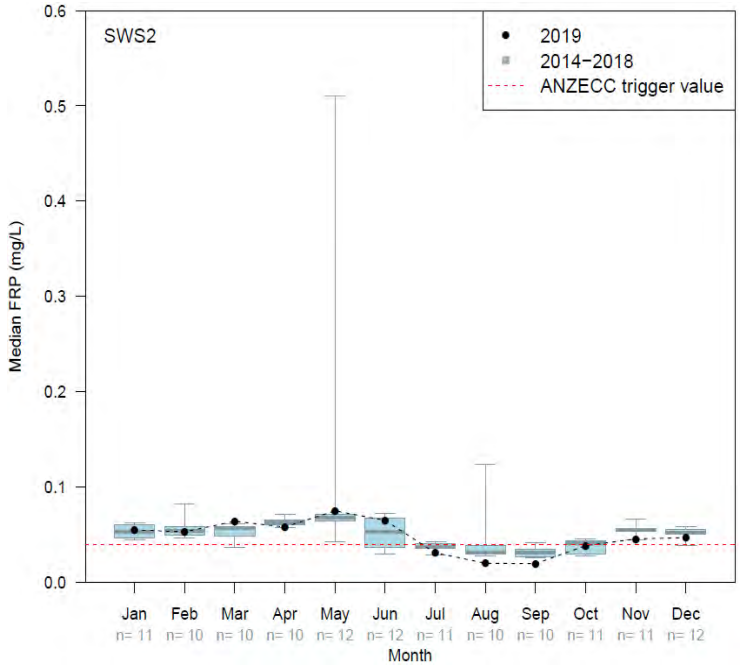

Figure 18. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS2. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

SWS2 dissolved organic carbon (DOC)

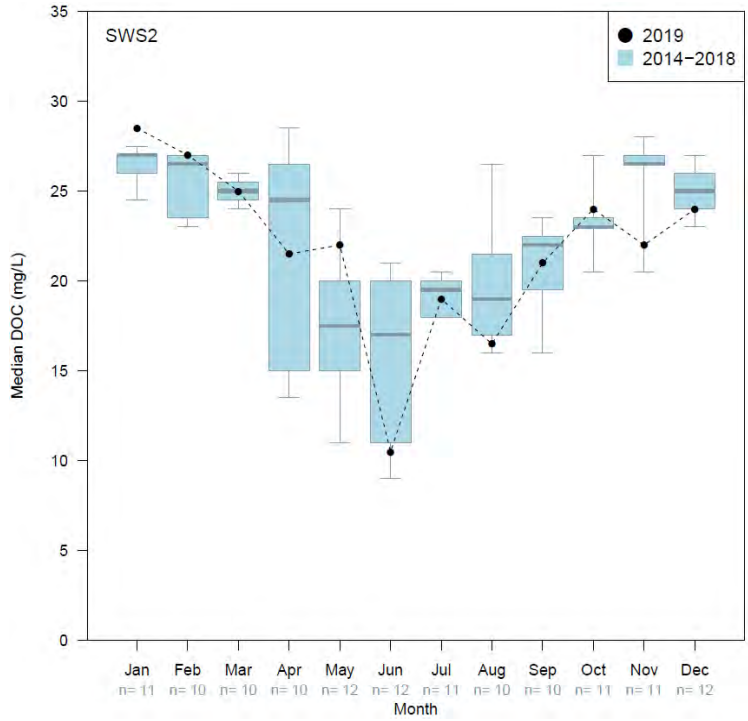

Figure 19. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS2. Number of samples (n) is provided for the historical data.

SWS2 total suspended solids (TSS)

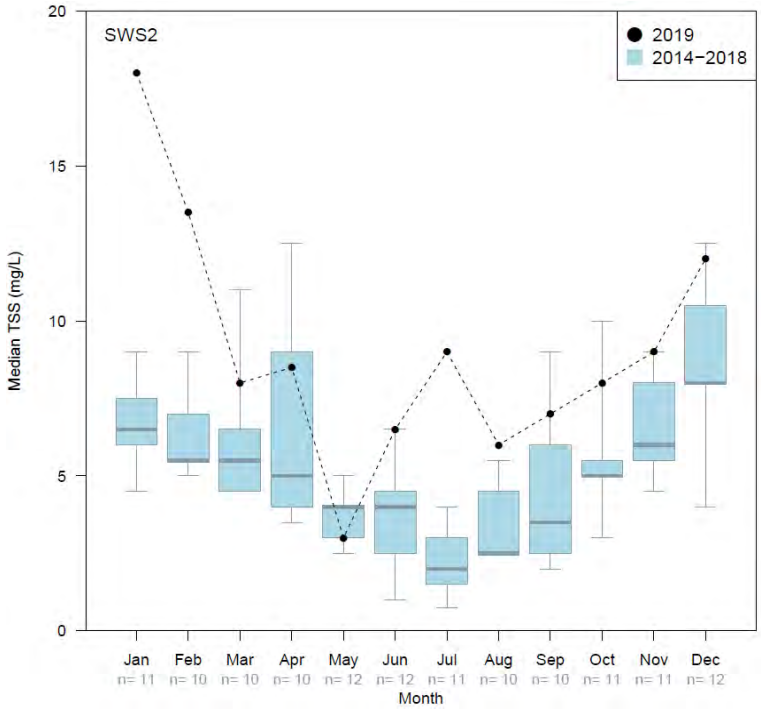

Figure 20. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS2. Number of samples (n) is provided for the historical data.

SWS2 dissolved oxygen (DO)

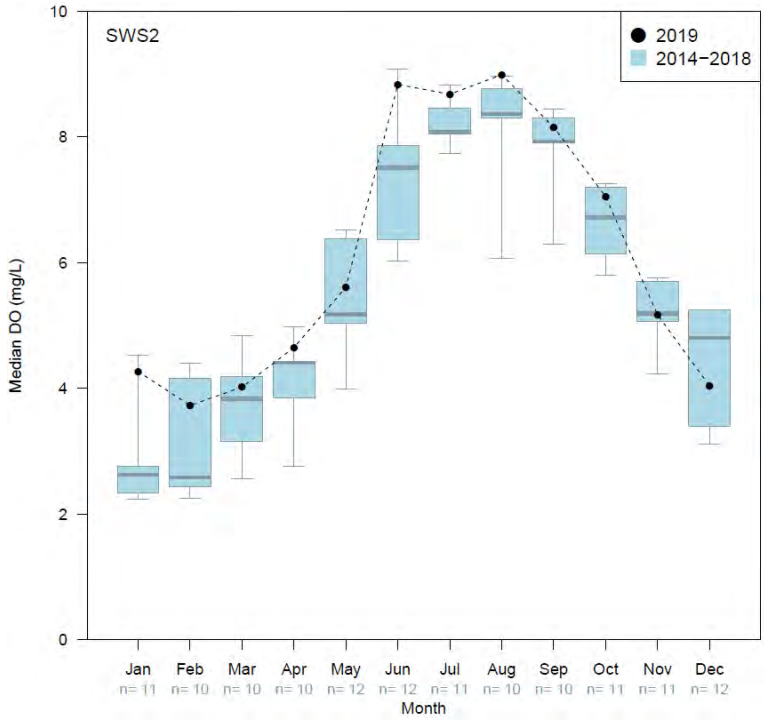

Figure 21. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS2. Number of samples (n) is provided for the historical data.

SWS2 specific conductivity (Sp. cond)

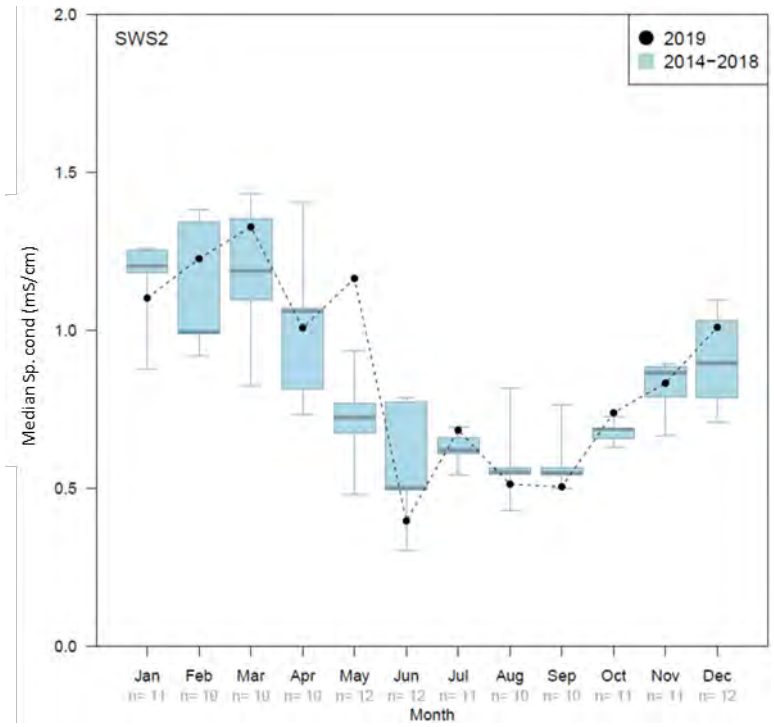

Figure 22. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS2. Number of samples (n) is provided for the historical data.

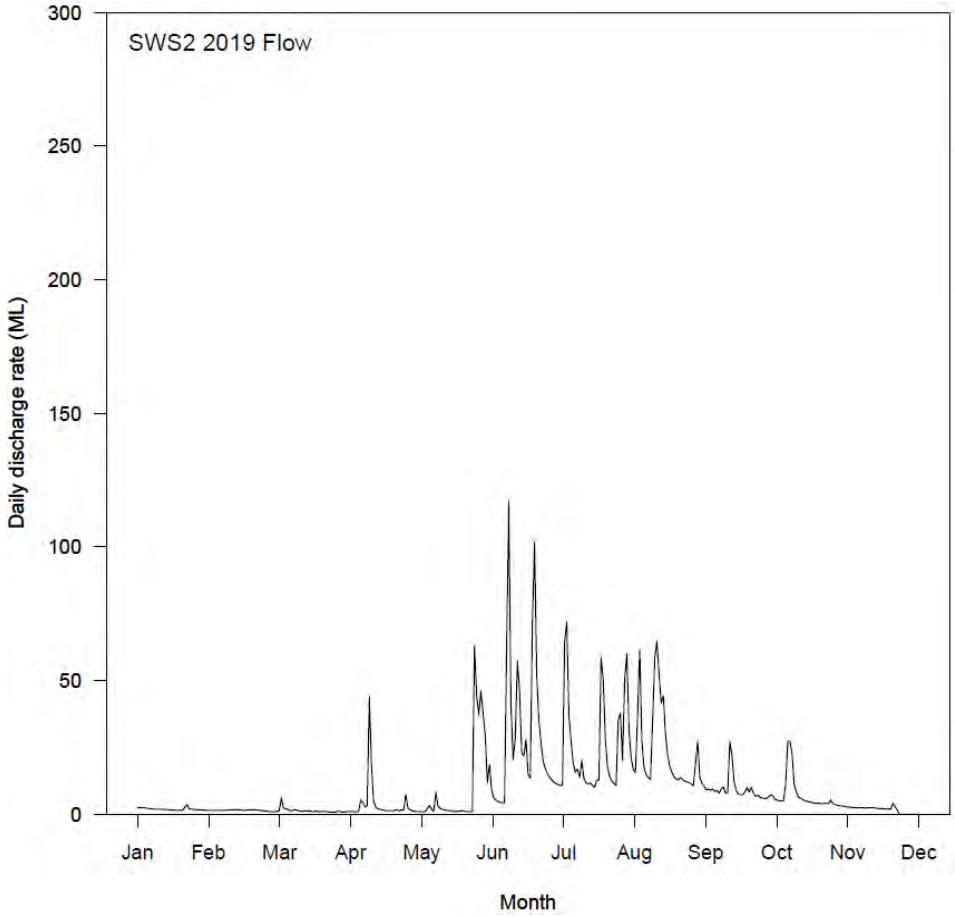

Figure 23. Daily discharge (ML) at Acacia Place gauging station (616134 - approx. 1km upstream of SWS2).

Table 4. 2019 monthly sample numbers, minimum and maximum values at SWS2.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	2	2	2	2	3	2	1	2	2	3	2	1
min	1.300	1.400	1.400	1.500	1.400	0.530	1.700	0.970	1.200	1.200	1.100	1.200
max	1.400	1.500	1.500	1.700	1.400	1.200	1.700	1.700	2.000	1.700	1.100	1.200
med	**1.350**	**1.450**	**1.450**	**1.600**	**1.400**	**0.865**	**1.700**	**1.335**	**1.600**	**1.450**	**1.100**	**1.200**
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.050	0.065	0.040	0.047	0.100	0.058	0.100	0.051	0.068	0.047	0.048	0.047
max	0.050	0.067	0.070	0.350	0.120	0.098	0.100	0.180	0.160	0.062	0.055	0.047
med	**0.050**	**0.066**	**0.050**	**0.199**	**0.110**	**0.078**	**0.100**	**0.116**	**0.114**	**0.055**	**0.052**	**0.047**
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.070	0.085	0.090	0.420	0.220	0.110	0.600	0.330	0.430	0.180	0.087	0.074
max	0.070	0.110	0.190	0.420	0.340	0.330	0.600	0.650	0.730	0.600	0.110	0.074
med	**0.070**	**0.098**	**0.140**	**0.420**	**0.230**	**0.220**	**0.600**	**0.490**	**0.580**	**0.390**	**0.099**	**0.074**
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	**1.100**	**1.000**	**1.000**	**0.850**	**0.830**	**0.260**	**0.800**	**0.430**	**0.620**	**0.820**	**0.870**	**1.100**
max	1.100	1.100	1.100	1.100	0.940	0.510	0.800	0.650	0.970	0.910	0.920	1.100
med	**1.100**	**1.050**	**1.050**	**0.975**	**0.890**	**0.385**	**0.800**	**0.540**	**0.795**	**0.865**	**0.895**	**1.100**
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.100	0.095	0.100	0.110	0.100	0.077	0.100	0.056	0.061	0.069	0.075	0.089
max	0.130	0.110	0.100	0.120	0.120	0.140	0.100	0.067	0.061	0.069	0.083	0.089
med	**0.110**	**0.103**	**0.100**	**0.115**	**0.100**	**0.109**	**0.100**	**0.062**	**0.061**	**0.069**	**0.079**	**0.089**
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.050	0.049	0.050	0.056	0.070	0.030	0.000	0.018	0.012	0.036	0.043	0.047
max	0.060	0.057	0.080	0.060	0.100	0.100	0.000	0.022	0.027	0.041	0.048	0.047
med	**0.060**	**0.053**	**0.060**	**0.058**	**0.080**	**0.065**	**0.000**	**0.020**	**0.020**	**0.039**	**0.046**	**0.047**
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	28.00	27.00	25.00	18.00	21.00	6.000	19.00	13.00	16.00	24.00	21.00	24.00
max	29.00	27.00	25.00	25.00	22.00	15.00	19.00	20.00	26.00	24.00	23.00	24.00
med	**28.50**	**27.00**	**25.00**	**21.50**	**22.00**	**10.50**	**19.00**	**16.50**	**21.00**	**24.00**	**22.00**	**24.00**
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	10.00	12.00	6.000	8.000	3.000	5.000	9.000	5.000	6.000	8.000	9.000	12.00
max	26.00	15.00	10.00	9.000	5.000	8.000	9.000	7.000	8.000	8.000	9.000	12.00
med	**18.00**	**13.50**	**8.000**	**8.500**	**3.000**	**6.500**	**9.000**	**6.000**	**7.000**	**8.000**	**9.000**	**12.00**
DO (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	3.910	3.590	3.570	4.150	5.320	8.480	8.700	8.810	7.470	6.100	4.780	4.040
max	4.630	3.870	4.470	5.150	5.820	9.190	8.700	9.170	8.840	7.180	5.560	4.040
med	**4.270**	**3.730**	**4.020**	**4.650**	**5.610**	**8.835**	**8.700**	**8.990**	**8.155**	**7.050**	**5.170**	**4.040**
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	1.060	1.189	1.310	0.609	0.980	0.232	0.700	0.389	0.484	0.685	0.774	1.009
max	1.140	1.264	1.350	1.406	1.190	0.561	0.700	0.637	0.525	0.835	0.891	1.009
med	**1.100**	**1.227**	**1.330**	**1.008**	**1.160**	**0.397**	**0.700**	**0.513**	**0.505**	**0.739**	**0.833**	**1.009**

The water quality data for SWS2 in 2019 generally followed the trend of background data (Figures 13-22, Table 4). Elevated concentrations in analytes coincided with rainfall driven discharge in April, June and July and between mid-August and September (Figure 23).

Concentrations of TN in 2019 remained within the range of the background data, however elevated concentrations of NH_3-N (0.35 mg/L) and NO_x-N (0.42 mg/L) were observed in April, which exceeded the range of the background data for these species of nitrogen (Figure 13-15, Table 4). Elevated concentrations of these species of nitrogen were also observed between July and September, however these remained within the range of the background data. DOrgN remained within range of the background data throughout 2019 (Figure 16). Concentrations of TP and FRP remained within the range of the background data (Figures 17-18).

TN concentrations exceeded the ANZECC trigger value (1.2 mg/L) for lowland rivers for most of the 2019 reporting period, except for June and November where concentrations were below the guideline (Figure 13). NO_x-N concentrations exceeded the ANZECC trigger value (0.15 mg/L) for lowland rivers between April and October (Figure 15). These exceedances are likely a response to the seasonal winter flows. Concentrations of TP and FRP exceeded their respective ANZECC trigger values for lowland rivers of 0.065 mg/L and 0.04 mg/L throughout most of the 2019 reporting period, except from August to September for TP and July to October for FRP (Figures 17-18).

In 2019, median DOC concentrations ranged between 10.5 and 28.5 mg/L and were within the range of historic values for this site (Figure 19, Table 4). A decrease in median DOC levels below 15 mg/L in June likely corresponds with an earlier significant seasonal rainfall event (Figure 341). Elevated TSS levels were recorded in January and February 2019 (Figure 20) but did not appear to be associated with any rainfall events (Figure 341). Elevated levels were also observed in July, which corresponded with a discharge event at that time (Figure 23). Median dissolved oxygen levels were usually above 4 mg/L and specific conductivity was indicative of freshwater discharge (Figures 21-22).

3. Bayswater Main Drain (SWS10)

SWS10 total nitrogen (TN)

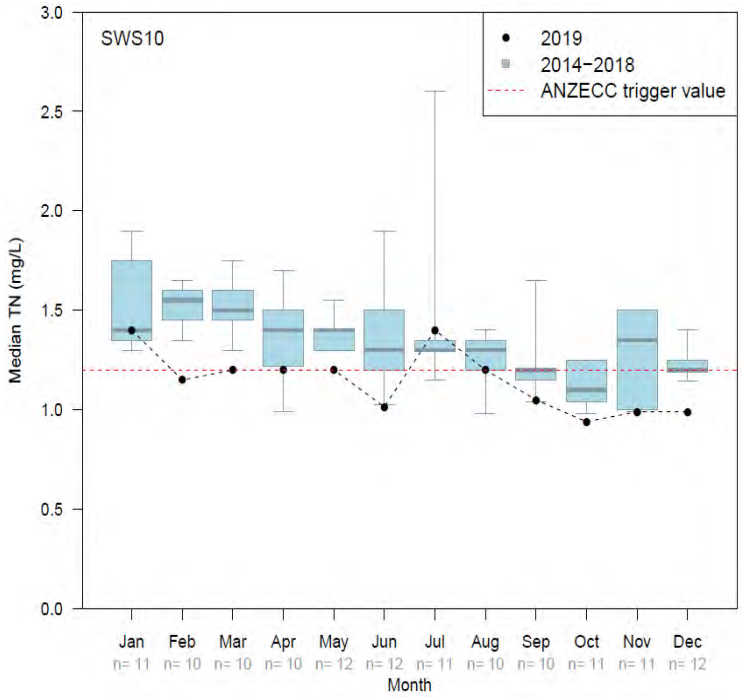

Figure 24. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS10. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

SWS10 ammoniacal nitrogen (NH_3-N)

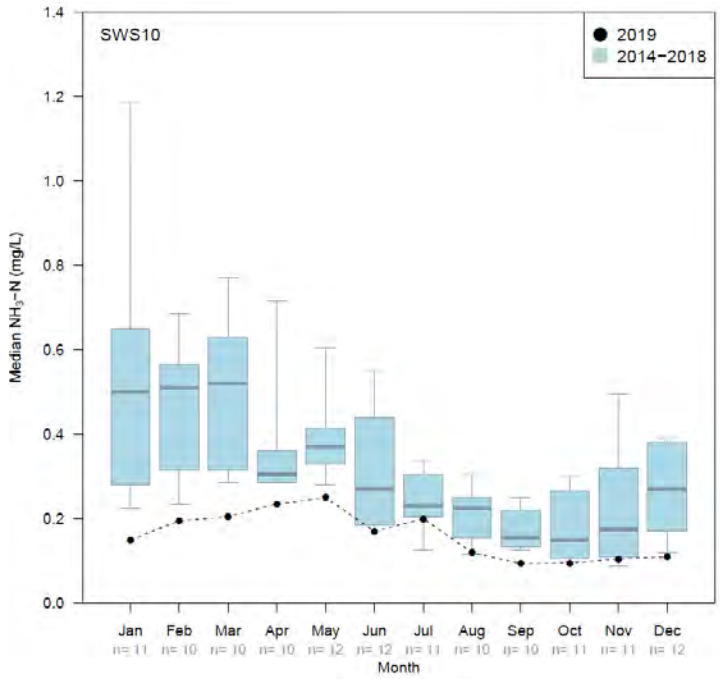

Figure 25. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS10 (Bayswater MD). Number of samples (n) is provided for the historical data.

SWS10 total oxidised nitrogen (NO_x-N)

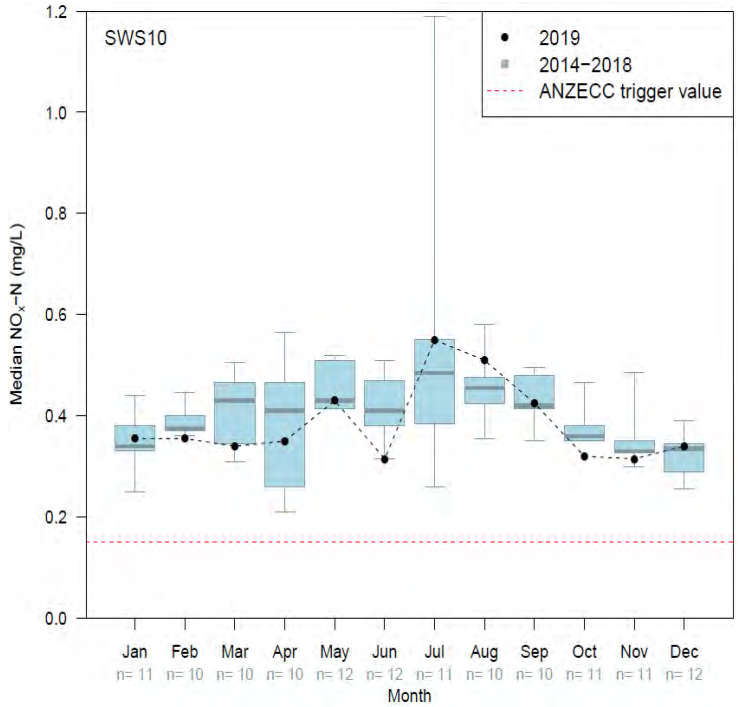

Figure 26. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS10. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

SWS10 dissolved organic nitrogen (DOrgN)

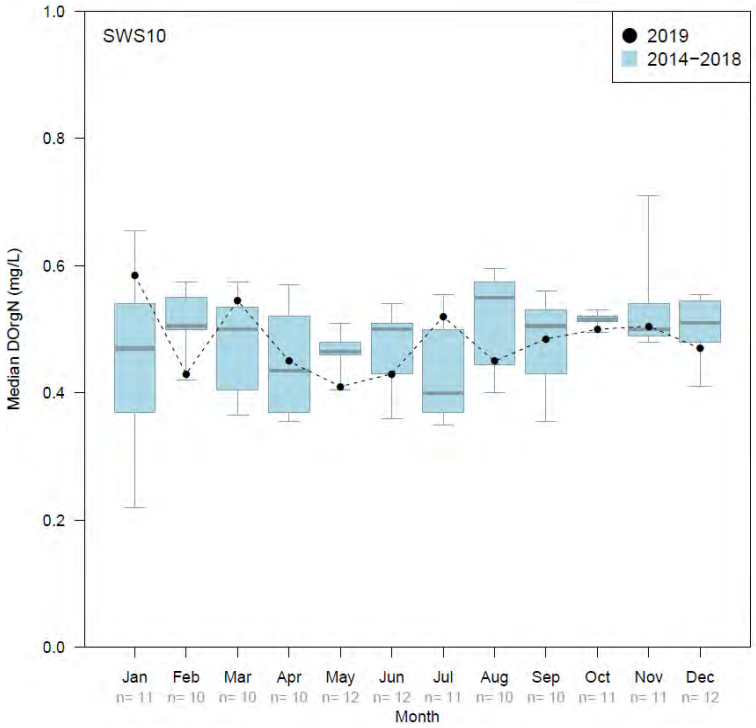

Figure 27. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS10. Number of samples (n) is provided for the historical data.

SWS10 total phosphorus (TP)

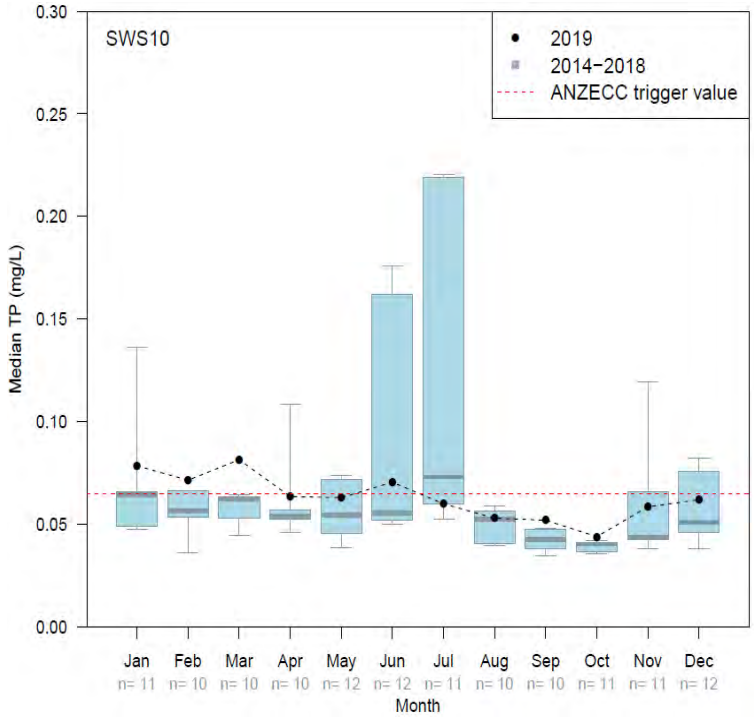

Figure 28. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS10. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

SWS10 filterable reactive phosphorus (FRP)

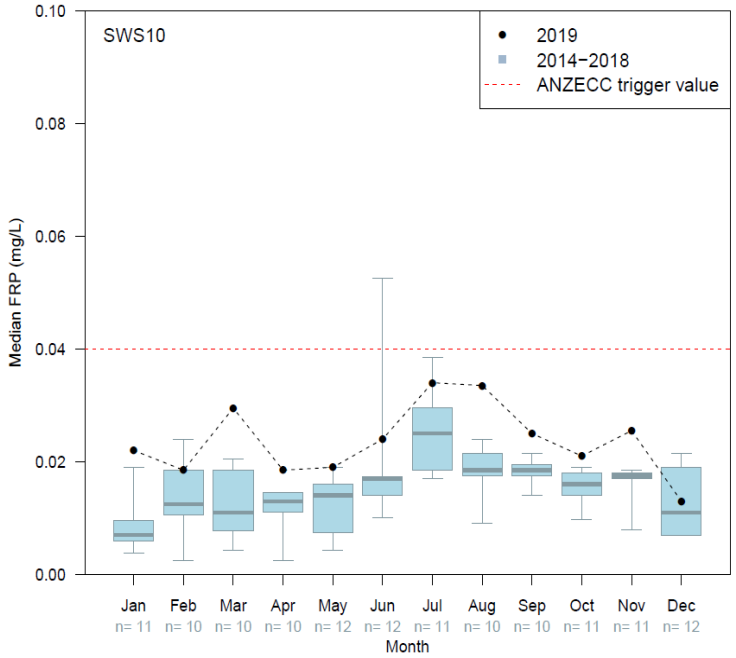

Figure 29. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS10. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

SWS10 dissolved organic carbon (DOC)

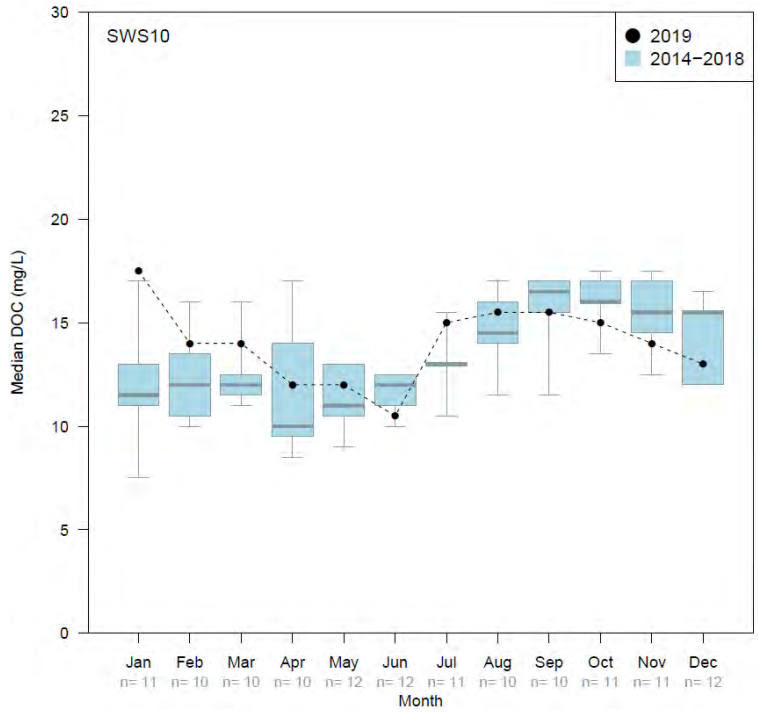

Figure 30. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS10. Number of samples (n) is provided for the historical data.

SWS10 total suspended solids (TSS)

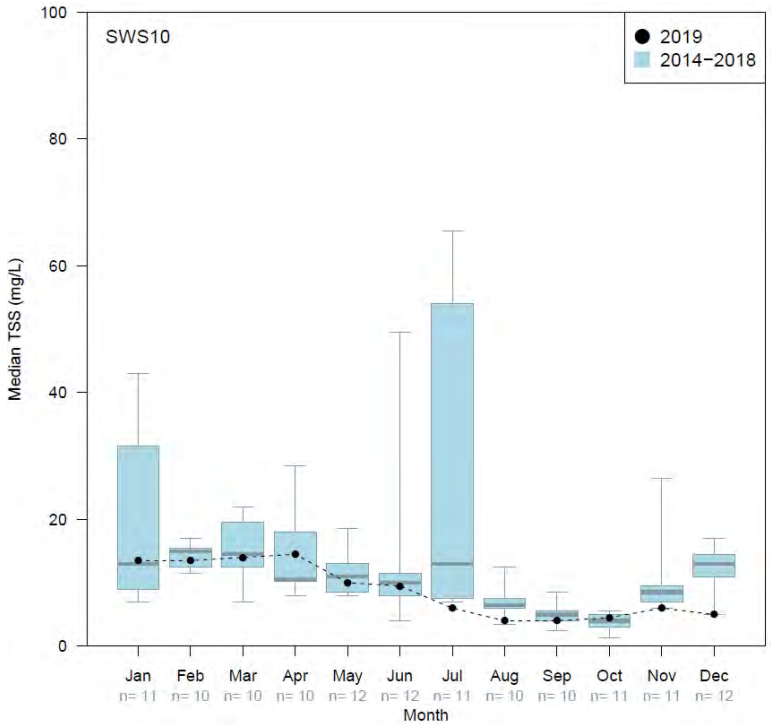

Figure 31. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS10. Number of samples (n) is provided for the historical data.

SWS10 dissolved oxygen (DO)

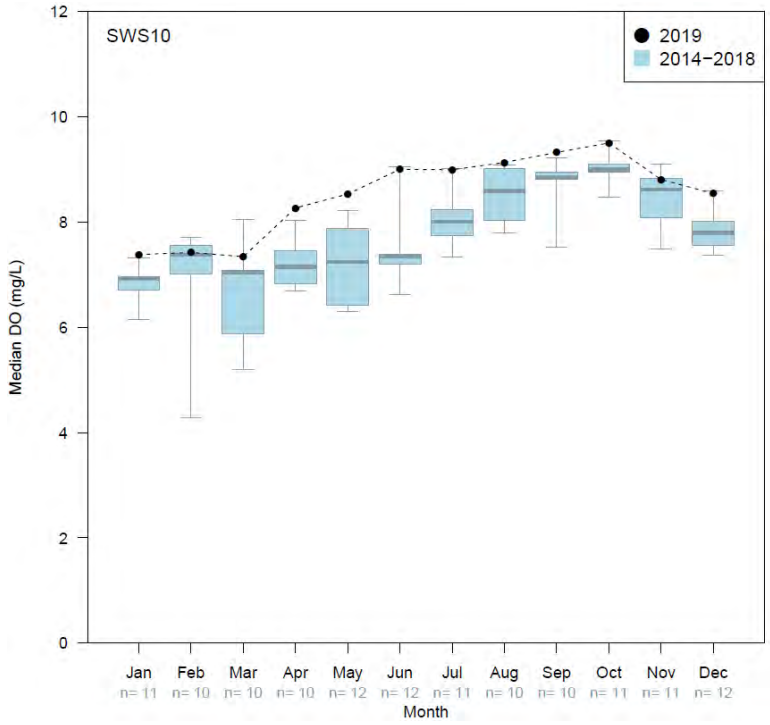

Figure 32. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS10. Number of samples (n) is provided for the historical data.

SWS10 specific conductivity (Sp. cond)

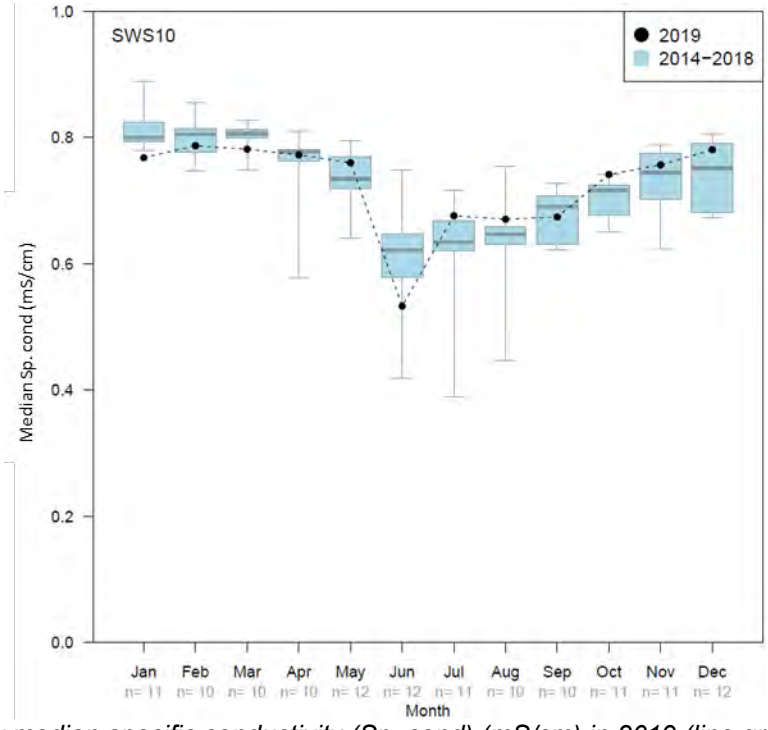

Figure 33. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS10. Number of samples (n) is provided for the historical data.

Table 5. 2019 monthly sample numbers, minimum and maximum values at SWS10.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	2	2	2	2	3	2	1	2	2	3	2	1
min	1.200	1.100	1.100	1.200	1.100	0.830	1.400	1.100	1.000	0.880	0.980	0.990
max	1.600	1.200	1.300	1.200	1.200	1.200	1.400	1.300	1.100	1.000	1.000	0.990
med	**1.400**	**1.150**	**1.200**	**1.200**	**1.200**	**1.015**	**1.400**	**1.200**	**1.050**	**0.940**	**0.990**	**0.990**
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.140	0.190	0.200	0.220	0.230	0.150	0.200	0.120	0.088	0.091	0.100	0.110
max	0.160	0.200	0.210	0.250	0.280	0.190	0.200	0.120	0.100	0.100	0.110	0.110
med	**0.150**	**0.195**	**0.205**	**0.235**	**0.250**	**0.170**	**0.200**	**0.120**	**0.094**	**0.096**	**0.105**	**0.110**
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.330	0.350	0.320	0.350	0.380	0.280	0.550	0.500	0.380	0.270	0.300	0.340
max	0.380	0.360	0.360	0.350	0.430	0.350	0.550	0.520	0.470	0.370	0.330	0.340
med	**0.355**	**0.355**	**0.340**	**0.350**	**0.430**	**0.315**	**0.550**	**0.510**	**0.425**	**0.320**	**0.315**	**0.340**
DorgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.550	0.360	0.470	0.450	0.390	0.310	0.520	0.440	0.480	0.490	0.490	0.470
max	0.620	0.500	0.620	0.450	0.550	0.550	0.520	0.460	0.490	0.510	0.520	0.470
med	**0.585**	**0.430**	**0.545**	**0.450**	**0.410**	**0.430**	**0.520**	**0.450**	**0.485**	**0.500**	**0.505**	**0.470**
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.068	0.066	0.067	0.063	0.061	0.056	0.060	0.051	0.046	0.038	0.056	0.062
max	0.089	0.077	0.096	0.064	0.071	0.085	0.060	0.055	0.058	0.050	0.061	0.062
med	**0.079**	**0.072**	**0.082**	**0.064**	**0.063**	**0.071**	**0.060**	**0.053**	**0.052**	**0.044**	**0.059**	**0.062**
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.020	0.018	0.018	0.015	0.015	0.020	0.034	0.031	0.022	0.019	0.024	0.013
max	0.024	0.019	0.041	0.022	0.021	0.028	0.034	0.036	0.028	0.023	0.027	0.013
med	**0.022**	**0.019**	**0.030**	**0.019**	**0.019**	**0.024**	**0.034**	**0.034**	**0.025**	**0.021**	**0.026**	**0.013**
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	16.00	14.00	12.00	12.00	12.00	9.000	15.00	15.00	15.00	15.00	14.00	13.00
max	19.00	14.00	16.00	12.00	13.00	12.00	15.00	16.00	16.00	15.00	14.00	13.00
med	**17.50**	**14.00**	**14.00**	**12.00**	**12.00**	**10.50**	**15.00**	**15.50**	**15.50**	**15.00**	**14.00**	**13.00**
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	12.000	11.000	14.000	12.000	10.000	6.000	6.000	4.000	4.000	4.000	5.000	5.000
max	15.000	16.000	14.000	17.000	22.000	13.000	6.000	4.000	4.000	5.000	7.000	5.000
med	**13.50**	**13.50**	**14.00**	**14.50**	**10.00**	**9.500**	**6.000**	**4.000**	**4.000**	**4.500**	**6.000**	**5.000**
DO (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	7.350	7.330	7.100	8.070	8.450	8.730	8.990	9.030	9.280	8.820	8.720	8.540
max	7.410	7.510	7.580	8.460	8.680	9.270	8.990	9.230	9.360	9.540	8.890	8.540
med	**7.380**	**7.420**	**7.340**	**8.265**	**8.530**	**9.000**	**8.990**	**9.130**	**9.320**	**9.500**	**8.805**	**8.540**
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.760	0.785	0.781	0.751	0.686	0.450	0.676	0.663	0.632	0.637	0.751	0.781
max	0.776	0.789	0.782	0.794	0.762	0.616	0.676	0.678	0.716	0.757	0.762	0.781
med	**0.768**	**0.787**	**0.782**	**0.773**	**0.760**	**0.533**	**0.676**	**0.670**	**0.674**	**0.741**	**0.757**	**0.781**

NB: Daily discharge data was not available for SWS10 in 2019 as the gauge did not produce reliable data over this period.

Median values for TN and NH_3-N in 2019 at SWS10 were typically lower than background data (Figure 24 and 25), with TN concentrations similar or below the ANZECC trigger value for lowland rivers of 1.2 mg/L in all months, except January and July. Concentrations of NO_x-N in 2019 were consistent with background values, but always exceeded the ANZECC trigger value of 0.15 mg/L for lowland rivers (Figure 26). Dissolved organic nitrogen levels ranged between 0.4 and 0.6 mg/L and were similar to the range of background data throughout the year (Figure 27, Table 5).

Concentrations of TP in 2019 were largely consistent with background ranges but exceeded the ANZECC trigger value of 0.065 mg/L between January and March and in June (Figure 28). FRP concentrations remained below the ANZECC trigger value for lowland rivers of 0.04 mg/L throughout 2019 but tended to be slightly elevated above background levels (Figure 29).

DOC was slightly elevated in January 2019 but was otherwise within the range of background data (Figure 30). In 2019, median TSS values ranged from 4 to 14.5 mg/L, dissolved oxygen concentrations were always above 7 mg/L and conductivity ranged between 0.53 and 0.78 mS/cm, with each of these parameters generally within the range of the background data (Figures 31-33, Table 5).

4. Bennett Brook (SWN12)

SWN12 total nitrogen (TN)

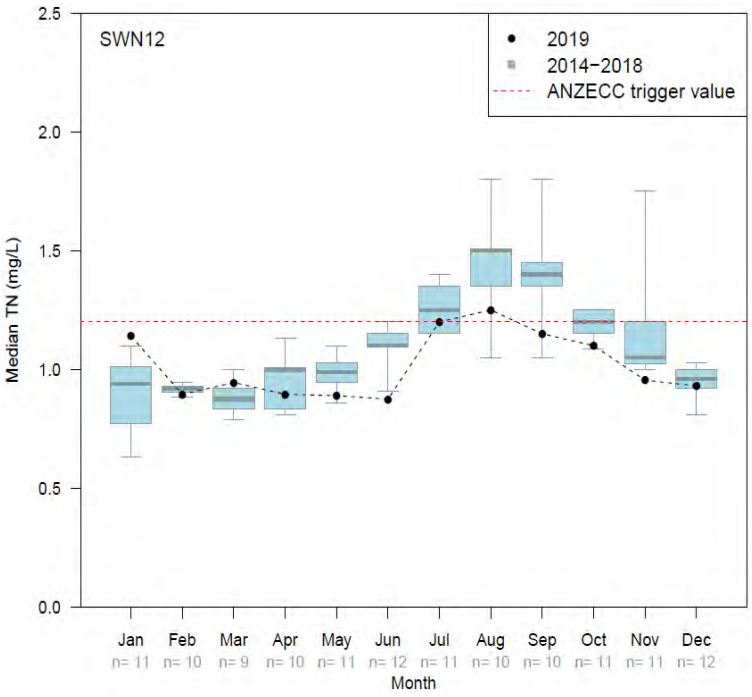

Figure 34. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN12. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

SWN12 ammoniacal nitrogen (NH_3-N)

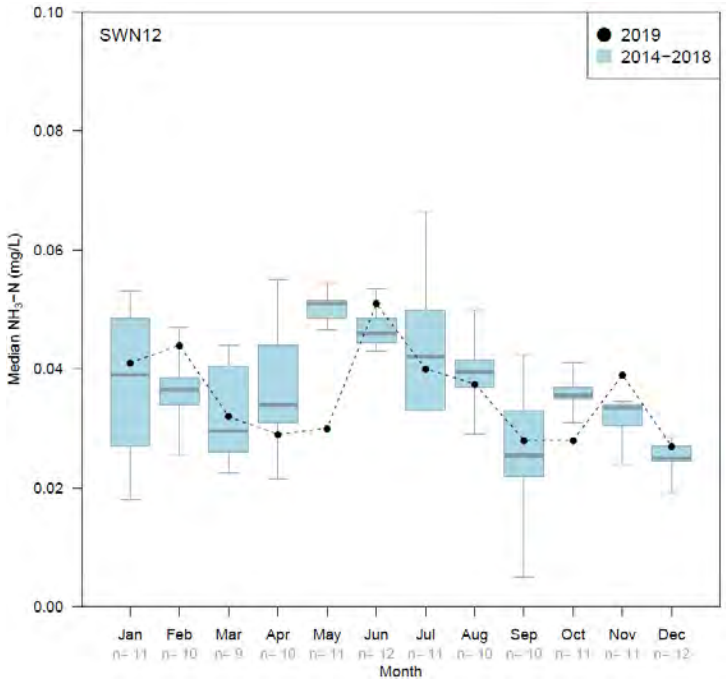

Figure 35. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN12. Number of samples (n) is provided for the historical data.

SWN12 dissolved organic nitrogen (NO_x-N)

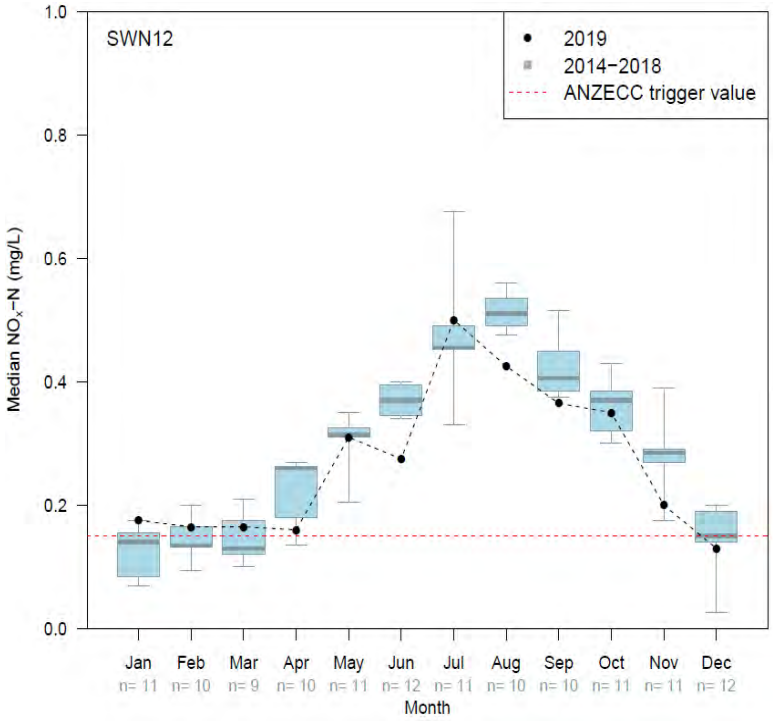

Figure 36. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN12. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

SWN12 dissolved organic nitrogen (DOrgN)

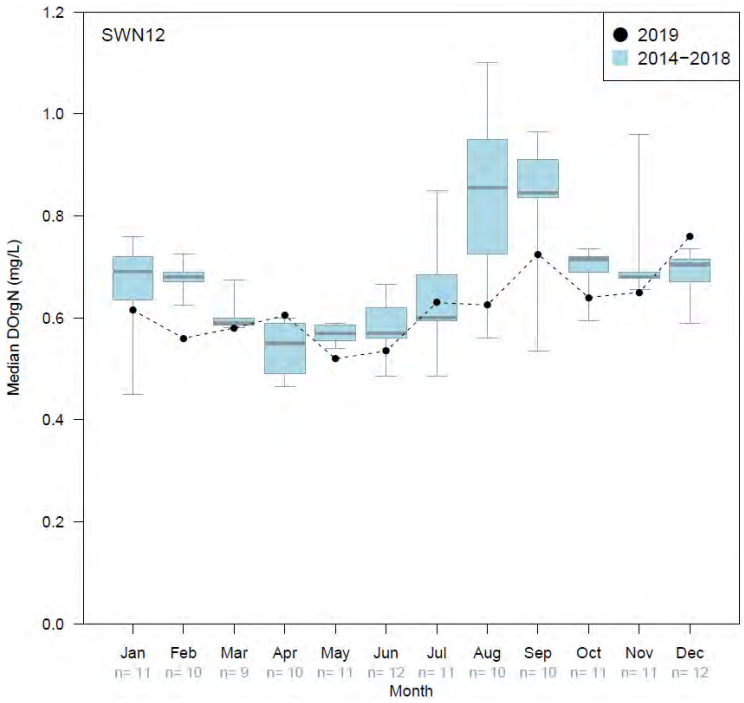

Figure 37. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN12. Number of samples (n) is provided for the historical data.

SWN12 total phosphorus (TP)

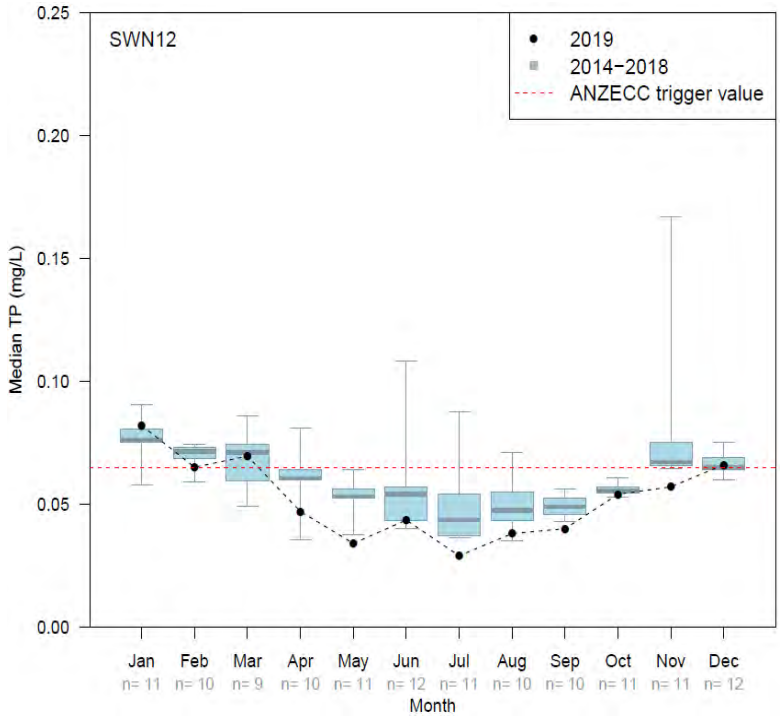

Figure 38. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN12. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

SWN12 filterable reactive phosphorus (FRP)

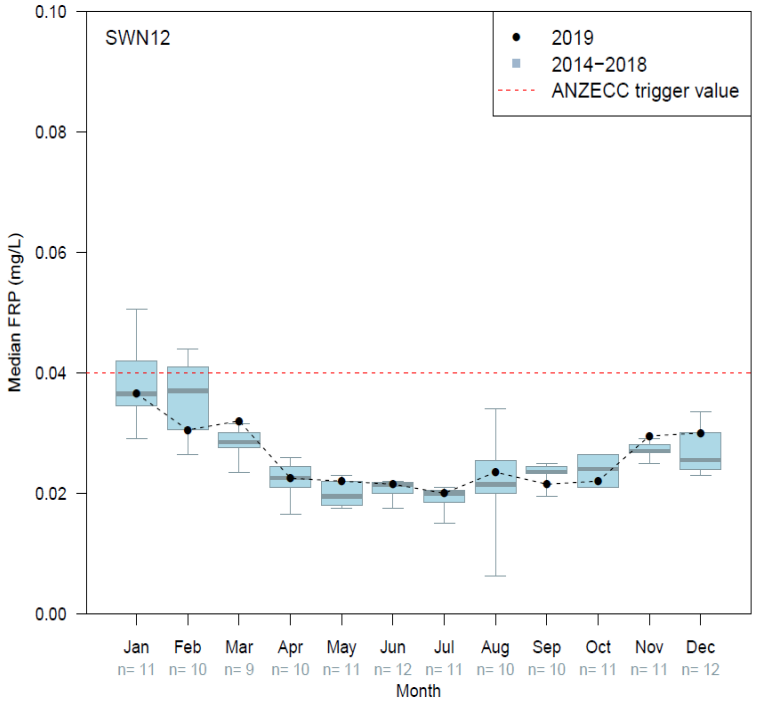

Figure 39. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN12. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

SWN12 dissolved organic carbon (DOC)

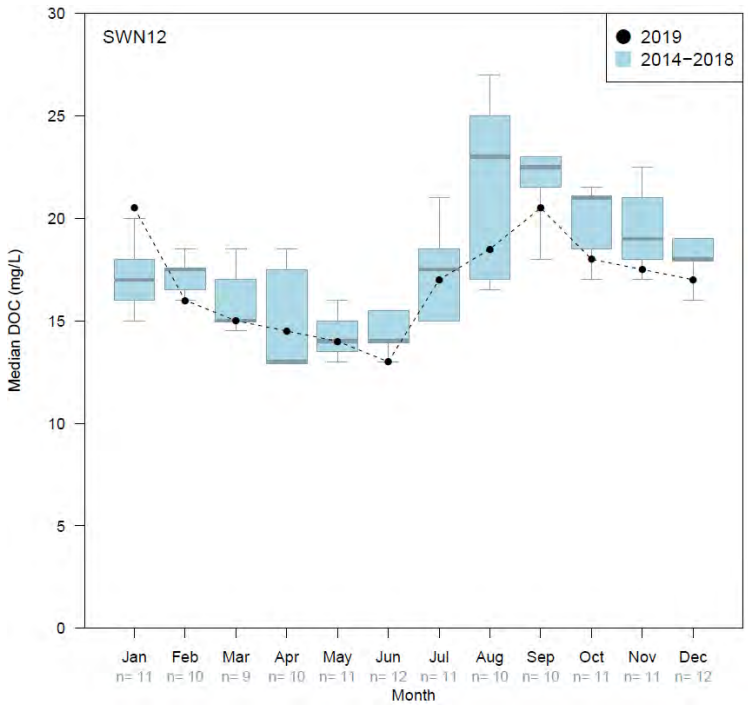

Figure 40. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN12. Number of samples (n) is provided for the historical data.

SWN12 total suspended solids (TSS)

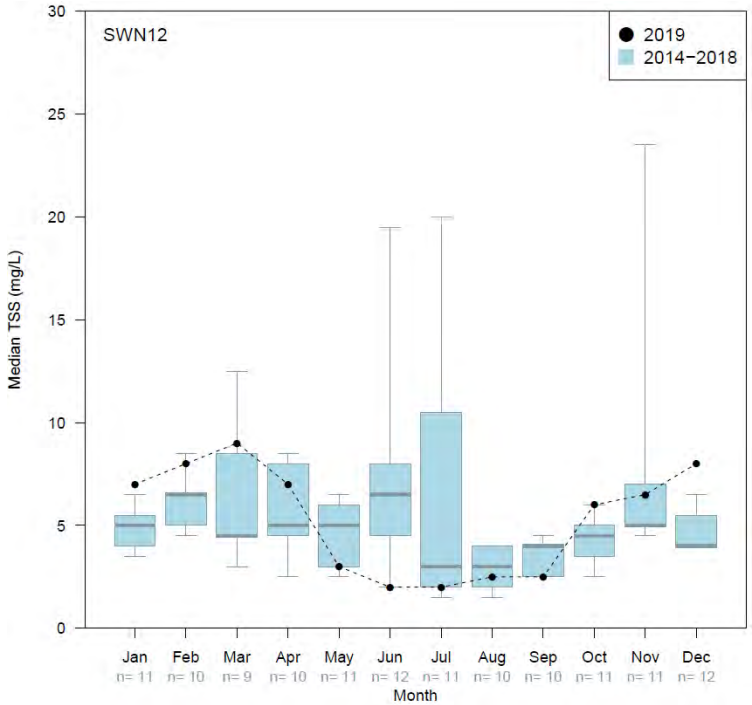

Figure 41. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN12. Number of samples (n) is provided for the historical data.

SWN12 dissolved oxygen (DO)

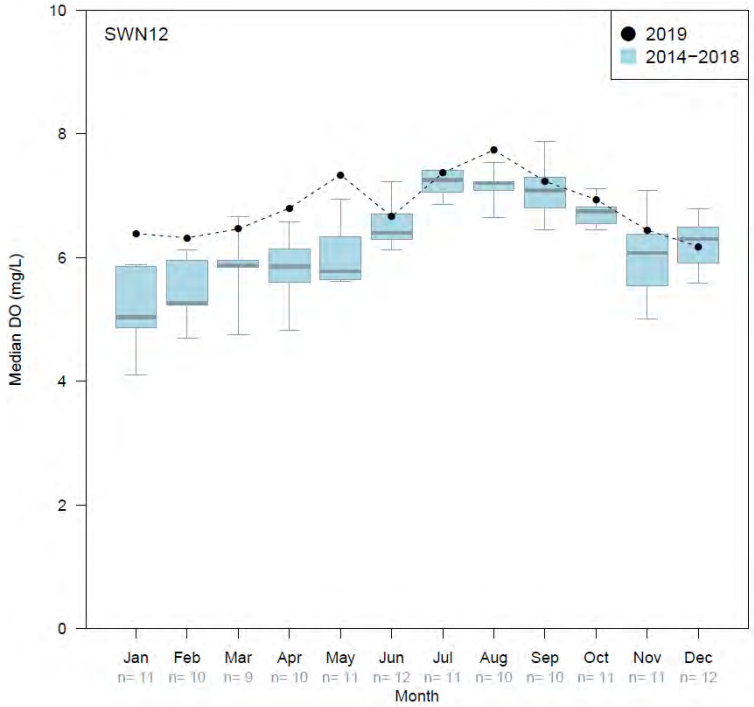

Figure 42. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN12. Number of samples (n) is provided for the historical data.

SWN12 specific conductivity (Sp. cond)

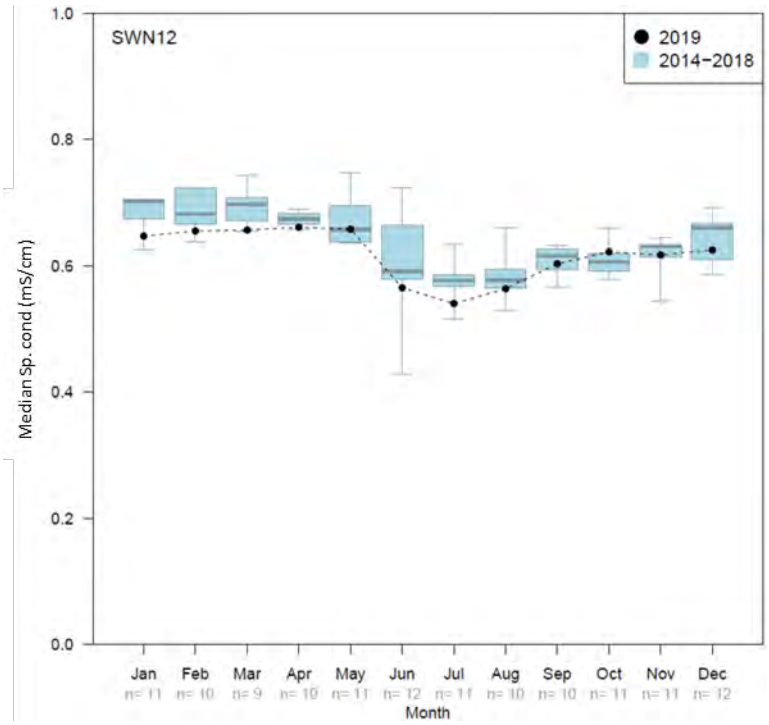

Figure 43. Monthly median Specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN12. Number of samples (n) is provided for the historical data.

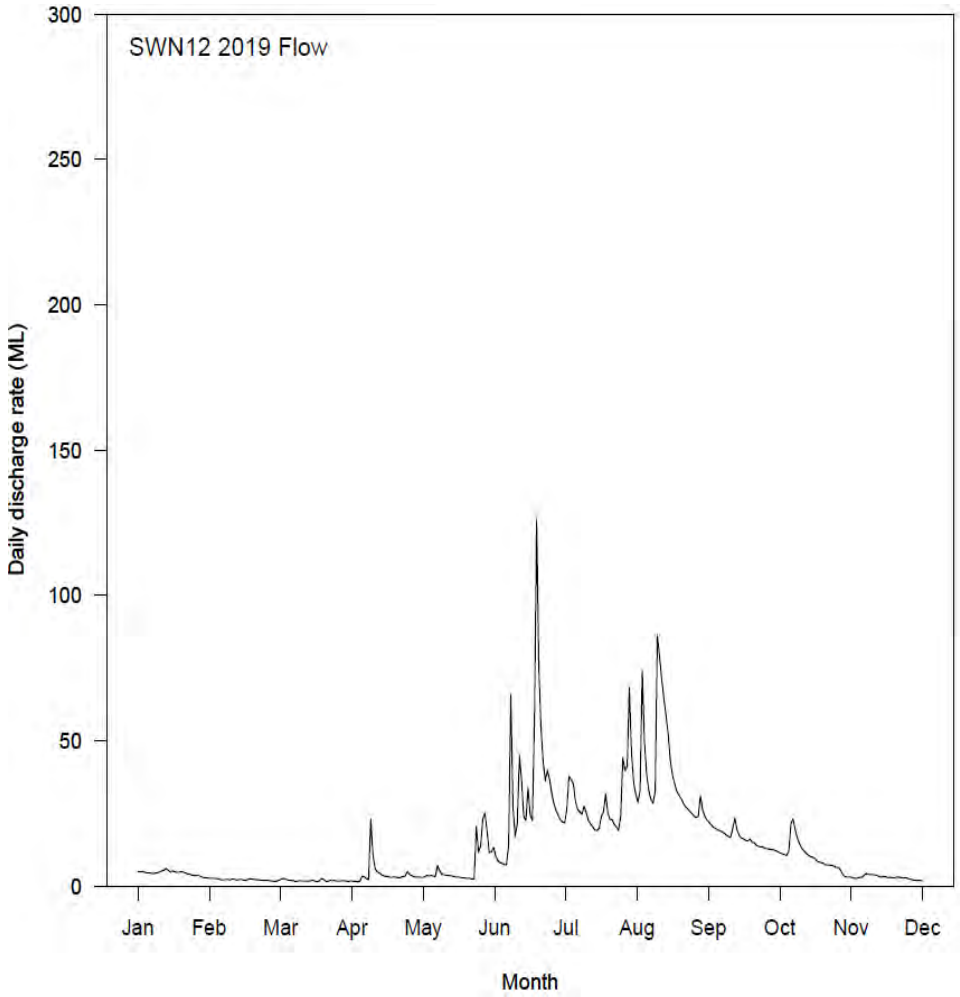

Figure 44. Daily discharge (ML) at Bennett Brook gauging station (616084 – at site of SWN12).

Concentrations of TN were at or below the ANZECC trigger values for lowland rivers of 1.2 mg/L in all months, except August 2019 (Figure 34). Concentrations of NH_3-N in 2019 were typically within the range of background data, except in May and October when concentrations were lower and November when concentrations were elevated (Figure 35). Although consistent with background trends, concentrations of NO_x-N exceeded the trigger value of 0.15 mg/L in all months except December 2019 and particularly in winter and spring (Figure 36). Concentrations of DOrgN typically followed the trend of background data (Figure 37).

Except for January, March and December 2019, TP concentrations remained below the ANZECC trigger value for lowland rivers of 0.065 mg/L (Figure 38), while FRP concentrations remained below its trigger of 0.04 mg/L for the entire 2019 reporting period (Figure 39).

Median DOC and TSS levels were usually within the range of background data (Figure 40 and 41). Median dissolved oxygen levels were above 6 mg/L throughout the year and conductivity ranged between 0.54 and 0.66 mg/L (Figures 42 and 43, Table 6).

Table 6. 2019 monthly sample numbers, minimum and maximum values at SWN12.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	3	3	2	1	2	2	3	2	1
min	0.980	0.870	0.790	0.890	0.770	0.750	1.200	1.100	1.100	1.100	0.920	0.930
max	1.300	0.920	1.100	0.900	1.200	1.000	1.200	1.400	1.200	1.100	0.990	0.930
med	**1.140**	**0.895**	**0.945**	**0.895**	**0.890**	**0.875**	**1.200**	**1.250**	**1.150**	**1.100**	**0.955**	**0.930**
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	3	3	2	1	2	2	3	2	1
min	0.037	0.043	0.031	0.029	0.019	0.046	0.040	0.035	0.028	0.023	0.035	0.027
max	0.045	0.045	0.033	0.029	0.049	0.056	0.040	0.040	0.028	0.030	0.043	0.027
med	**0.041**	**0.044**	**0.032**	**0.029**	**0.030**	**0.051**	**0.040**	**0.038**	**0.028**	**0.028**	**0.039**	**0.027**
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	3	3	2	1	2	2	3	2	1
min	0.130	0.160	0.130	0.160	0.290	0.180	0.500	0.410	0.350	0.190	0.180	0.130
max	0.220	0.170	0.200	0.160	0.310	0.370	0.500	0.440	0.380	0.360	0.220	0.130
med	**0.175**	**0.165**	**0.165**	**0.160**	**0.310**	**0.275**	**0.500**	**0.425**	**0.365**	**0.350**	**0.200**	**0.130**
DOrgN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	3	3	2	1	2	2	3	2	1
min	0.550	0.520	0.550	0.600	0.440	0.470	0.630	0.580	0.640	0.630	0.630	0.760
max	0.680	0.600	0.610	0.610	0.780	0.600	0.630	0.670	0.810	0.650	0.670	0.760
med	**0.615**	**0.560**	**0.580**	**0.605**	**0.520**	**0.535**	**0.630**	**0.625**	**0.725**	**0.640**	**0.650**	**0.760**
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	3	3	2	1	2	2	3	2	1
min	0.071	0.060	0.053	0.034	0.032	0.042	0.029	0.036	0.036	0.042	0.051	0.066
max	0.093	0.070	0.086	0.060	0.049	0.045	0.029	0.040	0.044	0.068	0.063	0.066
med	**0.082**	**0.065**	**0.070**	**0.047**	**0.034**	**0.044**	**0.029**	**0.038**	**0.040**	**0.054**	**0.057**	**0.066**
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	3	3	2	1	2	2	3	2	1
min	0.027	0.030	0.031	0.019	0.021	0.021	0.020	0.023	0.021	0.018	0.026	0.030
max	0.046	0.031	0.033	0.026	0.024	0.022	0.020	0.024	0.022	0.024	0.033	0.030
med	**0.037**	**0.031**	**0.032**	**0.023**	**0.022**	**0.022**	**0.020**	**0.024**	**0.022**	**0.022**	**0.030**	**0.030**
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	3	3	2	1	2	2	3	2	1
min	19.00	16.00	15.00	14.00	14.00	12.00	17.00	18.00	20.00	18.00	17.00	17.00
max	22.00	16.00	15.00	15.00	14.00	14.00	17.00	19.00	21.00	19.00	18.00	17.00
med	**20.50**	**16.00**	**15.00**	**14.50**	**14.00**	**13.00**	**17.00**	**18.50**	**20.50**	**18.00**	**17.50**	**17.00**
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	3	3	2	1	2	2	3	2	1
min	6.000	7.000	5.000	6.000	3.000	2.000	2.000	2.000	2.000	6.000	6.000	8.000
max	**8.000**	**9.000**	**13.000**	**8.000**	**4.000**	**2.000**	**2.000**	**3.000**	**3.000**	**6.000**	**7.000**	**8.000**
med	7.000	8.000	9.000	7.000	3.000	2.000	2.000	2.500	2.500	6.000	6.500	8.000
DO (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	3	3	2	1	2	2	3	2	1
min	6.250	6.290	5.940	6.770	7.310	6.380	7.370	7.720	6.970	6.850	6.270	6.180
max	6.530	6.350	6.990	6.830	7.350	6.950	7.370	7.760	7.500	7.110	6.620	6.180
med	**6.390**	**6.320**	**6.465**	**6.800**	**7.340**	**6.665**	**7.370**	**7.740**	**7.235**	**6.940**	**6.445**	**6.180**
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	3	3	2	1	2	2	3	2	1
min	0.645	0.652	0.652	0.645	0.589	0.546	0.540	0.564	0.574	0.564	0.615	0.625
max	0.649	0.658	0.661	0.677	0.700	0.584	0.540	0.564	0.632	0.631	0.619	0.625
med	**0.647**	**0.655**	**0.657**	**0.661**	**0.658**	**0.565**	**0.540**	**0.564**	**0.603**	**0.622**	**0.617**	**0.625**

5. Bickley Brook (SWS4)

SWS4 total nitrogen (TN)

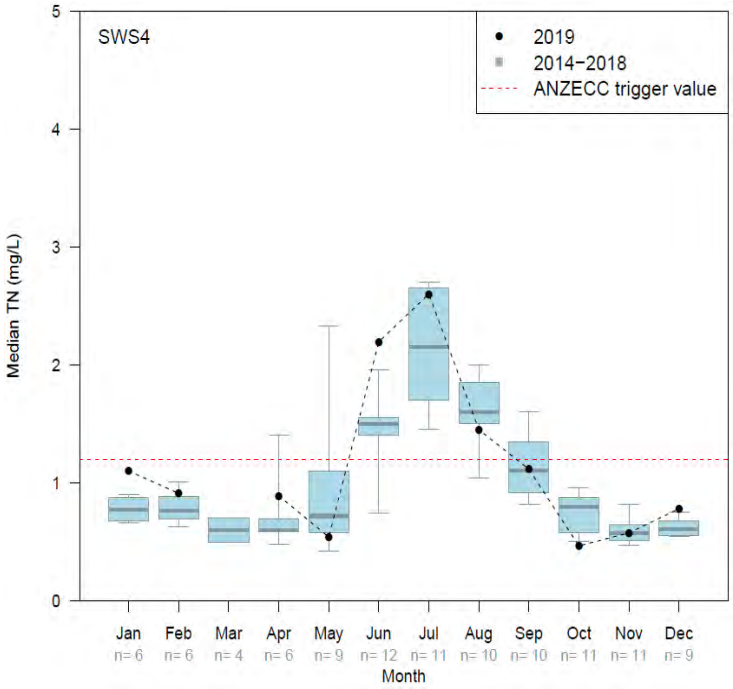

Figure 45. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS4. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

SWS4 ammoniacal nitrogen (NH_3-N)

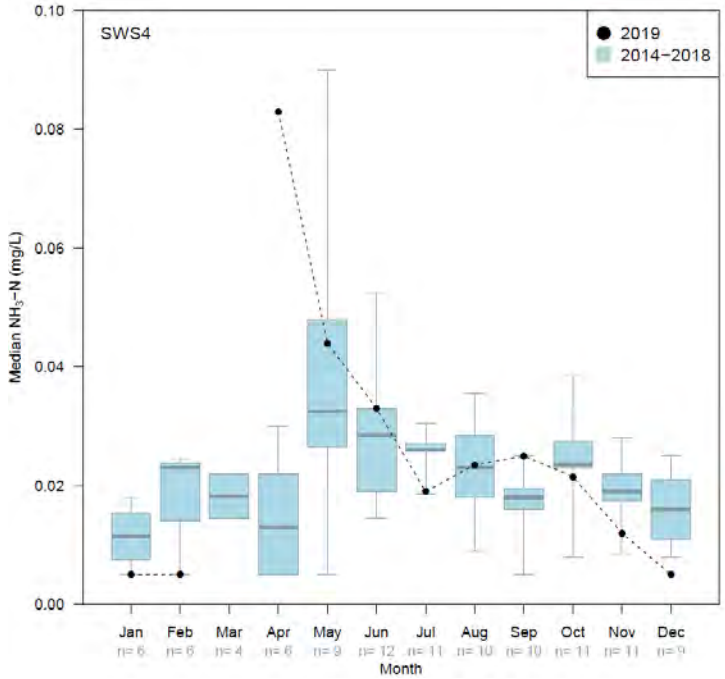

Figure 46. Monthly median ammoniacal nitrogen (NH_3-N) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS4. Number of samples (n) is provided for the historical data.

SWS4 total oxidised nitrogen (NO_x-N)

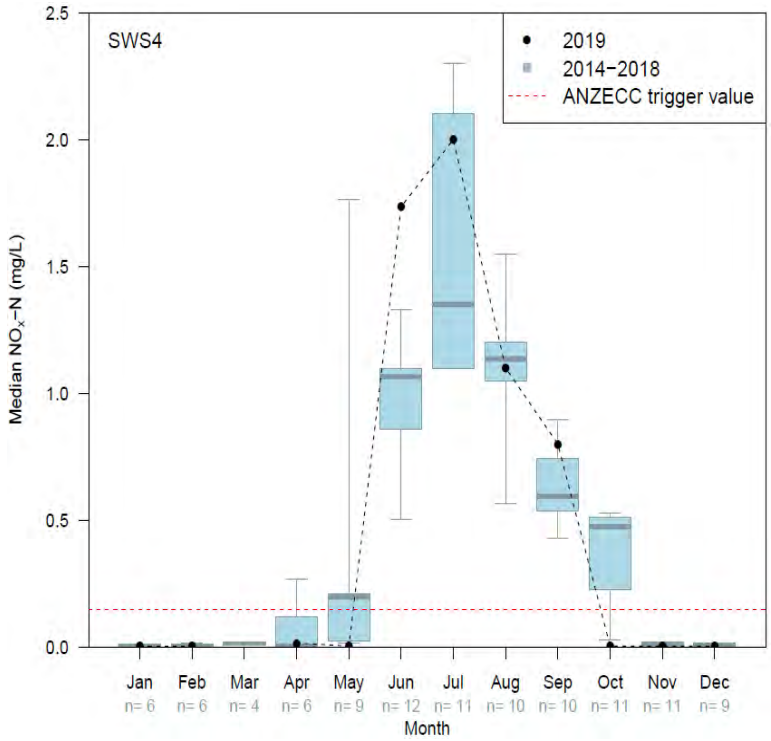

Figure 47. Monthly median Total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS4. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

SWS4 dissolved organic nitrogen (DOrgN)

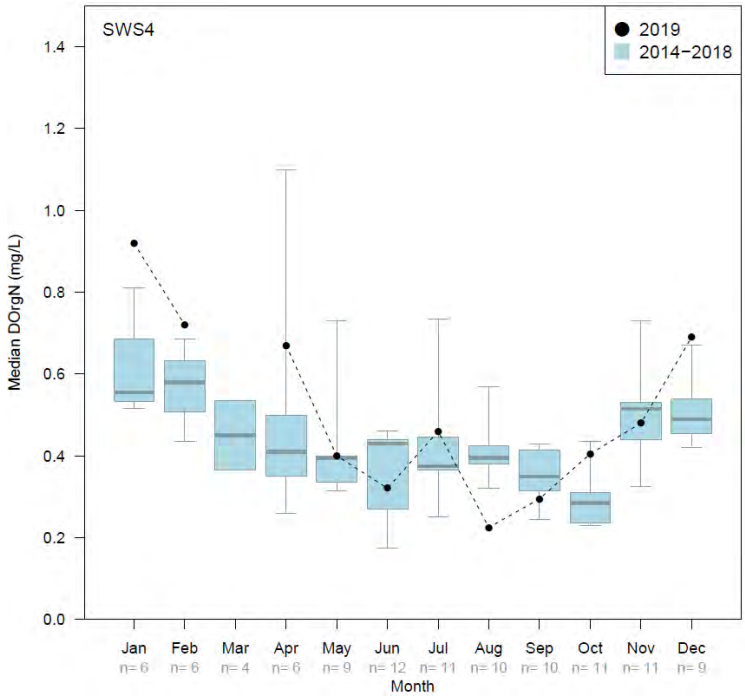

Figure 48. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS4. Number of samples (n) is provided for the historical data.

SWS4 total phosphorus (TP)

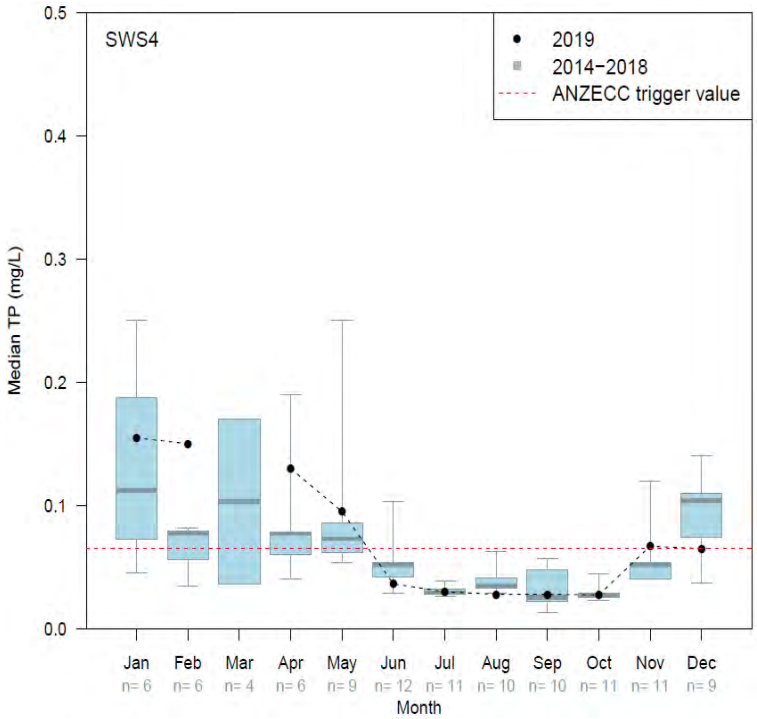

Figure 49. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS4. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

SWS4 filterable reactive phosphorus (FRP)

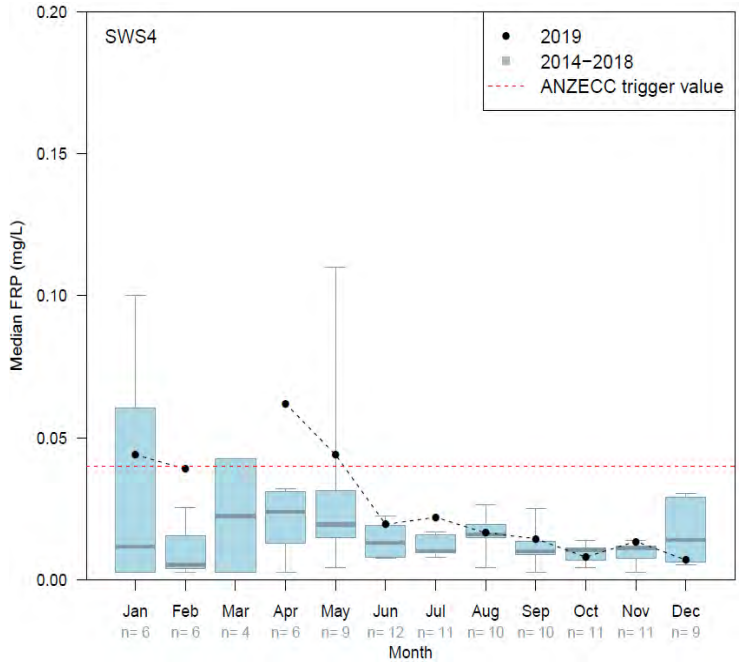

Figure 50. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS4. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

SWS4 dissolved organic carbon (DOC)

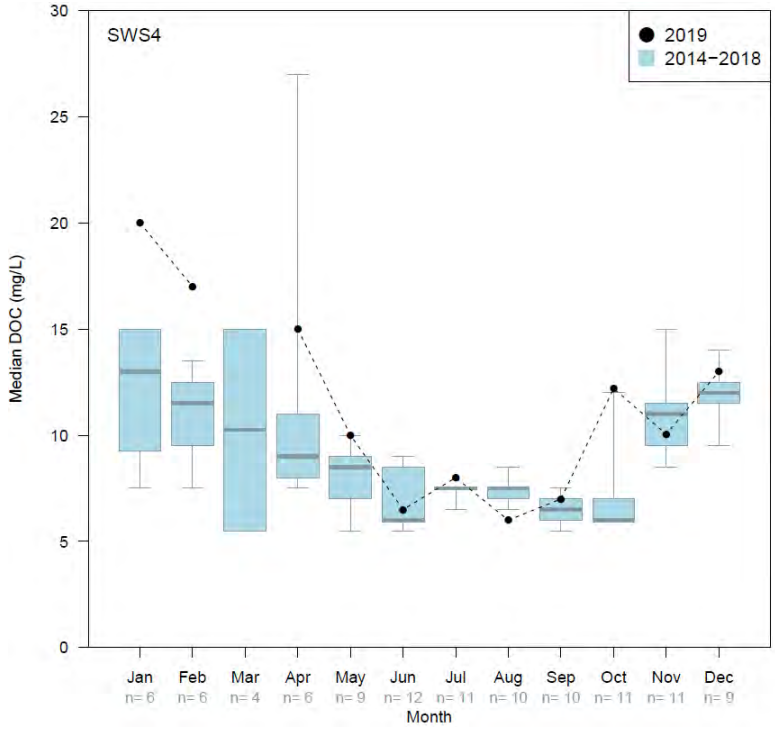

Figure 51. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS4. Number of samples (n) is provided for the historical data.

SWS4 total suspended solids (TSS)

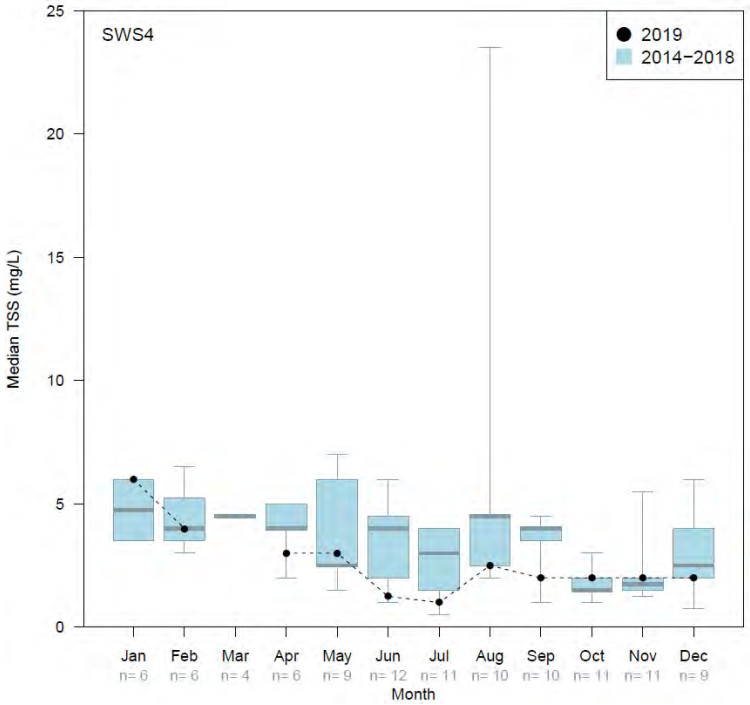

Figure 52. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS4. Number of samples (n) is provided for the historical data.

SWS4 dissolved oxygen (DO)

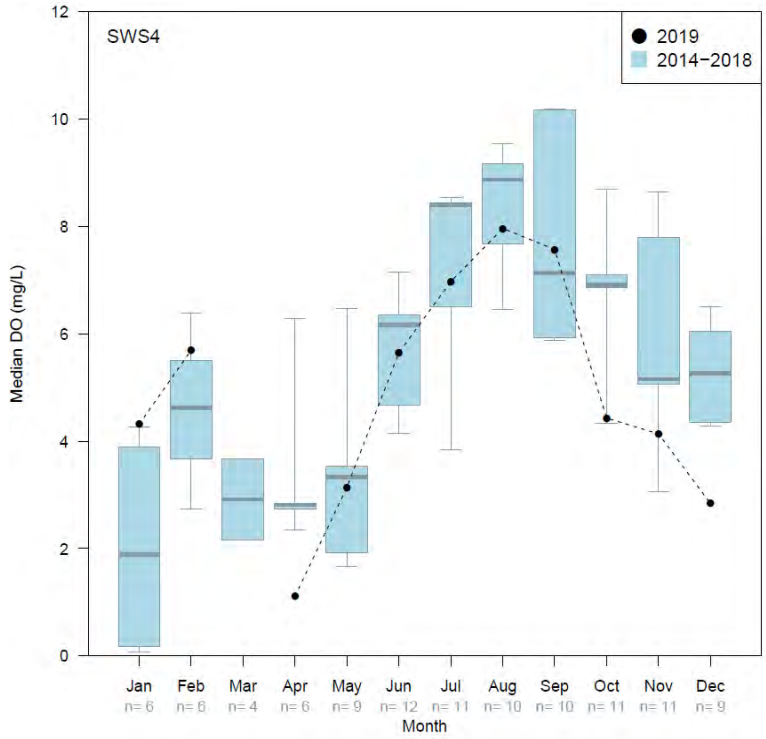

Figure 53. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS4. Number of samples (n) is provided for the historical data.

SWS4 specific conductivity (Sp. cond)

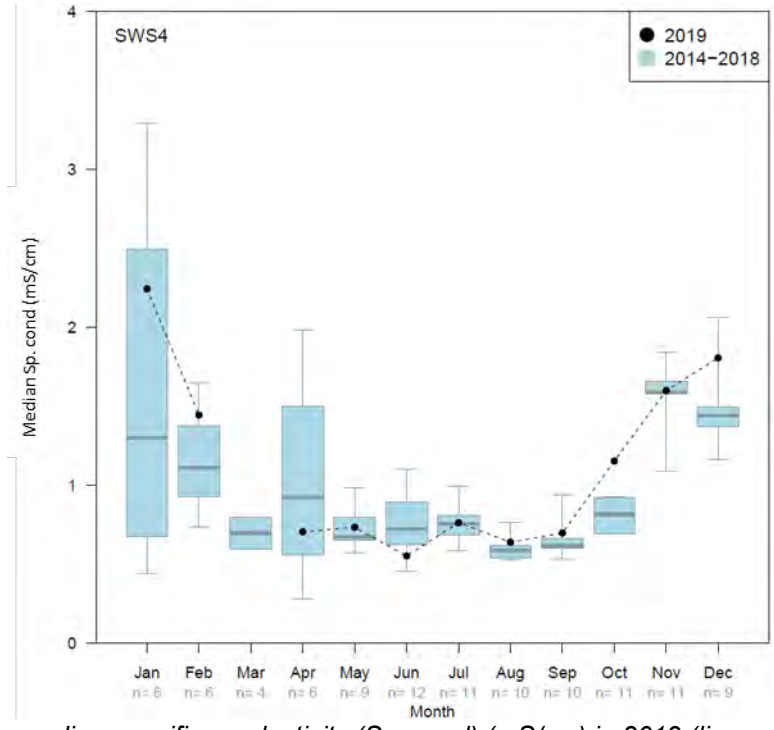

Figure 54. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS4. Number of samples (n) is provided for the historical data.

Table 7. 2019 monthly sample numbers, minimum and maximum values at SWS4.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	2	1	0	1	3	2	1	2	2	3	2	1
min	1.000	0.910		0.890	0.530	0.990	2.600	1.300	0.830	0.420	0.530	0.780
max	1.200	0.910		0.890	0.550	3.400	2.600	1.600	1.400	0.510	0.620	0.780
med	**1.100**	**0.910**		**0.890**	**0.540**	**2.195**	**2.600**	**1.450**	**1.115**	**0.465**	**0.575**	**0.780**
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	1	0	1	3	2	1	2	2	3	2	1
min	0.005	0.005		0.083	0.033	0.027	0.019	0.021	0.022	0.021	0.011	0.005
max	0.005	0.005		0.083	0.092	0.039	0.019	0.026	0.028	0.022	0.013	0.005
med	**0.005**	**0.005**		**0.083**	**0.044**	**0.033**	**0.019**	**0.024**	**0.025**	**0.022**	**0.012**	**0.005**
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	1	0	1	3	2	1	2	2	3	2	1
min	0.005	0.005		0.016	0.005	0.870	2.000	1.100	0.500	0.005	0.005	0.005
max	0.005	0.005		0.016	0.005	2.600	2.000	1.100	1.100	0.005	0.005	0.005
med	**0.005**	**0.005**		**0.016**	**0.005**	**1.735**	**2.000**	**1.100**	**0.800**	**0.005**	**0.005**	**0.005**
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	1	0	1	3	2	1	2	2	3	2	1
min	0.920	0.720		0.670	0.360	0.062	0.460	0.140	0.290	0.360	0.460	0.690
max	0.920	0.720		0.670	0.440	0.580	0.460	0.310	0.300	0.450	0.500	0.690
med	**0.920**	**0.720**		**0.670**	**0.400**	**0.321**	**0.460**	**0.225**	**0.295**	**0.405**	**0.480**	**0.690**
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	1	0	1	3	2	1	2	2	3	2	1
min	0.120	0.150		0.130	0.057	0.033	0.030	0.020	0.018	0.027	0.058	0.065
max	0.190	0.150		0.130	0.110	0.040	0.030	0.036	0.038	0.028	0.076	0.065
med	**0.155**	**0.150**		**0.130**	**0.095**	**0.037**	**0.030**	**0.028**	**0.028**	**0.028**	**0.067**	**0.065**
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	1	0	1	3	2	1	2	2	3	2	1
min	0.027	0.039		0.062	0.022	0.018	0.022	0.012	0.011	0.007	0.012	0.007
max	0.061	0.039		0.062	0.046	0.021	0.022	0.021	0.018	0.009	0.015	0.007
med	**0.044**	**0.039**		**0.062**	**0.044**	**0.020**	**0.022**	**0.017**	**0.015**	**0.008**	**0.014**	**0.007**
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	1	0	1	3	2	1	2	2	3	2	1
min	19.00	17.00		15.00	9.00	5.000	8.000	6.000	7.000	9.400	9.100	13.00
max	21.00	17.00		15.00	10.00	8.000	8.000	6.000	7.000	15.00	11.00	13.00
med	**20.00**	**17.00**		**15.00**	**10.00**	**6.500**	**8.000**	**6.000**	**7.000**	**12.20**	**10.05**	**13.00**
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	1	0	1	3	2	1	2	2	3	2	1
min	5.000	4.000		3.000	2.000	0.500	1.000	2.000	1.000	1.000	2.000	2.000
max	7.000	4.000		3.000	4.000	2.000	1.000	3.000	3.000	3.000	2.000	2.000
med	**6.000**	**4.000**		**3.000**	**3.000**	**1.250**	**1.000**	**2.500**	**2.000**	**2.000**	**2.000**	**2.000**
DO (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	2	1	0	1	3	2	1	2	2	3	2	1
min	3.230	5.690		1.110	2.020	5.530	6.970	7.710	5.580	4.130	3.700	2.840
max	5.400	5.690		1.110	4.940	5.760	6.970	8.210	9.560	6.040	4.570	2.840
med	**4.315**	**5.690**		**1.110**	**3.140**	**5.645**	**6.970**	**7.960**	**7.570**	**4.430**	**4.135**	**2.840**
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	1	0	1	3	2	1	2	2	3	2	1
min	2.241	1.444		0.704	0.529	0.282	0.762	0.562	0.516	0.968	1.568	1.806
max	2.244	1.444		0.704	0.788	0.821	0.762	0.715	0.877	1.640	1.630	1.806
med	**2.243**	**1.444**		**0.704**	**0.733**	**0.552**	**0.762**	**0.639**	**0.697**	**1.152**	**1.599**	**1.806**

NB: Daily discharge data was not available for this site for the duration of the 2019 sampling period. No samples were collected from Bickley Brook in March 2019 due to the absence of flow.

Concentrations of the various analytes typically followed the trends of background data (Figures 45-54, Table 7). However, concentrations of DOrgN, TP and DOC were elevated in late summer and autumn and NH_3-N (0.83 mg/L; Figure 46) and FRP (0.062 mg/L; Figure 50) were highly elevated in April 2019. Due to the highly modified nature of this catchment and its unpredictable response to rainfall (Figure 341), variations of this nature are not unusual (see Swan Canning catchment data report 2018).

TN and NO_x-N concentrations greatly exceeded the ANZECC trigger values for lowland rivers of 1.2 mg/L and 0.15 mg/L, respectively throughout much of winter (specifically from June to August for TN and June to September for NO_x-N), which is likely attributable to increased seasonal flow (Figures 45 and 47). Elevated TP concentrations exceeded the ANZECC trigger value of 0.065 mg/L between January and May 2019 (excluding March which was not sampled) and marginally exceeded the trigger in November 2019 (Figure 49). FRP exceeded the trigger of 0.04 mg/L in January, April, and May (Figure 50).

In 2019, median DOC concentrations were generally within the historic range, except in January and February when values exceeded 17 mg/L. TSS median values ranged from 1 to 6 mg/L and were within the background range. Dissolved oxygen levels were typically above 4 mg/L, but dropped below this level in April, May and December, with only 1.1 mg/L being recorded in April. Median conductivity ranged between 0.63 and 2.24 mS/cm and were within the historic levels (Figures 51-54, Table 7).

6. Blackadder Creek (SWN8)

SWN8 total nitrogen (TN)

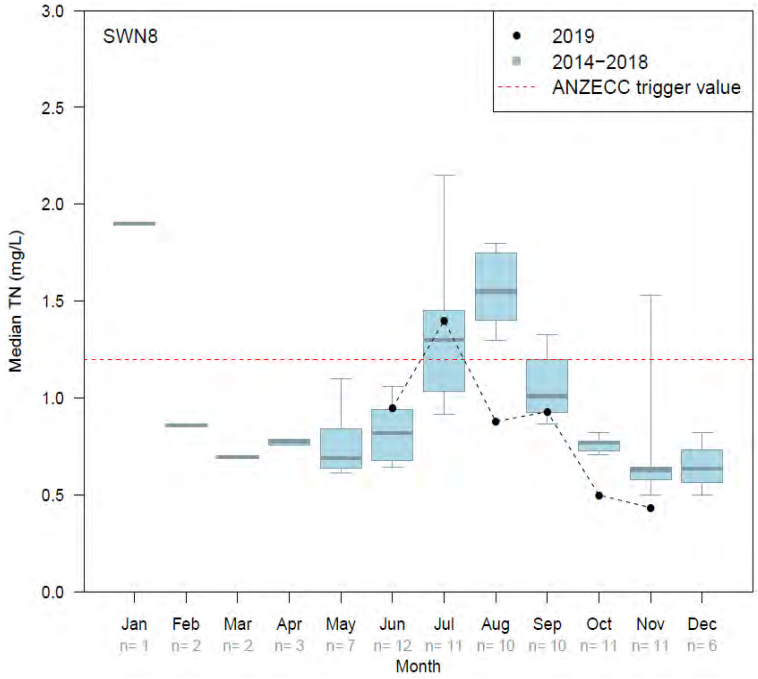

Figure 55. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN8. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

SWN8 ammoniacal nitrogen (NH_3-N)

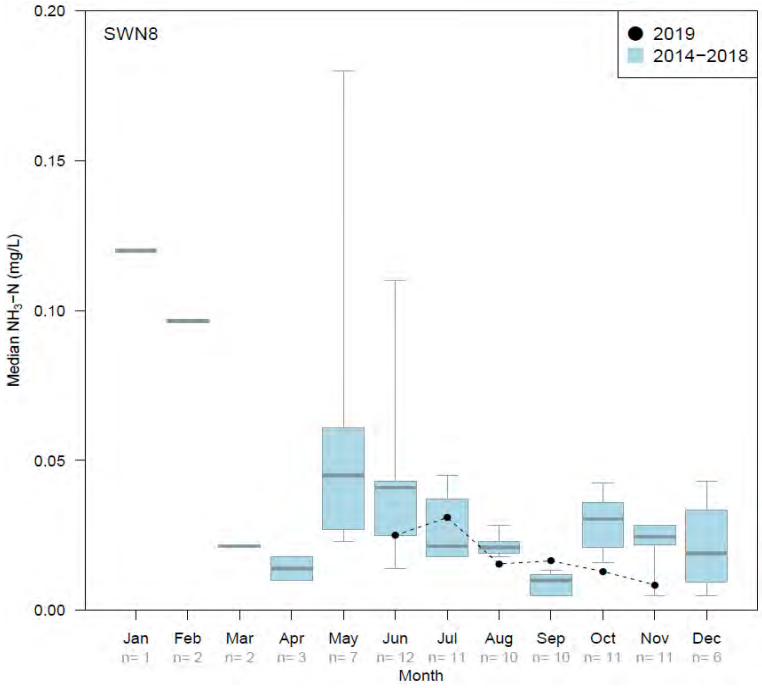

Figure 56. Ammoniacal nitrogen Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN8. Number of samples (n) is provided for the historical data.

SWN8 total oxidised nitrogen (NO_x-N)

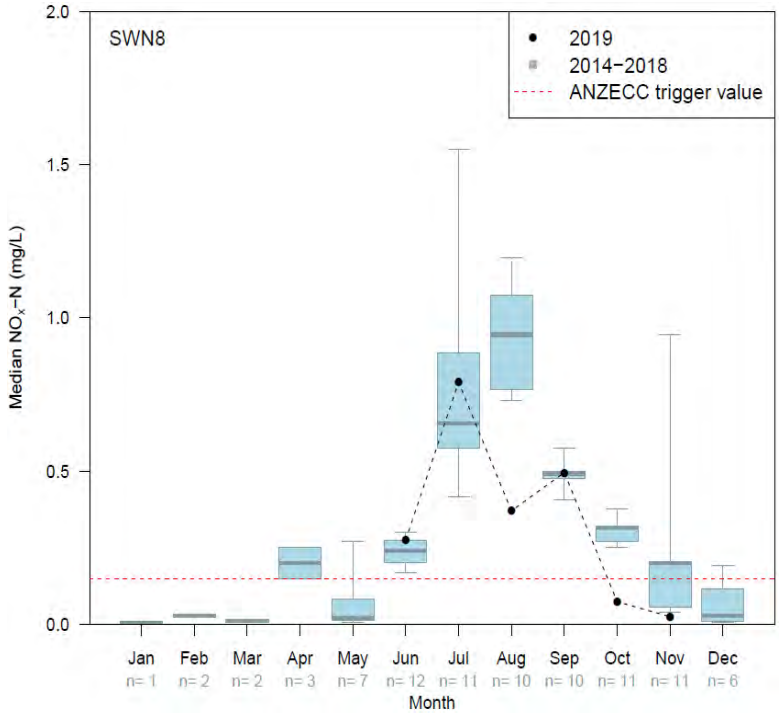

Figure 57. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN8. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

SWN8 dissolved organic nitrogen (DOrgN)

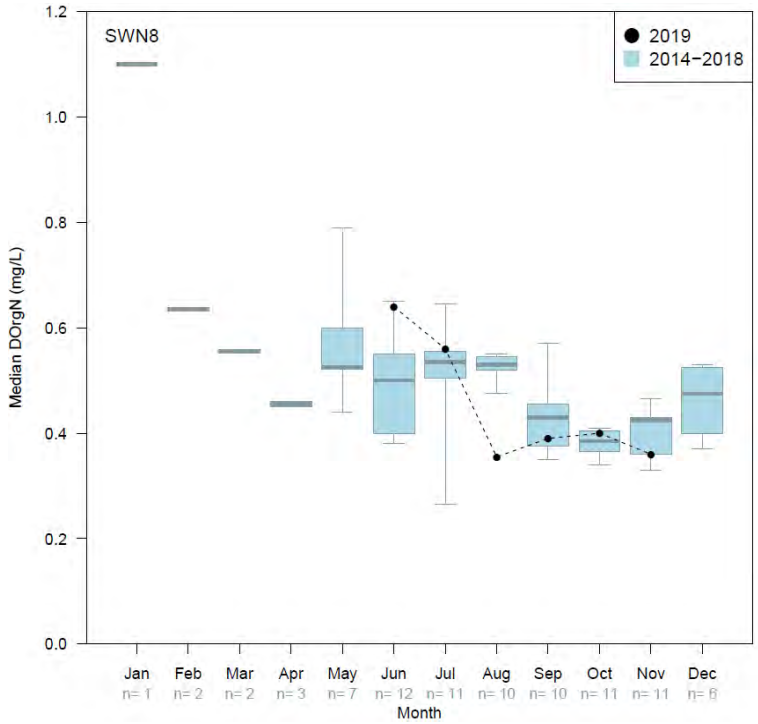

Figure 58. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN8. Number of samples (n) is provided for the historical data.

SWN8 total phosphorus (TP)

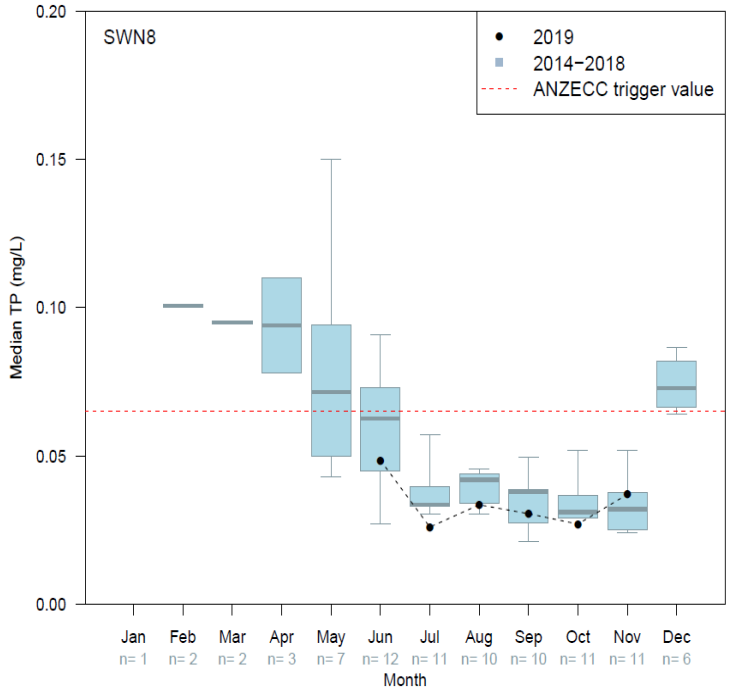

Figure 59. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN8. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

SWN8 filterable reactive phosphorus (FRP)

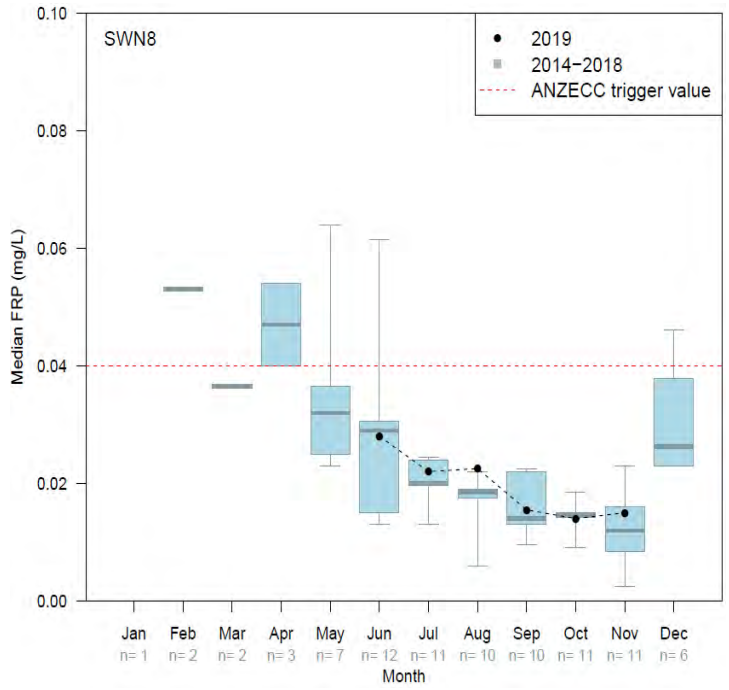

Figure 60. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN8. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

SWN8 dissolved organic carbon (DOC)

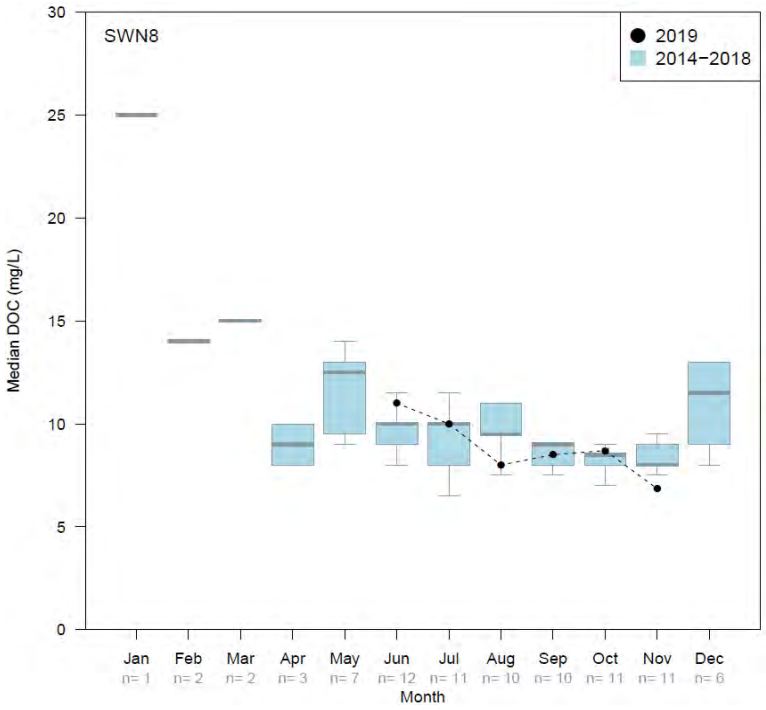

Figure 61. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN8. Number of samples (n) is provided for the historical data.

SWN8 total suspended solids (TSS)

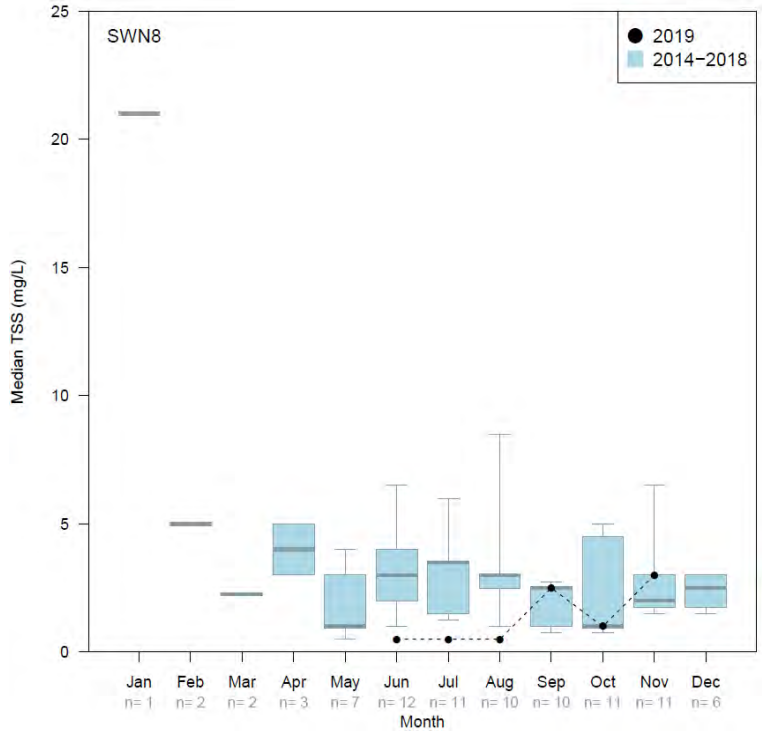

Figure 62. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN8. Number of samples (n) is provided for the historical data.

SWN8 dissolved oxygen (DO)

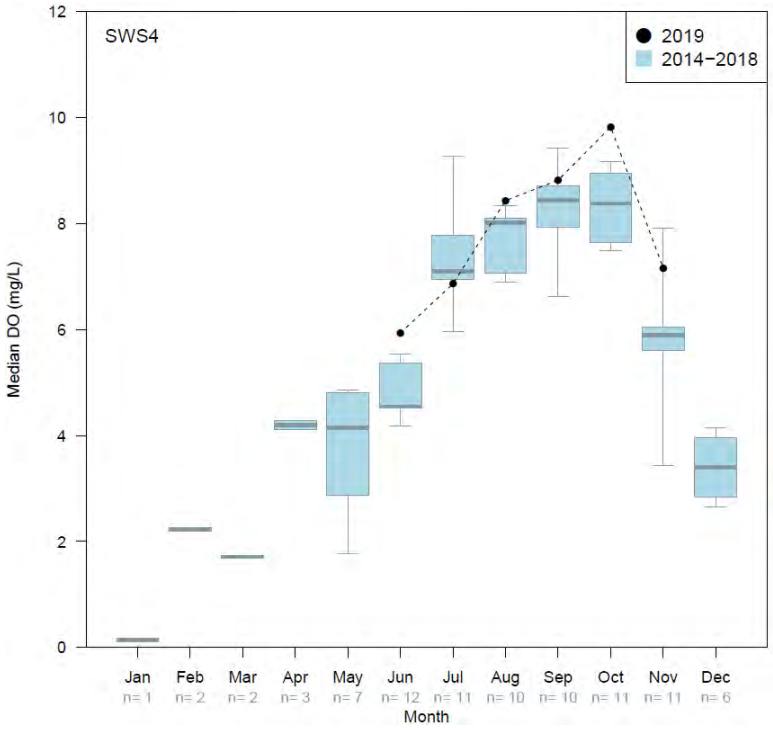

Figure 63. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN8. Number of samples (n) is provided for the historical data.

SWN8 specific conductivity (Sp. cond)

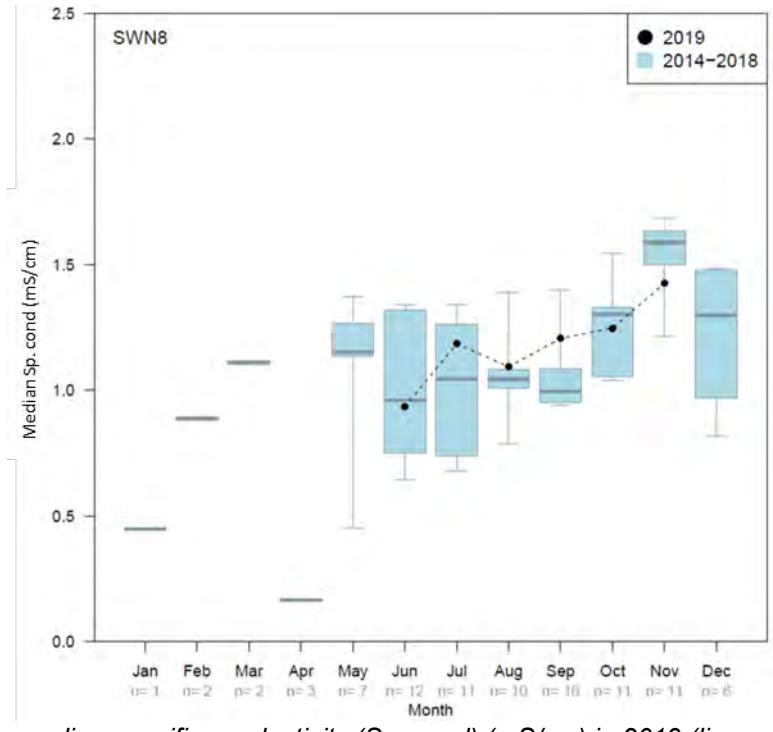

Figure 64. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN8. Number of samples (n) is provided for the historical data.

Table 8. 2019 monthly sample numbers, minimum and maximum values at SWN8.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	2	1	2	2	3	2	0
min						0.700	1.400	0.880	0.660	0.440	0.290	
max						1.200	1.400	0.880	1.200	0.630	0.580	
med						**0.950**	**1.400**	**0.880**	**0.930**	**0.500**	**0.435**	
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	2	1	2	2	3	2	0
min						0.018	0.031	0.013	0.016	0.005	0.005	
max						0.032	0.031	0.018	0.017	0.014	0.012	
med						**0.025**	**0.031**	**0.016**	**0.017**	**0.013**	**0.009**	
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	2	1	2	2	3	2	0
min						0.170	0.790	0.250	0.280	0.032	0.005	
max						0.380	0.790	0.490	0.710	0.160	0.045	
med						**0.275**	**0.790**	**0.370**	**0.495**	**0.074**	**0.025**	
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	2	1	2	2	3	2	0
min						0.490	0.560	0.300	0.350	0.360	0.280	
max						0.790	0.560	0.410	0.430	0.410	0.440	
med						**0.640**	**0.560**	**0.355**	**0.390**	**0.400**	**0.360**	
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	2	1	2	2	3	2	0
min						0.044	0.026	0.033	0.023	0.020	0.028	
max						0.053	0.026	0.034	0.038	0.029	0.046	
med						**0.049**	**0.026**	**0.034**	**0.031**	**0.027**	**0.037**	
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	2	1	2	2	3	2	0
min						0.022	0.022	0.021	0.012	0.009	0.013	
max						0.034	0.022	0.024	0.019	0.015	0.017	
med						**0.028**	**0.022**	**0.023**	**0.016**	**0.014**	**0.015**	
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	2	1	2	2	3	2	0
min						9.000	10.00	8.000	8.000	8.200	5.700	
max						13.00	10.00	8.000	9.000	9.000	8.000	
med						**11.00**	**10.00**	**8.000**	**8.500**	**8.700**	**6.850**	
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	2	1	2	2	3	2	0
min						0.500	0.500	0.500	2.000	0.500	2.000	
max						0.500	0.500	0.500	3.000	5.000	4.000	
med						**0.500**	**0.500**	**0.500**	**2.500**	**1.000**	**3.000**	
DO (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	2	1	2	2	3	2	0
min						5.440	6.860	8.240	8.500	8.630	4.670	
max						6.430	6.860	8.620	9.130	10.820	9.650	
med						**5.935**	**6.860**	**8.430**	**8.815**	**9.820**	**7.160**	
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	2	1	2	2	3	2	0
min						0.748	1.186	0.980	0.966	1.248	1.413	
max						1.121	1.186	1.208	1.448	1.566	1.439	
med						**0.935**	**1.186**	**1.094**	**1.207**	**1.350**	**1.426**	

NB: Daily discharge data is not available for SWN8 as this site is not gauged. Due to the ephemeral nature of flow in Blackadder Creek and the below average rainfall in 2019, samples were only collected between June and November 2019.

Median values for TN, NH_3-N, NO_x-N generally followed the trends of the background data but were often lower than the background range between August and November 2019 (Figures 55-57). DOrgN also tended to follow the trend in historic data, except in August 2019 when it was significantly lower (Figure 58).

Concentrations of TN and NO_x-N were likely driven by increased flow over winter with exceedances of the ANZECC trigger values (1.2 mg/L and 0.15 mg/L, respectively) in July 2019 for TN and from June to September 2019 for NO_x-N (Figures 55 and 57).

Both TP and FRP concentrations remained below their respective trigger values of 0.065 mg/L and 0.04 mg/L for all months sampled in 2019 and were generally within the historical range (Figures 59 and 60).

In 2019, median DOC levels were generally within the historic range, but were slightly lower (6.85 mg/L) in November (Figure 61, Table 8). TSS levels in Blackadder Creek were lower than the historic range between June and August but tended to follow historic trends between September and November (Figure 62). Dissolved oxygen levels were typically above 6 mg/L during the flow period and conductivity ranged between 0.93 and 1.42 mS/cm, which was consistent with historic data (Figures 63 and 64, Table 8).

7. Bull Creek (SCCIS2)

SCCIS2 total nitrogen (TN)

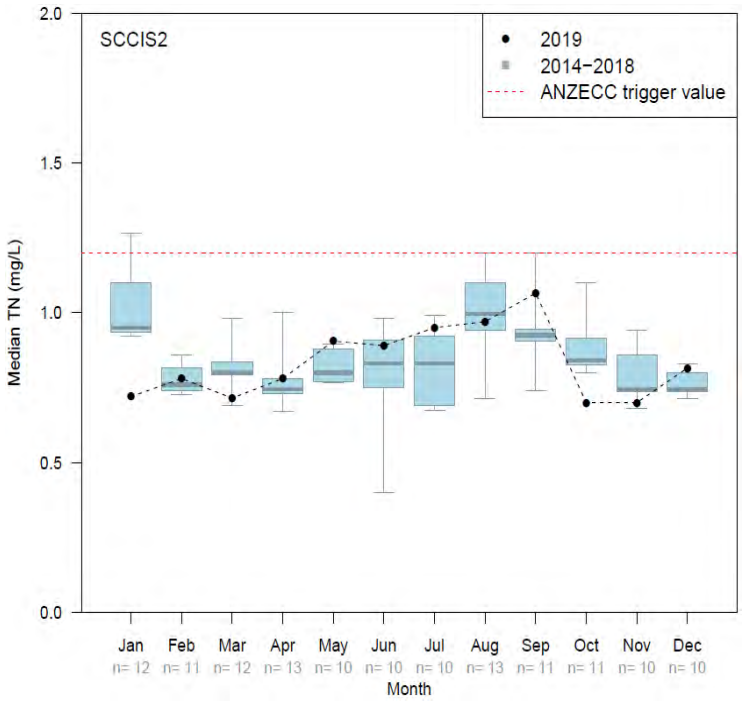

Figure 65. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS2. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

SCCIS2 ammoniacal nitrogen (NH_3-N)

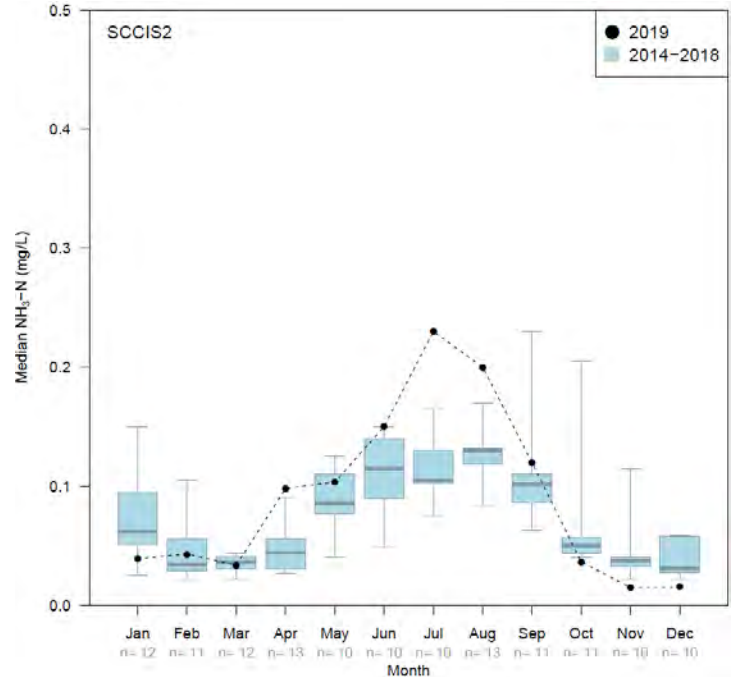

Figure 66. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS2. Number of samples (n) is provided for the historical data.

SCCIS2 total oxidised nitrogen (NO_x-N)

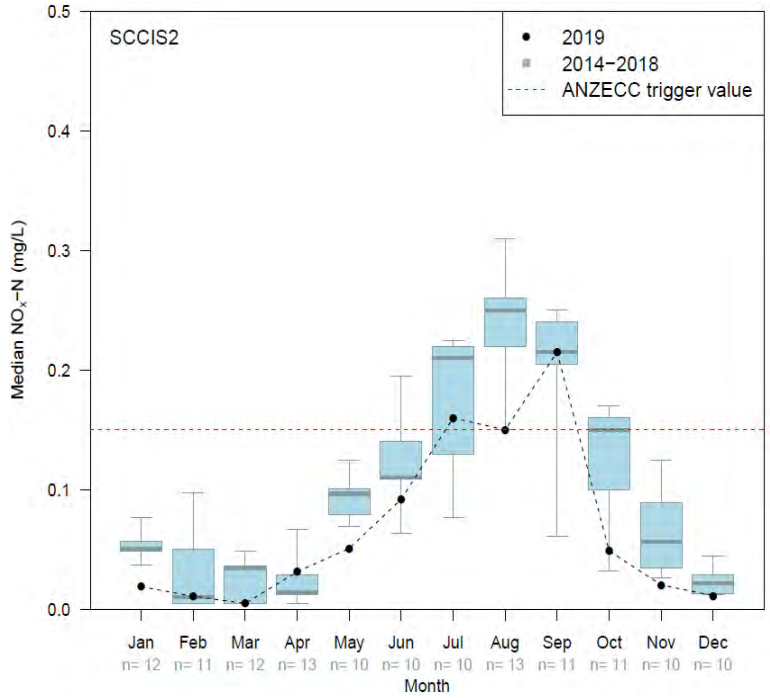

Figure 67. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS2. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

SCCIS2 dissolved organic nitrogen (DOrgN)

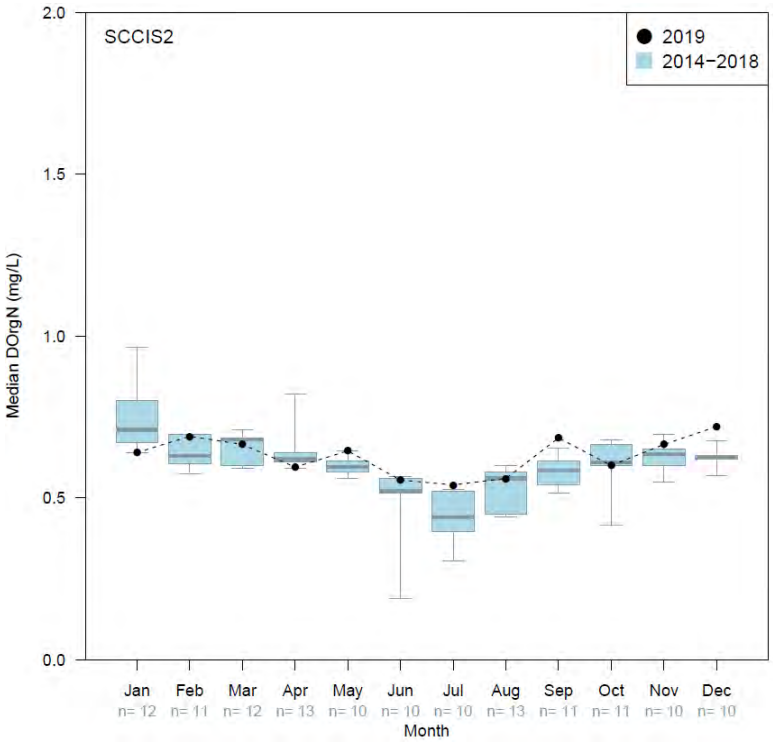

Figure 68. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS2. Number of samples (n) is provided for the historical data.

SCCIS2 total phosphorus (TP)

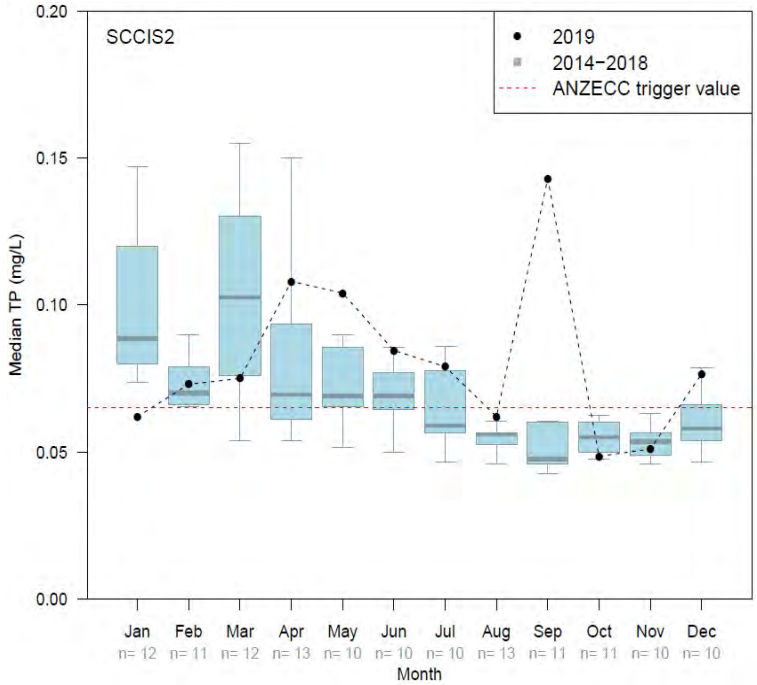

Figure 69. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS2. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

SCCIS2 filterable reactive phosphorus (FRP)

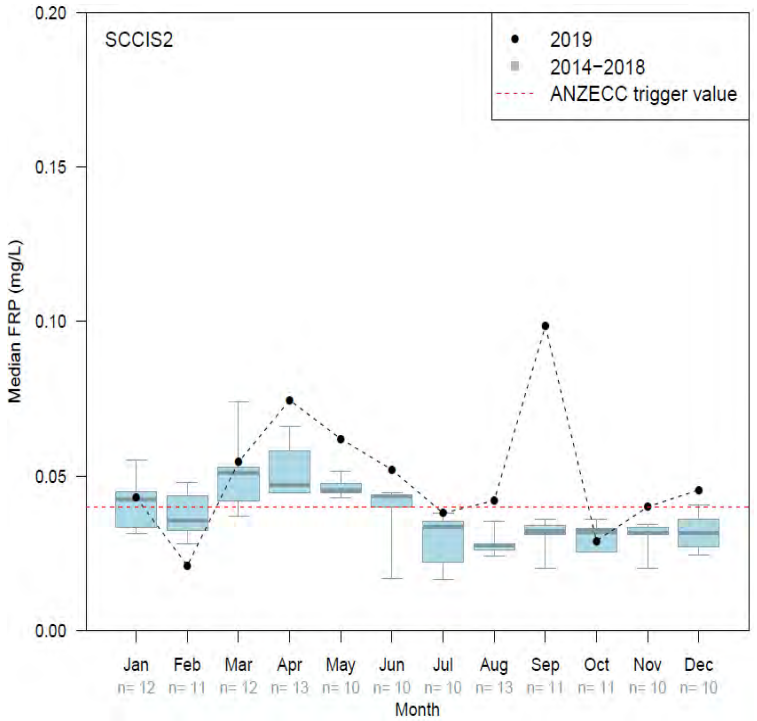

Figure 70. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS2. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

SCCIS2 dissolved organic carbon (DOC)

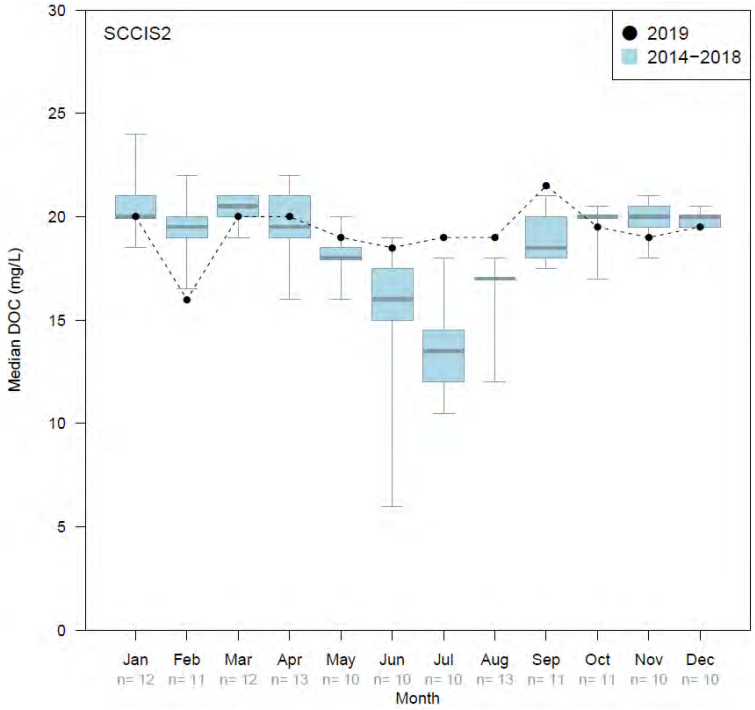

Figure 71. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS2. Number of samples (n) is provided for the historical data.

SCCIS2 total suspended solids (TSS)

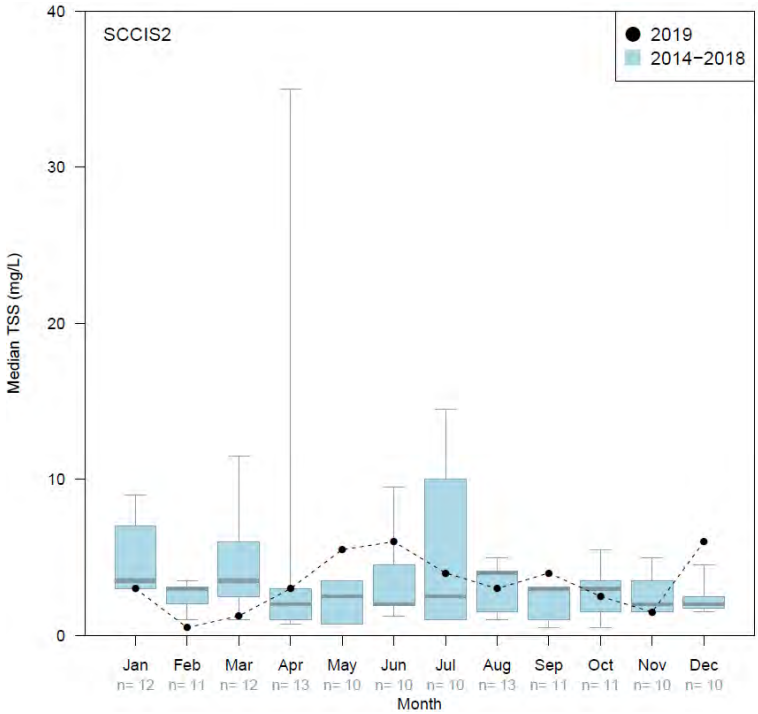

Figure 72. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS2. Number of samples (n) is provided for the historical data.

SCCIS2 dissolved oxygen (DO)

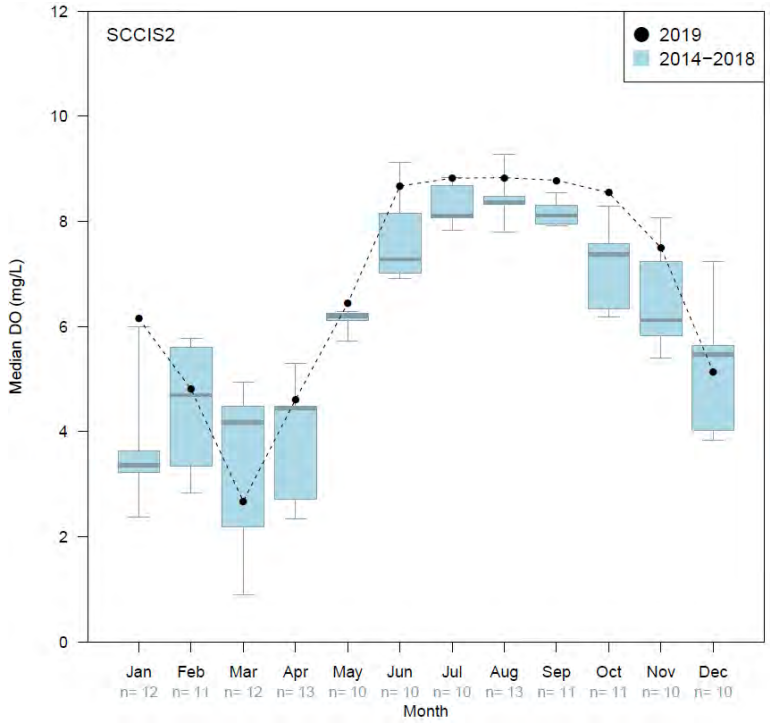

Figure 73. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS2. Number of samples (n) is provided for the historical data.

SCCIS2 specific conductivity (Sp. cond)

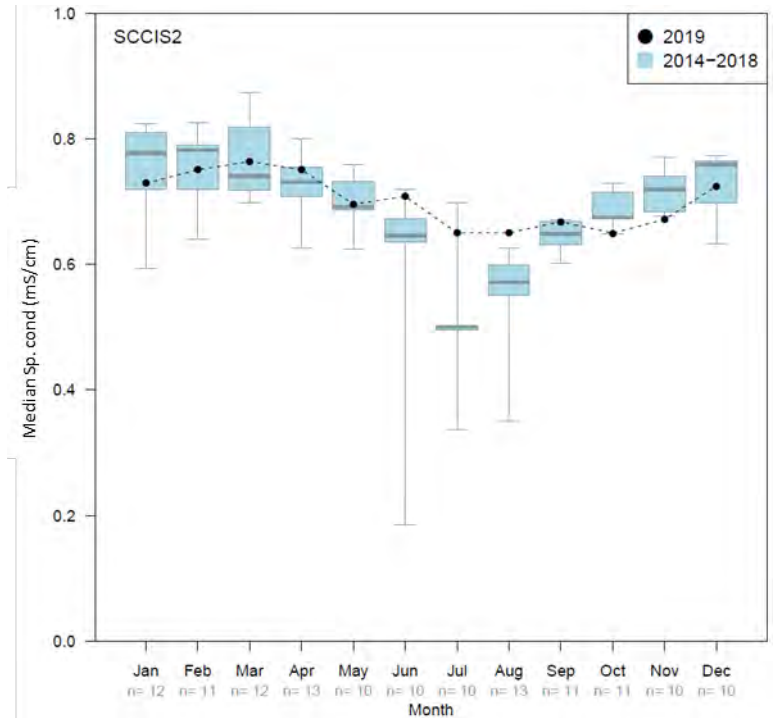

Figure 74. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS2. Number of samples (n) is provided for the historical data.

Table 9. 2019 monthly sample numbers, minimum and maximum values at SCCIS2.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	1	2	2	2	2
min	0.710	0.780	0.710	0.710	0.900	0.850	0.930	0.970	0.830	0.650	0.680	0.740
max	0.850	0.780	0.720	0.850	0.910	0.930	1.100	0.970	1.300	0.750	0.720	0.890
med	0.720	0.780	0.715	0.780	0.905	0.890	0.950	0.970	1.065	0.700	0.700	0.815
NH_3-N (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	1	2	2	2	2
min	0.037	0.043	0.029	0.086	0.067	0.120	0.190	0.200	0.120	0.028	0.005	0.005
max	0.051	0.043	0.038	0.110	0.140	0.180	0.230	0.200	0.120	0.045	0.025	0.026
med	0.039	0.043	0.034	0.098	0.104	0.150	0.230	0.200	0.120	0.037	0.015	0.016
NO_x-N (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	1	2	2	2	2
min	0.013	0.011	0.005	0.011	0.029	0.084	0.130	0.150	0.120	0.021	0.016	0.011
max	0.044	0.011	0.005	0.052	0.073	0.100	0.170	0.150	0.310	0.077	0.025	0.012
med	0.019	0.011	0.005	0.032	0.051	0.092	0.160	0.150	0.215	0.049	0.021	0.012
DOrgN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	1	2	2	2	2
min	0.610	0.690	0.660	0.510	0.630	0.520	0.470	0.560	0.560	0.590	0.650	0.640
max	0.660	0.690	0.670	0.680	0.660	0.590	0.670	0.560	0.810	0.610	0.680	0.800
med	0.640	0.690	0.665	0.595	0.645	0.555	0.540	0.560	0.685	0.600	0.665	0.720
TP (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	1	2	2	2	2
min	0.060	0.073	0.072	0.096	0.098	0.075	0.057	0.062	0.066	0.047	0.045	0.063
max	0.065	0.073	0.078	0.120	0.110	0.094	0.090	0.062	0.220	0.050	0.057	0.090
med	0.062	0.073	0.075	0.108	0.104	0.085	0.079	0.062	0.143	0.049	0.051	0.077
FRP (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	1	2	2	2	2
min	0.032	0.021	0.052	0.071	0.059	0.051	0.037	0.042	0.037	0.023	0.035	0.045
max	0.047	0.021	0.057	0.078	0.065	0.053	0.042	0.042	0.160	0.035	0.045	0.046
med	0.043	0.021	0.055	0.075	0.062	0.052	0.038	0.042	0.099	0.029	0.040	0.046
DOC (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	1	2	2	2	2
min	20.00	16.00	20.00	19.00	19.00	18.00	17.00	19.00	19.00	19.00	19.00	19.00
max	21.00	16.00	20.00	21.00	19.00	19.00	19.00	19.00	24.00	20.00	19.00	20.00
med	20.00	16.00	20.00	20.00	19.00	18.50	19.00	19.00	21.50	19.50	19.00	19.50
TSS (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	1	2	2	2	2
min	0.500	0.500	0.500	2.000	4.000	3.000	4.000	3.000	4.000	1.000	1.000	2.000
max	10.000	0.500	2.000	4.000	7.000	9.000	14.000	3.000	4.000	4.000	2.000	10.000
med	3.000	0.500	1.250	3.000	5.500	6.000	4.000	3.000	4.000	2.500	1.500	6.000
DO (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	1	2	2	2	2
min	5.630	3.930	1.760	2.910	5.990	8.260	8.670	8.830	8.660	8.100	7.270	4.510
max	6.670	5.680	3.590	6.310	6.890	9.080	8.940	8.830	8.900	8.990	7.720	5.770
med	6.150	4.805	2.675	4.610	6.440	8.670	8.820	8.830	8.780	8.545	7.495	5.140
Sp. cond (mS/cm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	1	2	2	2	2
min	0.705	0.749	0.755	0.741	0.679	0.686	0.648	0.650	0.641	0.602	0.668	0.722
max	0.784	0.752	0.772	0.760	0.712	0.730	0.664	0.650	0.695	0.697	0.675	0.726
med	0.729	0.751	0.764	0.751	0.696	0.708	0.650	0.650	0.668	0.650	0.671	0.724

NB: Daily discharge data is not available for SCCIS2 as this site is not gauged.

Data for the various analytes for SCCIS2 generally exhibited a seasonal pattern in 2019 and remined largely within the range of the background data (Figures 65-74, Table 9). There was however a noticeable reduction in TN and NO_x-N in January 2019 with the median concentration well below the range of the background data (Figure 65-67). Elevated NH_3-N concentrations were observed in July and August (Figure 66), which exceeded the range of the background data and were likely attributable to a winter flow event.

Throughout the 2019 reporting period, TN concentrations remained below the ANZECC trigger values of 1.2 mg/L for lowland rivers (Figure 65). Concentrations of NO_x-N typically remained below the trigger value (0.15 mg/L), except in July and September, which were likely a response to seasonal flow (Figure 67).

Concentrations of TP and FRP exceeded their ANZECC trigger values (0.065 mg/L and 0.04 mg/L, respectively) from Feb to July for TP and March to June and August for FRP and in September for both TP and FRP (Figures 69 and 70). The noticeable peak in TP (0.22 mg/L) and FRP (0.16 mg/L) in September greatly exceeded the range of background data (Figures 69 and 70, Table 9).

In 2019, median DOC levels ranged between 16 and 21.5 mg/L and were outside the historic range in February and between July and September (Figure 71, Table 9). TSS was generally quite low, ranging from 0.5 to 6 mg/L, but with medians outside the range of historic data in February, May, September, and December (Figure 72, Table 9). Dissolved oxygen levels were typically greater than 4 mg/L, apart from March when median oxygen levels were 2.6 mg/L (Figure 73, Table 9). This value was within the range of historical data for this catchment, which is typically low between January and April. Conductivity was generally within the historic range, except for August when the median value was slightly higher at 0.65 mS/cm (Figure 74, Table 9).

8. Bull Creek (BAMDKD)

BAMDKD total nitrogen (TN)

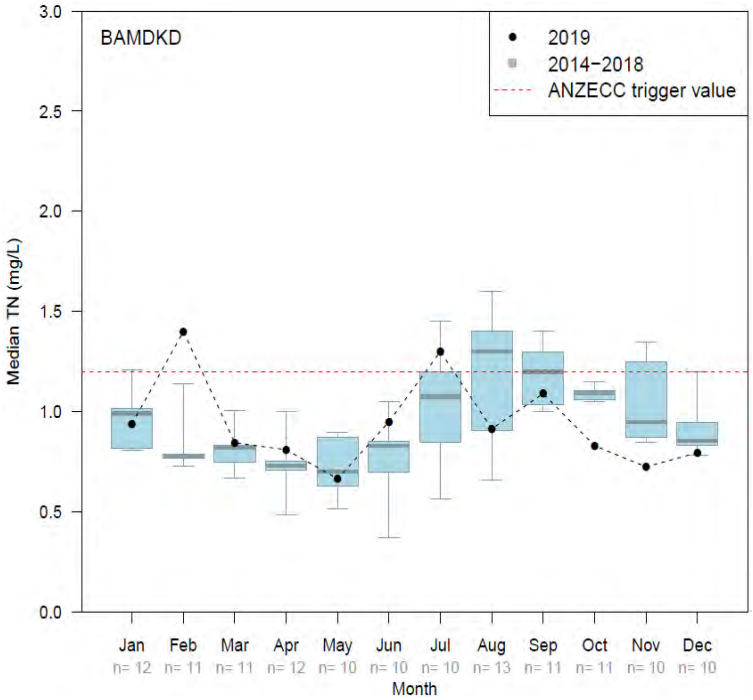

Figure 75. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site BAMDKD. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

BAMDKD ammoniacal nitrogen (NH_3-N)

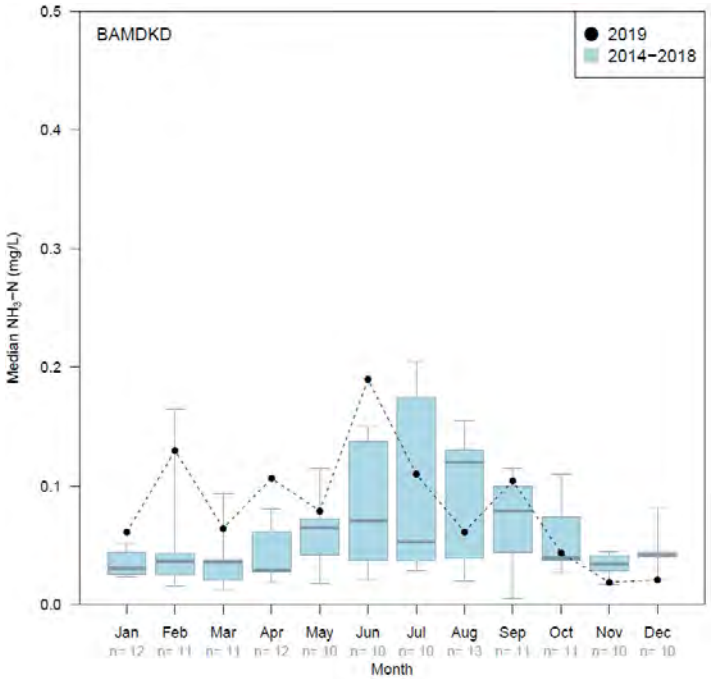

Figure 76. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site BAMDKD. Number of samples (n) is provided for the historical data.

BAMDKD total oxidised nitrogen (NO_x-N)

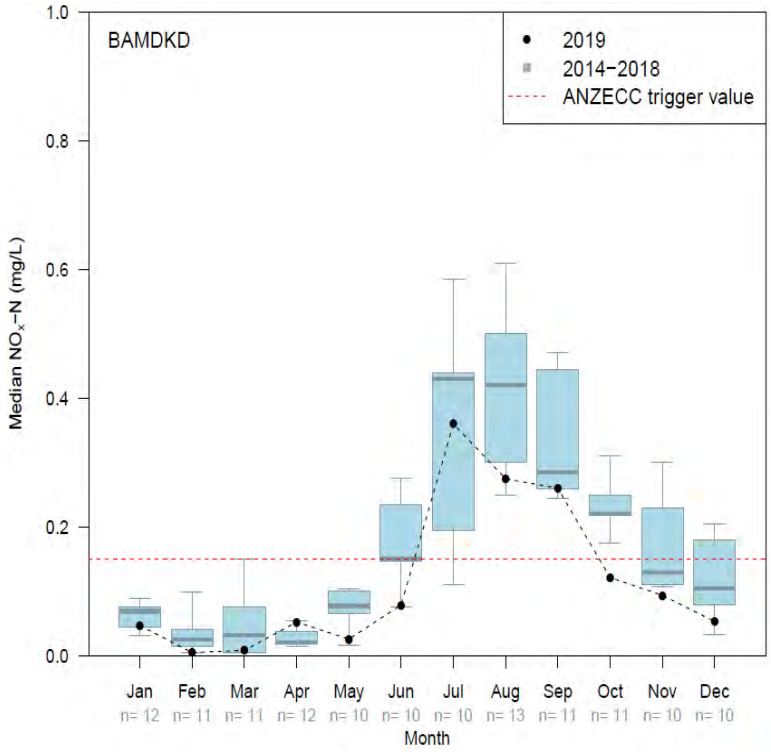

Figure 77. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site BAMDKD. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

BAMDKD dissolved organic nitrogen (DOrgN)

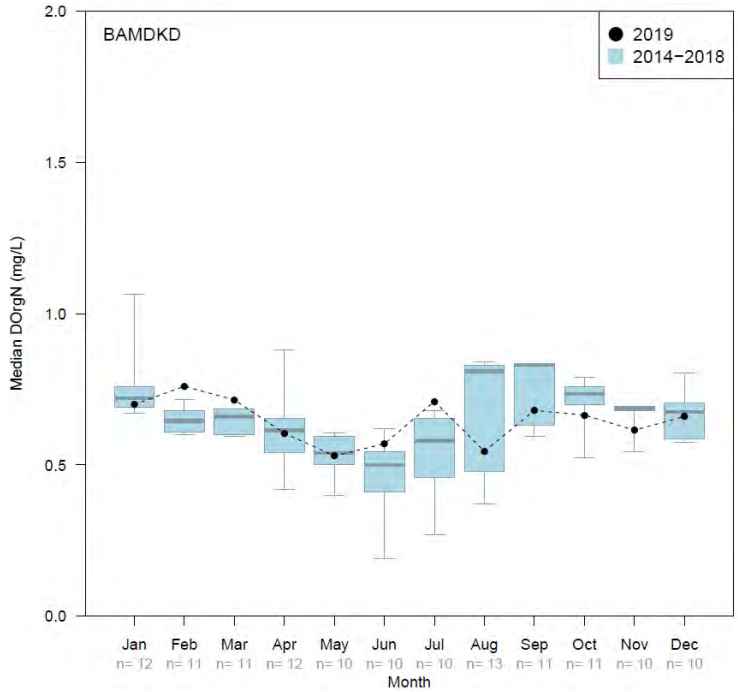

Figure 78. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site BAMDKD. Number of samples (n) is provided for the historical data.

BAMDKD total phosphorus (TP)

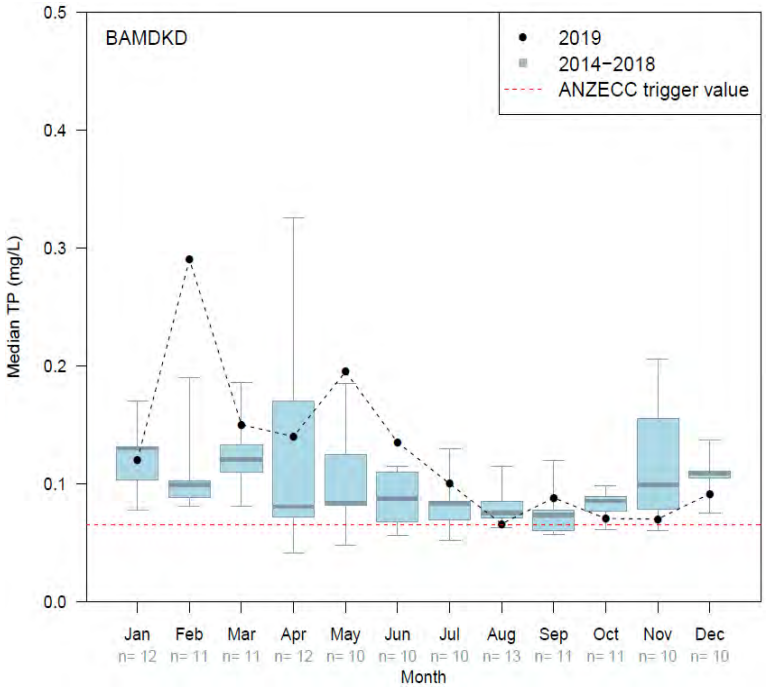

Figure 79. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site BAMDKD. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

BAMDKD filterable reactive phosphorus (FRP)

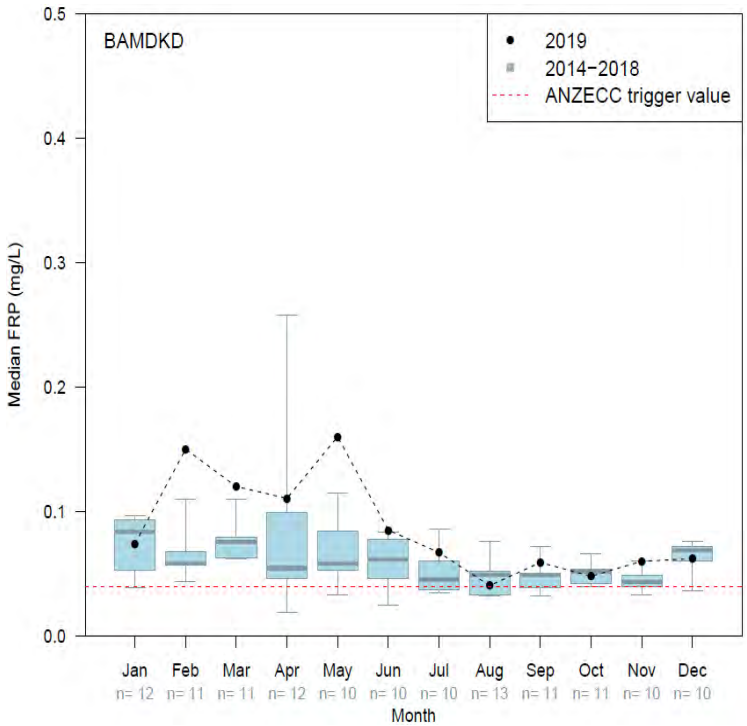

Figure 80. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site BAMDKD. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

BAMDKD dissolved organic carbon (DOC)

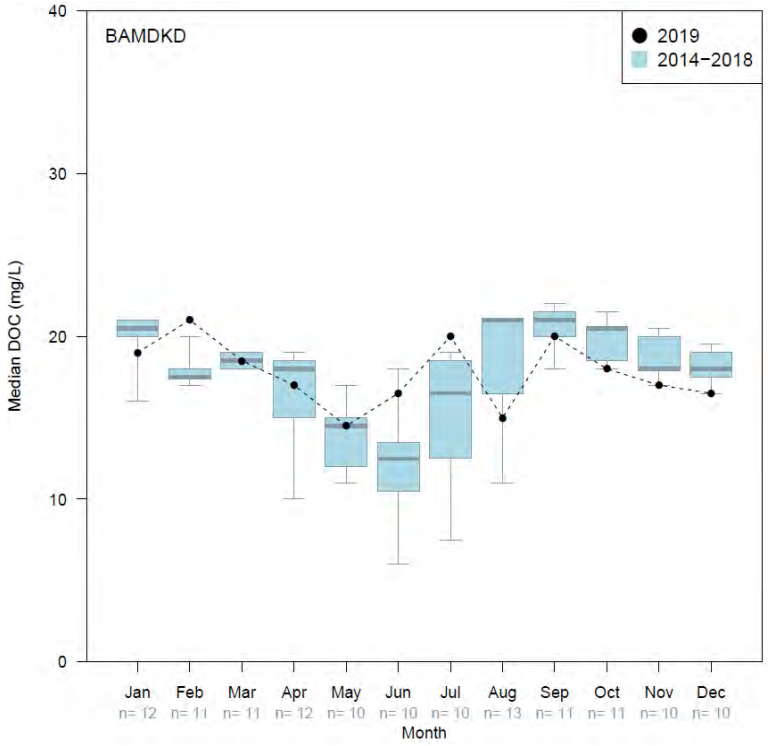

Figure 81. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site BAMDKD. Number of samples (n) is provided for the historical data.

BAMDKD total suspended solids (TSS)

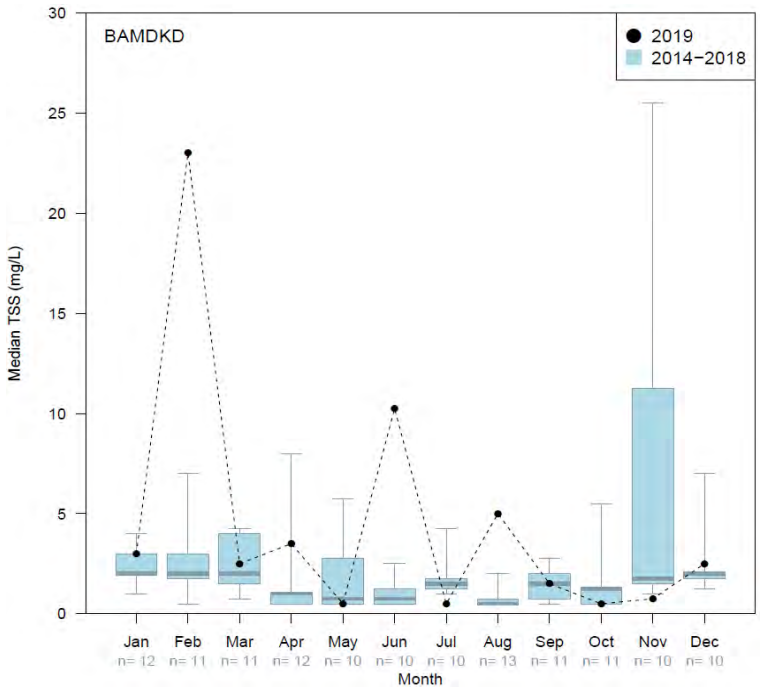

Figure 82. Total suspended solids Monthly median Total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site BAMDKD. Number of samples (n) is provided for the historical data.

BAMDKD dissolved oxygen (DO)

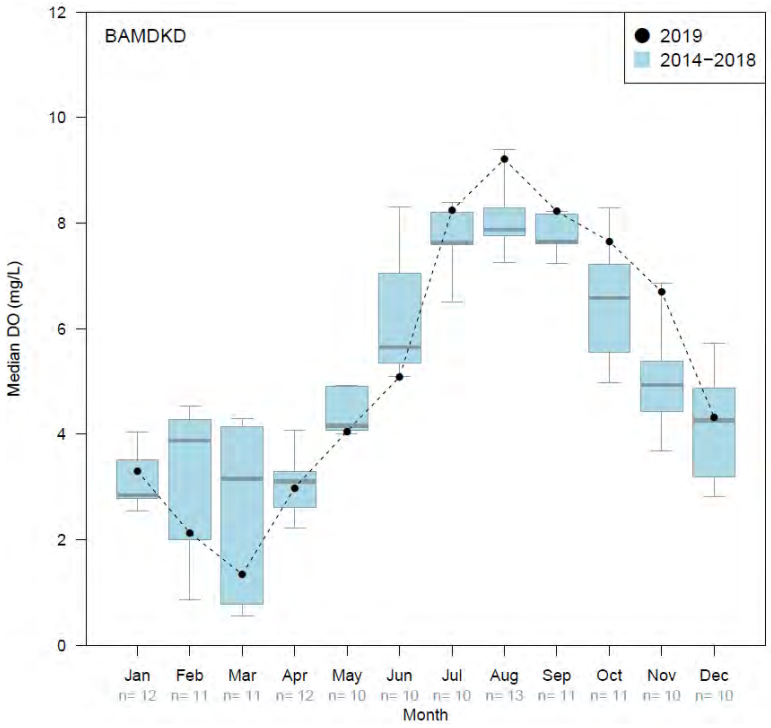

Figure 83. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site BAMDKD. Number of samples (n) is provided for the historical data.

BAMDKD specific conductivity (Sp. cond)

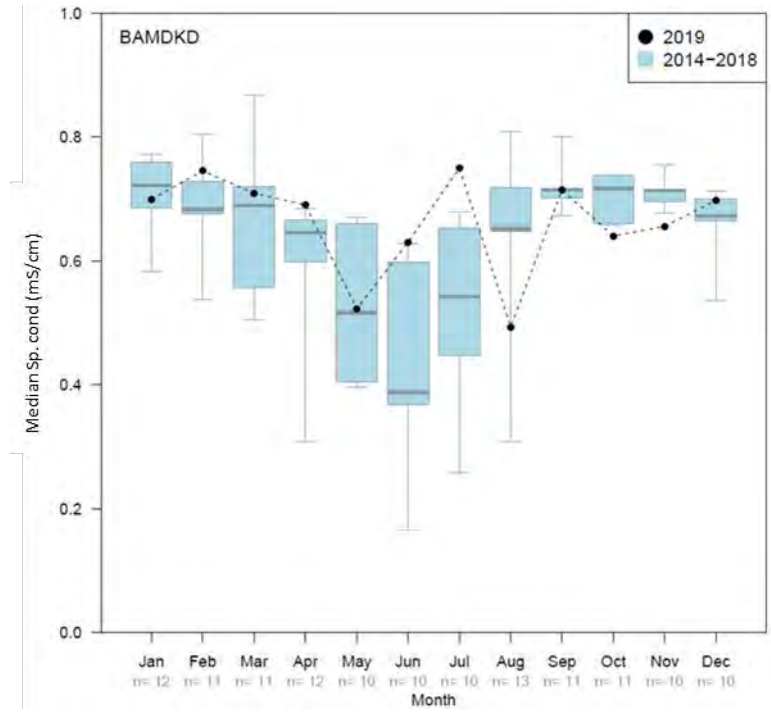

Figure 84. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site BAMDKD. Number of samples (n) is provided for the historical data.

Table 10. 2019 monthly sample numbers, minimum and maximum values at BAMDKD.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.860	1.400	0.800	0.770	0.640	0.900	1.100	0.530	0.980	0.770	0.700	0.790
max	1.100	1.400	0.890	0.850	0.690	1.000	1.400	1.300	1.200	0.890	0.750	0.800
med	**0.940**	**1.400**	**0.845**	**0.810**	**0.665**	**0.950**	**1.300**	**0.915**	**1.090**	**0.830**	**0.725**	**0.795**
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.057	0.130	0.057	0.063	0.061	0.180	0.094	0.039	0.099	0.030	0.005	0.005
max	0.083	0.130	0.072	0.150	0.097	0.200	0.140	0.084	0.110	0.057	0.033	0.037
med	**0.061**	**0.130**	**0.065**	**0.107**	**0.079**	**0.190**	**0.110**	**0.062**	**0.105**	**0.044**	**0.019**	**0.021**
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.045	0.005	0.005	0.005	0.023	0.048	0.180	0.150	0.190	0.093	0.090	0.042
max	0.059	0.005	0.012	0.100	0.029	0.110	0.380	0.400	0.330	0.150	0.098	0.065
med	**0.047**	**0.005**	**0.009**	**0.053**	**0.026**	**0.079**	**0.360**	**0.275**	**0.260**	**0.122**	**0.094**	**0.054**
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.700	0.760	0.710	0.550	0.470	0.550	0.680	0.300	0.660	0.650	0.570	0.600
max	0.730	0.760	0.720	0.660	0.590	0.590	0.750	0.790	0.700	0.680	0.660	0.720
med	**0.700**	**0.760**	**0.715**	**0.605**	**0.530**	**0.570**	**0.710**	**0.545**	**0.680**	**0.665**	**0.615**	**0.660**
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.100	0.290	0.130	0.100	0.130	0.130	0.095	0.051	0.086	0.062	0.064	0.091
max	0.130	0.290	0.170	0.180	0.260	0.140	0.120	0.081	0.090	0.079	0.076	0.092
med	**0.120**	**0.290**	**0.150**	**0.140**	**0.195**	**0.135**	**0.100**	**0.066**	**0.088**	**0.071**	**0.070**	**0.092**
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.072	0.150	0.110	0.071	0.100	0.077	0.059	0.029	0.058	0.035	0.056	0.056
max	0.100	0.150	0.130	0.150	0.220	0.093	0.080	0.052	0.060	0.061	0.064	0.068
med	**0.074**	**0.150**	**0.120**	**0.111**	**0.160**	**0.085**	**0.067**	**0.041**	**0.059**	**0.048**	**0.060**	**0.062**
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	19.000	21.000	18.000	16.000	13.000	16.000	16.000	8.000	19.000	18.000	17.000	16.000
max	20.000	21.000	19.000	18.000	16.000	17.000	21.000	22.000	21.000	18.000	17.000	17.000
med	**19.000**	**21.000**	**18.500**	**17.000**	**14.500**	**16.500**	**20.000**	**15.000**	**20.000**	**18.000**	**17.000**	**16.500**
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.500	23.000	2.000	2.000	0.500	0.500	0.500	1.000	1.000	0.500	0.500	2.000
max	5.000	23.000	3.000	5.000	0.500	20.000	0.500	9.000	2.000	0.500	1.000	3.000
med	**3.000**	**23.000**	**2.500**	**3.500**	**0.500**	**10.250**	**0.500**	**5.000**	**1.500**	**0.500**	**0.750**	**2.500**
DO (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	3.160	0.840	1.200	1.500	3.790	3.520	7.680	8.980	8.020	6.780	6.580	4.120
max	4.030	3.420	1.490	4.470	4.320	6.650	8.660	9.440	8.420	8.530	6.810	4.530
med	**3.300**	**2.130**	**1.345**	**2.985**	**4.055**	**5.085**	**8.240**	**9.210**	**8.220**	**7.655**	**6.695**	**4.325**
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.672	0.724	0.668	0.634	0.473	0.593	0.598	0.223	0.679	0.605	0.642	0.685
max	0.710	0.767	0.751	0.747	0.572	0.668	0.780	0.764	0.750	0.676	0.670	0.711
med	**0.700**	**0.746**	**0.710**	**0.691**	**0.523**	**0.631**	**0.750**	**0.494**	**0.715**	**0.641**	**0.656**	**0.698**

NB: Daily discharge data is not available for BAMDKD as this site is not gauged.

In February 2019, a notable increase in TN (Figure 75), NH_3-N (Figure 76), TP (Figure 79) and FRP (Figure 80) concentrations above background values was observed and coincided with a similarly large increase in TSS (Figure 82). Field notes indicated that structural works had been undertaken at the monitoring sites in Bull Creek during that month. The observed dramatic increase in these analytes is therefore likely due to the disturbance of sediments and a change in flow dynamics resulting from the works.

Subsequently, elevated concentrations were observed in NH_3-N, TP, FRP until at least June and in TSS in April and June that often exceed the range in background data and may be a result of increased flow driven by rainfall events (Figures 76, 79, 80 and 82). Fluctuations in TN were largely a result of variations in NH_3-N concentrations, as NO_x-N and DOrgN concentrations tended to follow the trends of the background data more closely (Figures 79 and 80).

TN concentrations exceeded the ANZECC trigger values of 1.2 mg/L for lowland rivers in February and July (Figure 75), while NO_x-N concentrations exceeded the ANZECC trigger value (0.15 mg/L) from July to September (Figure 77). Concentrations of TP and FRP exceeded their respective trigger values (0.065 mg/L and 0.04 mg/L) throughout the entire 2019 reporting period (Figure 79 and 80).

In 2019, median DOC values were usually within the range of historic value, but slightly exceeded these in February and July (Figure 81). Dissolved oxygen concentrations were low (<4 mg/L) from January through to April particularly in March (< 2 mg/L) but were above 4 mg/L for the remainder of the year (Figure 83, Table 10). Conductivity was within the historic range, only exceeding background values in July with a median of 0.75 mS/cm (Figure 84, Table 10).

9. Canning River (SWS12)

SWS12 total nitrogen (TN)

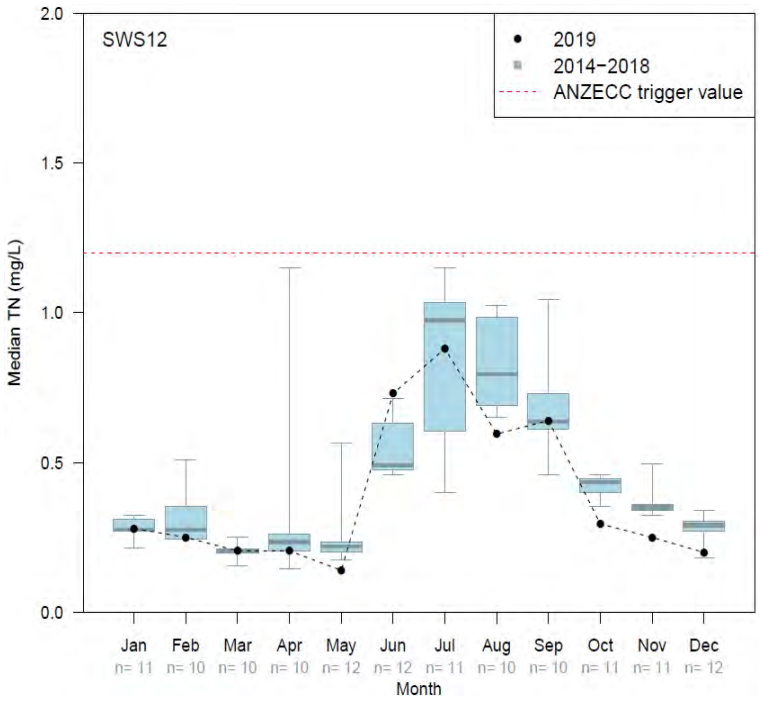

Figure 85. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS12. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

SWS12 ammoniacal nitrogen (NH_3-N)

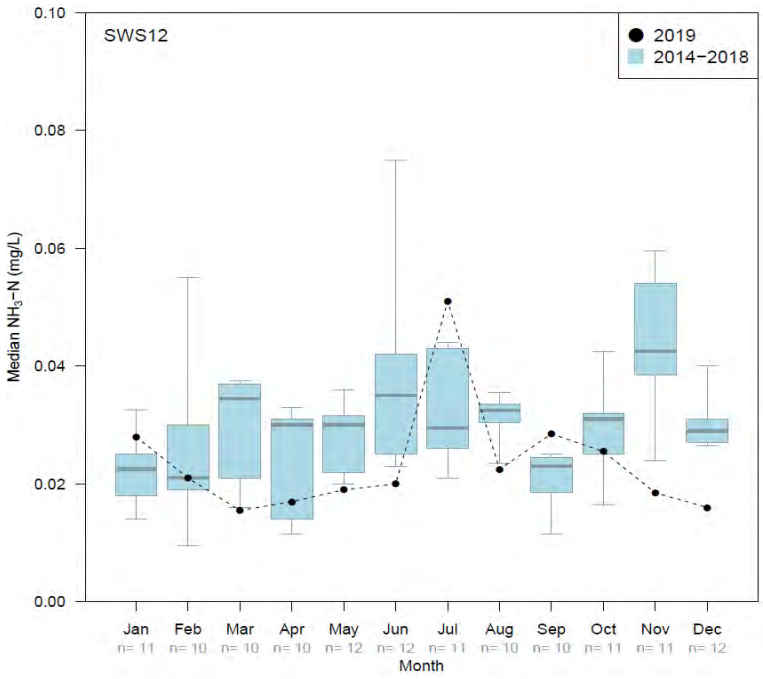

Figure 86. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS12. Number of samples (n) is provided for the historical data.

SWS12 total oxidised nitrogen (NO_x-N)

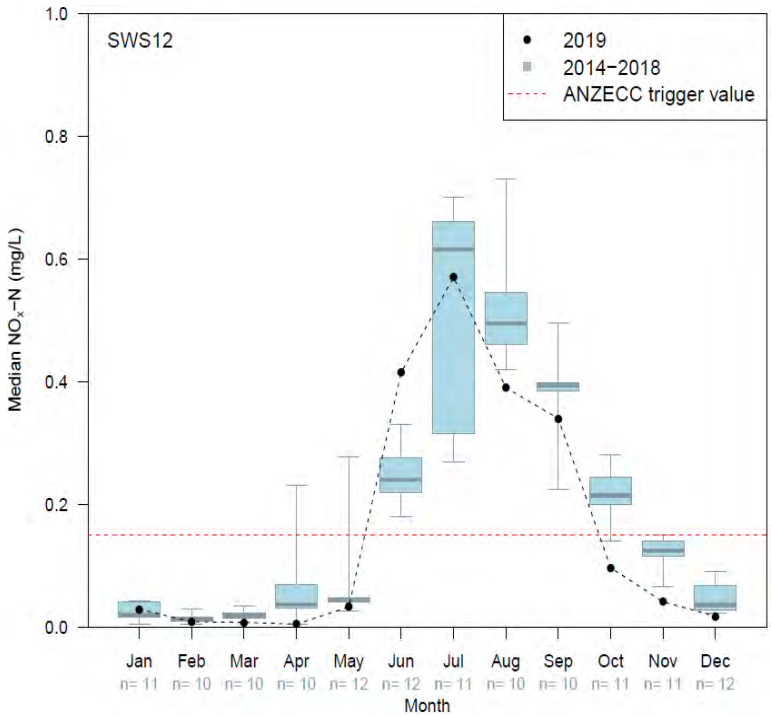

Figure 87. Monthly median Total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS12. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

SWS12 dissolved organic nitrogen (DOrgN)

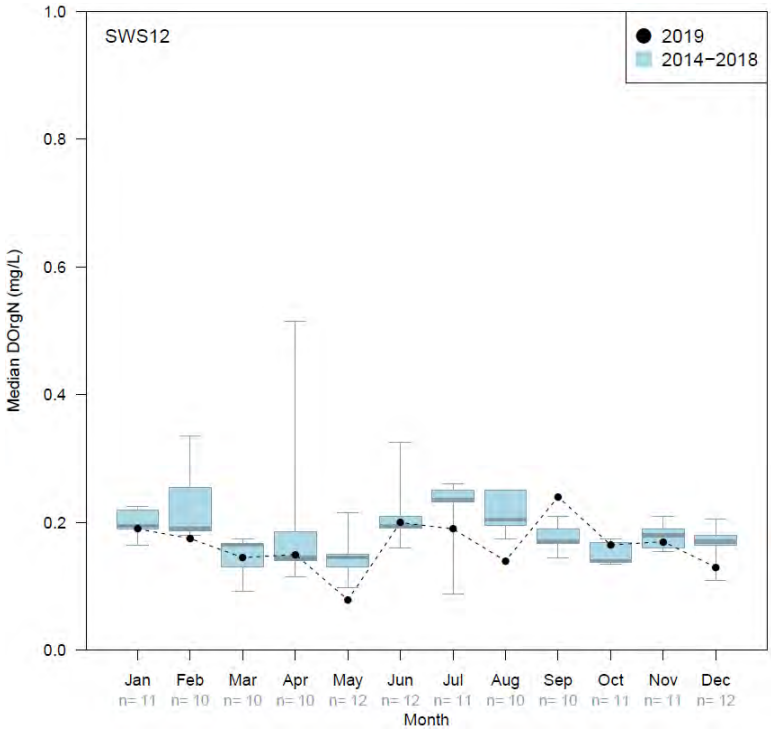

Figure 88. Monthly median Dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS12. Number of samples (n) is provided for the historical data.

SWS12 total phosphorus (TP)

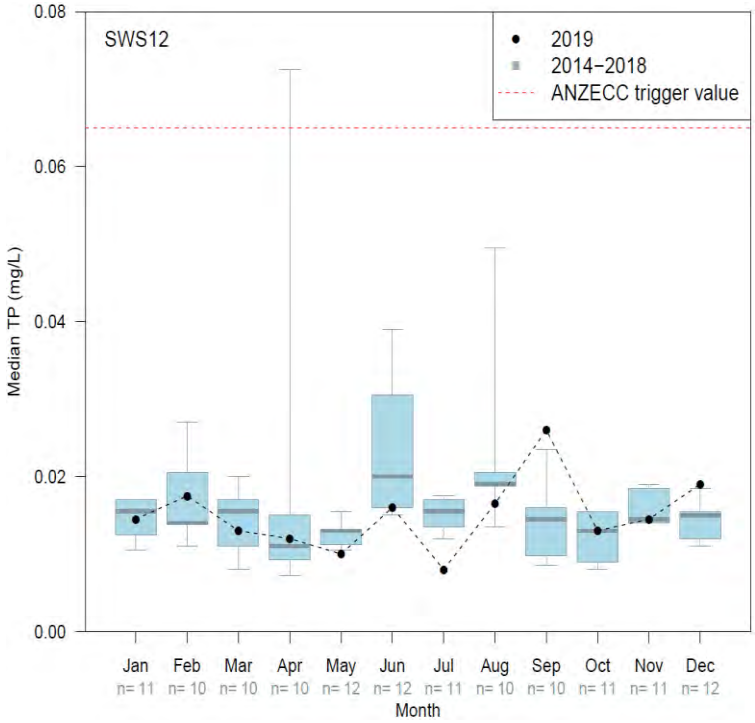

Figure 89. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS12. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

SWS12 filterable reactive phosphorus (FRP)

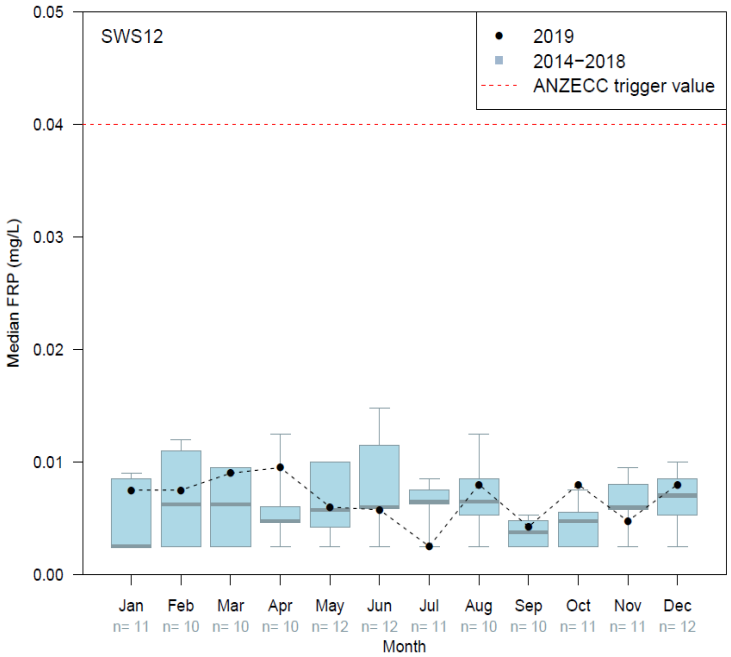

Figure 90. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS12. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

SWS12 dissolved organic carbon (DOC)

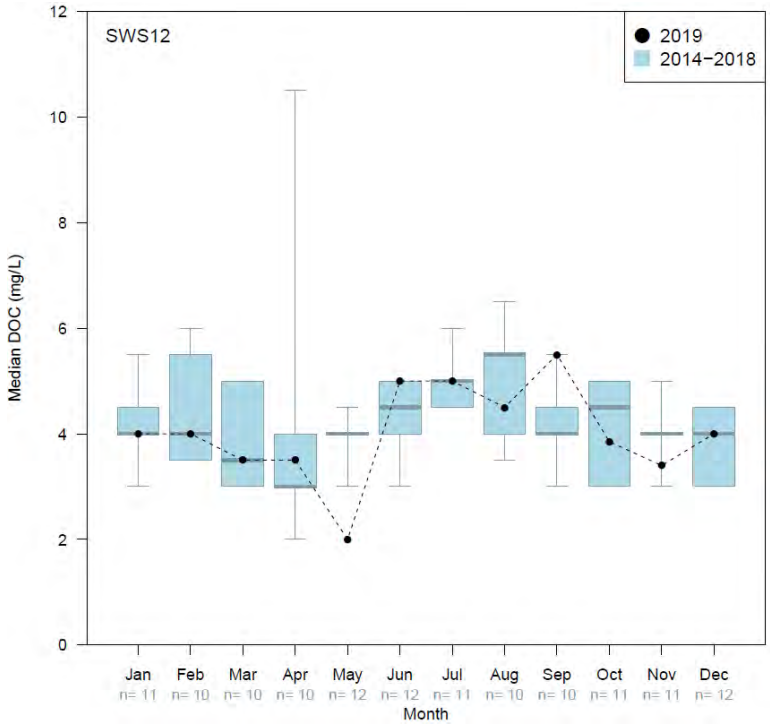

Figure 91. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS12. Number of samples (n) is provided for the historical data.

SWS12 total suspended solids (TSS)

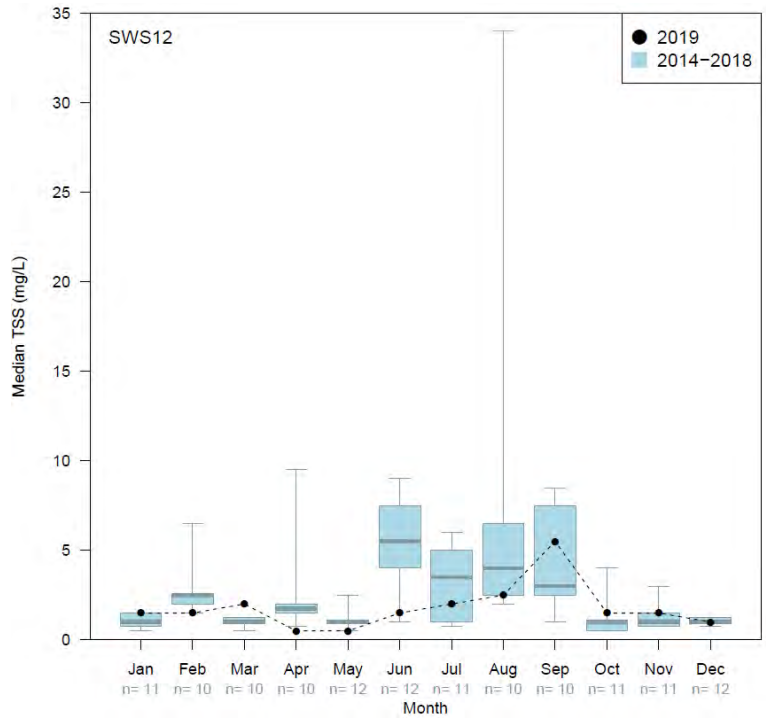

Figure 92. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS12. Number of samples (n) is provided for the historical data.

SWS12 dissolved oxygen (DO)

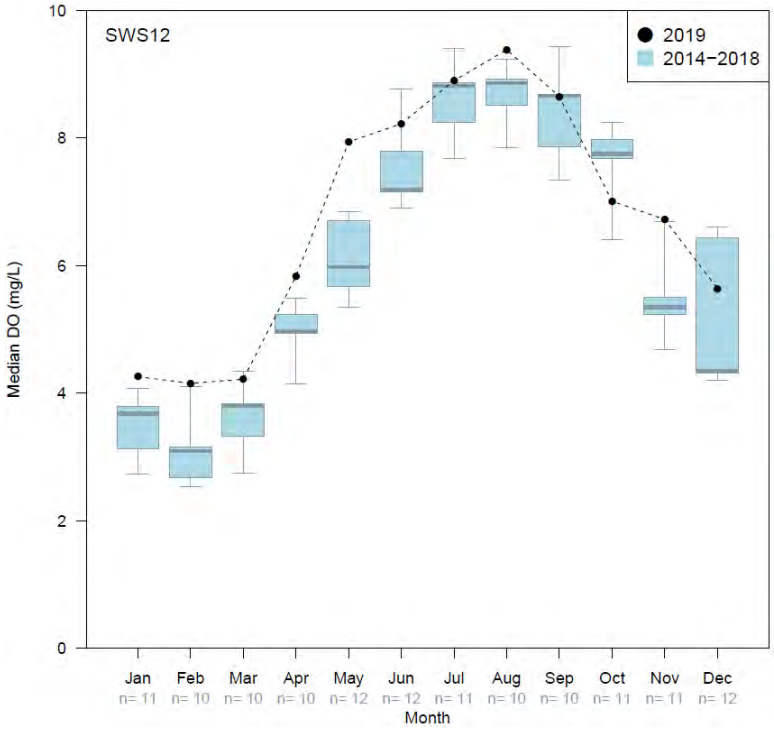

Figure 93. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS12. Number of samples (n) is provided for the historical data.

SWS12 specific conductivity (Sp. cond)

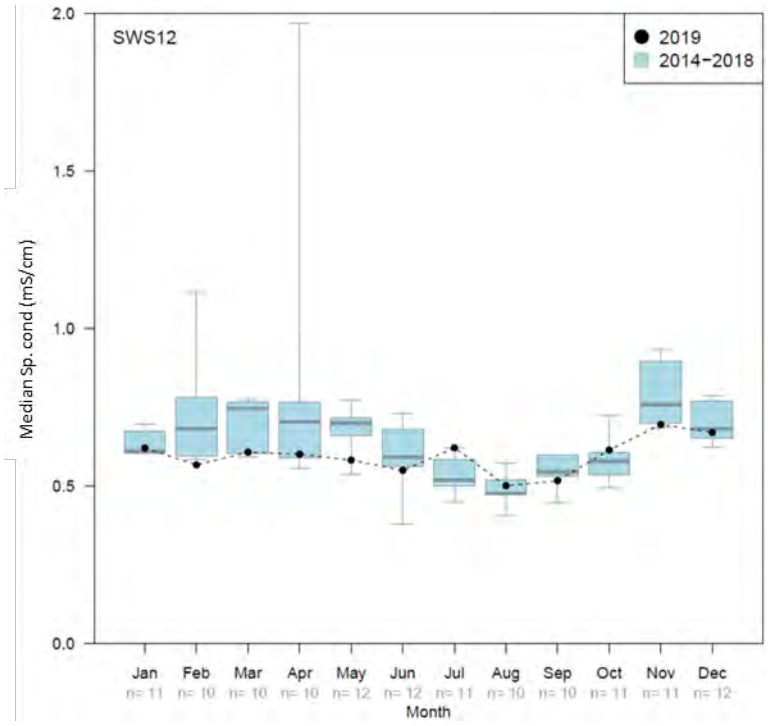

Figure 94. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS12. Number of samples (n) is provided for the historical data.

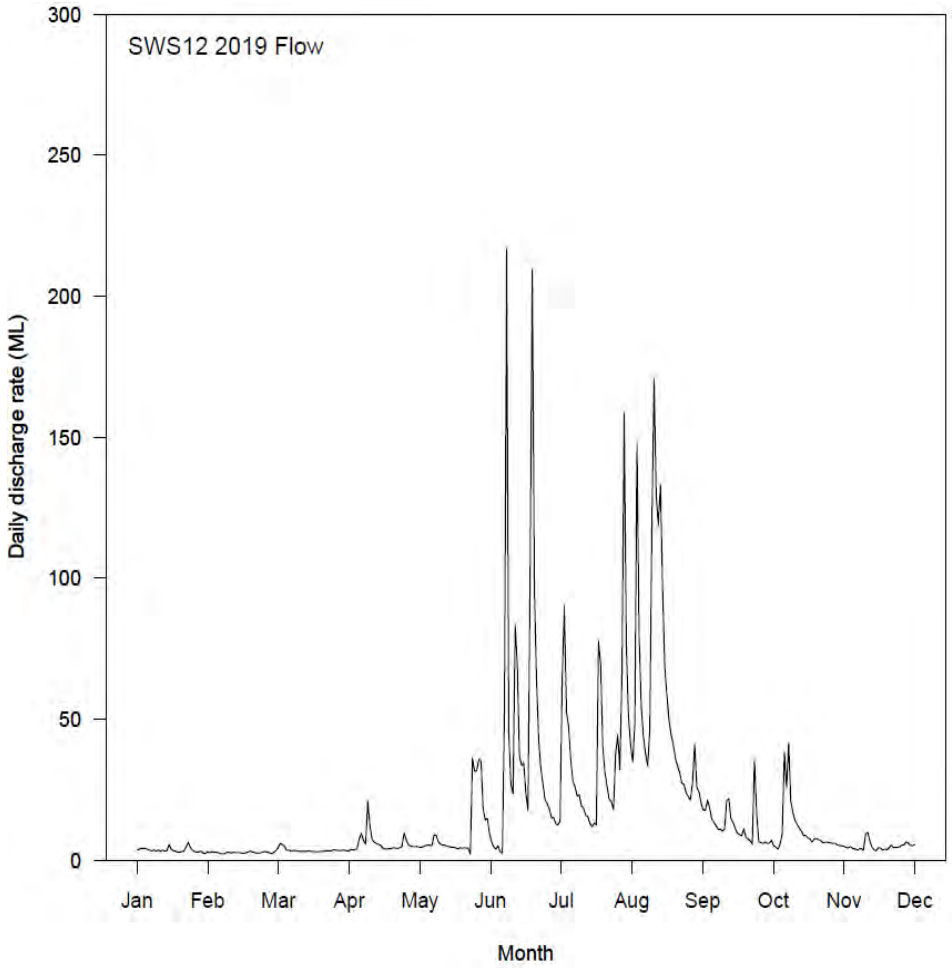

Figure 95. Daily discharge (ML) at Canning River gauging station (616027 – at site of SWS12).

Concentrations of TN exhibited a typical response to seasonal flow (Figure 95), with concentrations increasing over the winter months. These increases were driven largely by NO_x-N between June and September (Figure 87) and to a lesser extent by NH_3-N in July (Figure 86). Despite the elevated concentrations over winter, TN remained below the ANZECC trigger value of 1.2 mg/L for lowland rivers throughout the entire 2019 reporting period (Figure 85), however NO_x-N concentrations exceeded its ANZECC trigger of 0.15 mg/L from June to September (Figure 87). Concentrations of both TN and NO_x-N were very low (<0.3 mg/L and <0.05 mg/L, respectively) over summer and autumn, during which time flows in the Canning River are supplemented with scheme water (Figures 85 and 87, Table 11).

Concentrations of TP and FRP were far less variable in 2019 than the concentrations of the various nitrogen analytes, showing little seasonal trends, but were more in keeping with patterns observed in the background data (Figure 89 and 90).

In 2019, median DOC values were within background range, except for May (Figure 91, Table 11). Median TSS values ranged between 0.5 and 5.5 mg/L and were within the range of background data (Figure 92, Table 11). Dissolved oxygen concentrations were consistently above 4 mg/L and highest in winter months (Figure 93) when flow was highest (Figure 95). Conductivity was often towards the lower limit of the range of background data (Figure 94).

Table 11. 2019 monthly sample numbers, minimum and maximum values at SWS12.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.270	0.210	0.190	0.200	0.130	0.470	0.880	0.560	0.560	0.250	0.210	0.200
max	0.290	0.290	0.220	0.210	0.140	0.990	0.880	0.630	0.720	0.340	0.290	0.200
med	**0.280**	**0.250**	**0.205**	**0.205**	**0.140**	**0.730**	**0.880**	**0.595**	**0.640**	**0.295**	**0.250**	**0.200**
NH_3-N (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.028	0.017	0.012	0.017	0.011	0.011	0.051	0.022	0.024	0.024	0.016	0.016
max	0.028	0.025	0.019	0.017	0.026	0.029	0.051	0.023	0.033	0.027	0.021	0.016
med	**0.028**	**0.021**	**0.016**	**0.017**	**0.019**	**0.020**	**0.051**	**0.023**	**0.029**	**0.026**	**0.019**	**0.016**
NO_x-N (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.028	0.005	0.005	0.005	0.024	0.260	0.570	0.390	0.250	0.064	0.023	0.018
max	0.031	0.013	0.011	0.005	0.040	0.570	0.570	0.390	0.430	0.130	0.060	0.018
med	**0.030**	**0.009**	**0.008**	**0.005**	**0.033**	**0.415**	**0.570**	**0.390**	**0.340**	**0.097**	**0.042**	**0.018**
DOrgN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.180	0.150	0.120	0.130	0.067	0.150	0.190	0.110	0.230	0.160	0.150	0.130
max	0.200	0.200	0.170	0.170	0.092	0.250	0.190	0.170	0.250	0.170	0.190	0.130
med	**0.190**	**0.175**	**0.145**	**0.150**	**0.079**	**0.200**	**0.190**	**0.140**	**0.240**	**0.165**	**0.170**	**0.130**
TP (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.012	0.012	0.010	0.012	0.009	0.016	0.008	0.012	0.024	0.011	0.014	0.019
max	0.017	0.023	0.016	0.012	0.017	0.016	0.008	0.021	0.028	0.015	0.015	0.019
med	**0.015**	**0.018**	**0.013**	**0.012**	**0.010**	**0.016**	**0.008**	**0.017**	**0.026**	**0.013**	**0.015**	**0.019**
FRP (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.007	0.006	0.008	0.007	0.005	0.003	0.003	0.005	0.003	0.006	0.003	0.008
max	0.008	0.009	0.010	0.012	0.009	0.009	0.003	0.011	0.006	0.010	0.007	0.008
med	**0.008**	**0.008**	**0.009**	**0.010**	**0.006**	**0.006**	**0.003**	**0.008**	**0.004**	**0.008**	**0.005**	**0.008**
DOC (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	2	2	2	2	3	2	1	2	2	3	2	1
min	4.000	4.000	3.000	3.000	2.000	5.000	5.000	4.000	5.000	3.800	3.300	4.000
max	4.000	4.000	4.000	4.000	3.000	5.000	5.000	5.000	6.000	3.900	3.500	4.000
med	**4.000**	**4.000**	**3.500**	**3.500**	**2.000**	**5.000**	**5.000**	**4.500**	**5.500**	**3.850**	**3.400**	**4.000**
TSS (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	2	2	2	2	3	2	1	2	2	3	2	1
min	1.000	1.000	1.000	0.500	0.500	1.000	2.000	1.000	3.000	1.000	1.000	1.000
max	2.000	2.000	3.000	0.500	0.500	2.000	2.000	4.000	8.000	2.000	2.000	1.000
med	**1.500**	**1.500**	**2.000**	**0.500**	**0.500**	**1.500**	**2.000**	**2.500**	**5.500**	**1.500**	**1.500**	**1.000**
DO (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	2	2	2	2	3	2	1	2	2	3	2	1
min	4.000	4.030	3.700	5.430	7.380	7.990	8.900	9.350	8.100	6.280	6.570	5.640
max	4.520	4.280	4.740	6.240	8.240	8.460	8.900	9.420	9.200	7.740	6.880	5.640
med	**4.260**	**4.155**	**4.220**	**5.835**	**7.940**	**8.225**	**8.900**	**9.385**	**8.650**	**7.010**	**6.725**	**5.640**
Sp. cond (mS/cm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.589	0.565	0.603	0.596	0.507	0.413	0.621	0.452	0.403	0.583	0.692	0.670
max	0.652	0.569	0.611	0.606	0.593	0.686	0.621	0.549	0.630	0.645	0.697	0.670
med	**0.621**	**0.567**	**0.607**	**0.601**	**0.582**	**0.550**	**0.621**	**0.501**	**0.517**	**0.614**	**0.695**	**0.670**

10. Claise Brook (CB13)

CB13 total nitrogen (TN)

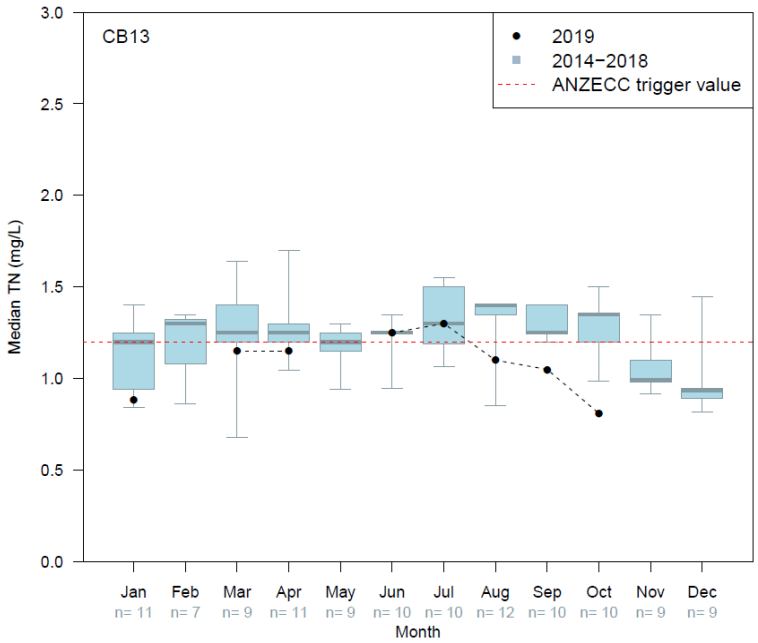

Figure 96. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CB13. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

CB13 ammoniacal nitrogen (NH_3-N)

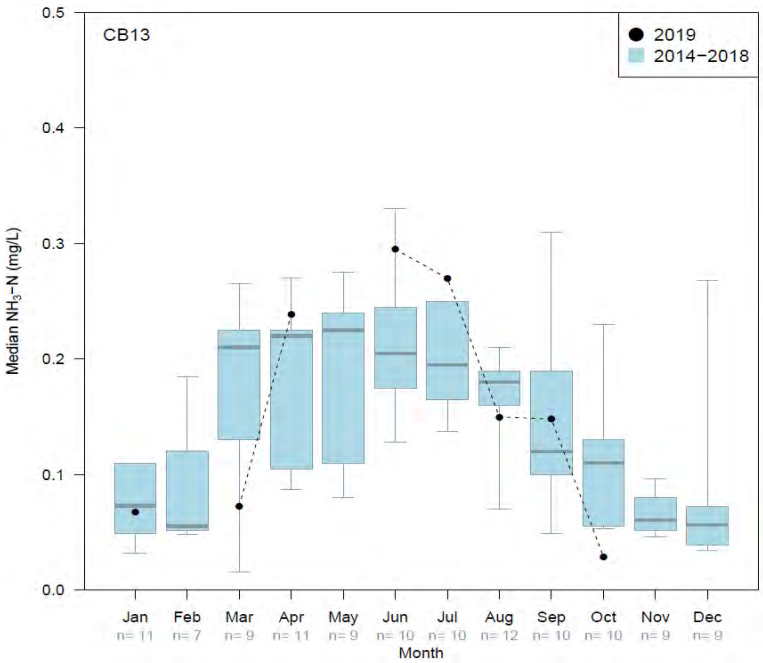

Figure 97. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CB13. Number of samples (n) is provided for the historical data.

CB13 total oxidised nitrogen (NO_x-N)

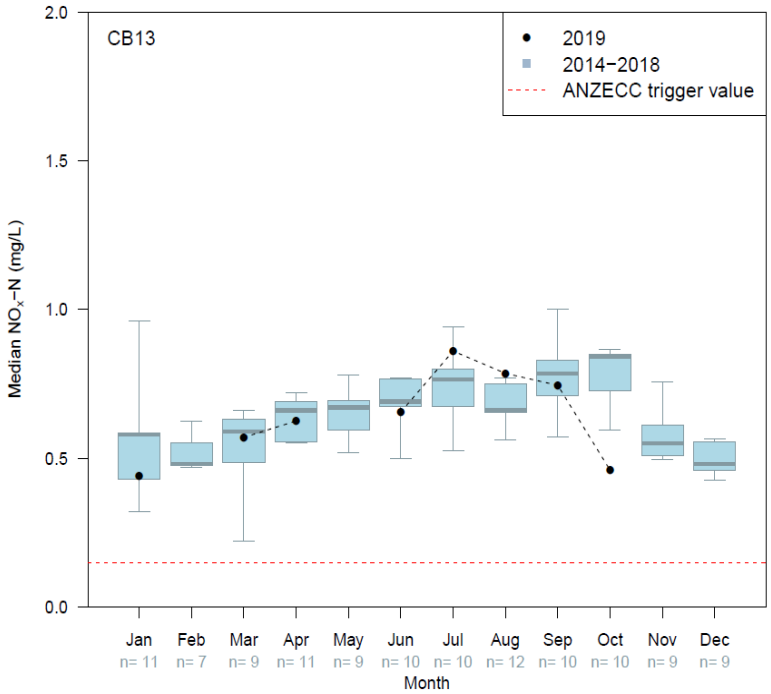

Figure 98. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CB13. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

CB13 dissolved organic nitrogen (DOrgN)

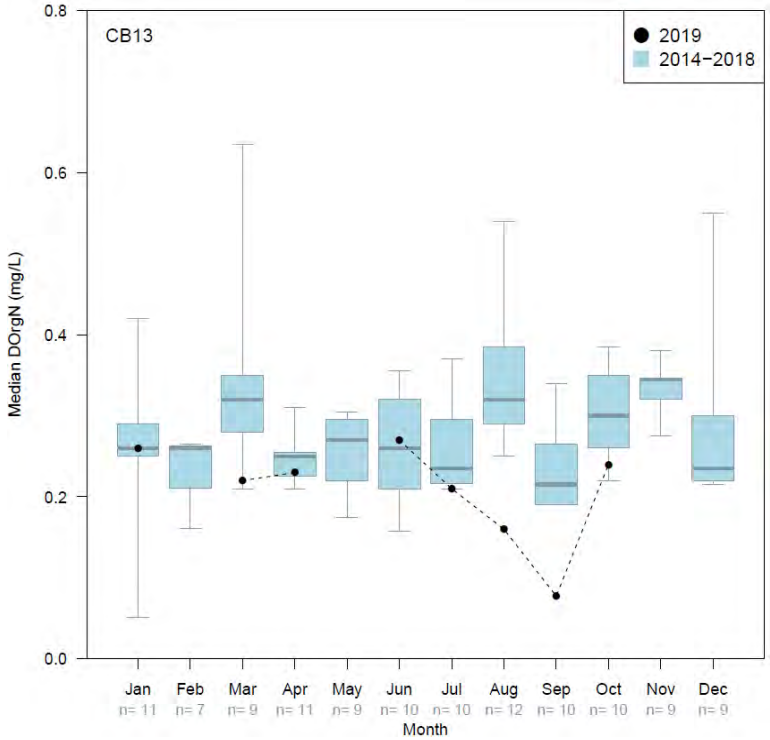

Figure 99. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CB13. Number of samples (n) is provided for the historical data.

CB13 total phosphorus (TP)

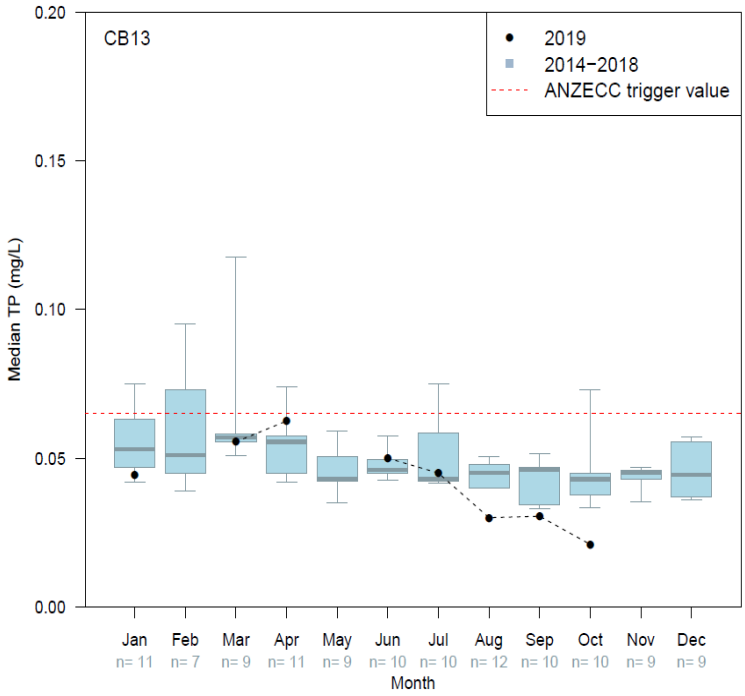

Figure 100. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CB13. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

CB13 filterable reactive phosphorus (FRP)

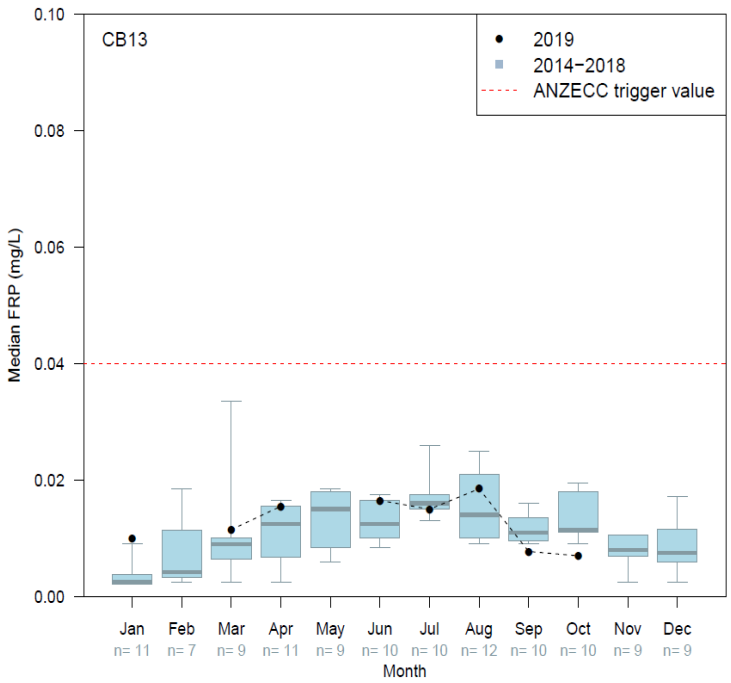

Figure 101. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CB13. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

CB13 dissolved organic carbon (DOC)

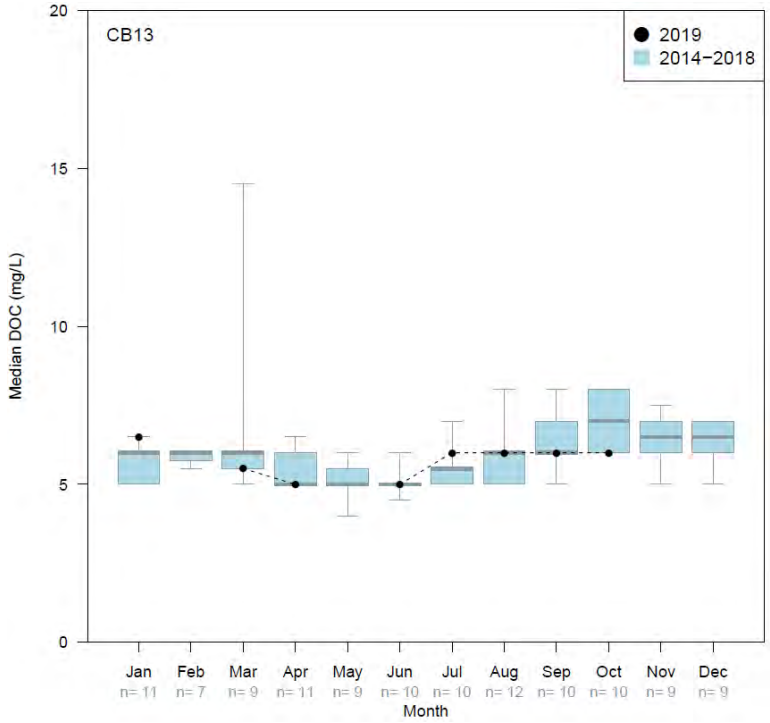

Figure 102. Monthly median 2019 dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CB13. Number of samples (n) is provided for the historical data.

CB13 total suspended solids (TSS)

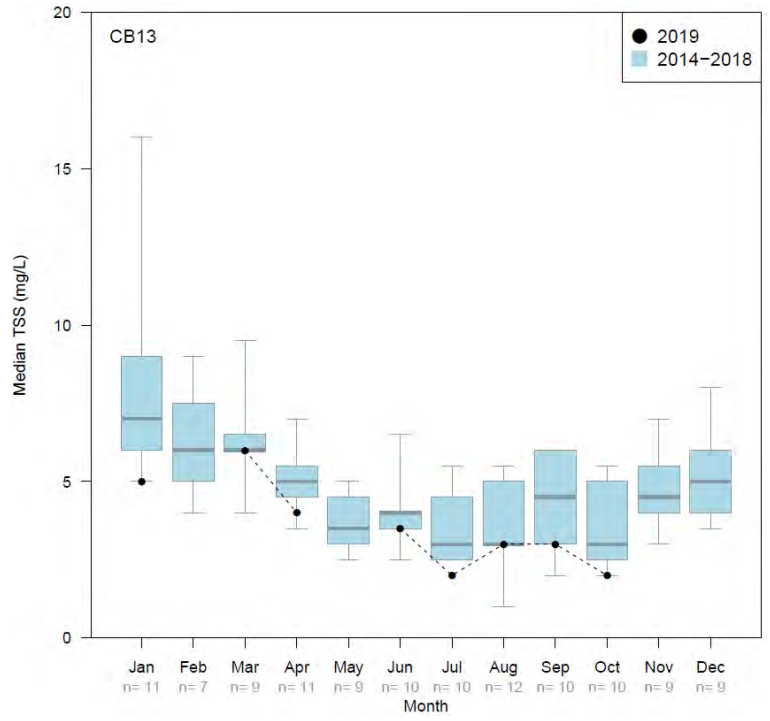

Figure 103. Monthly median 2019 total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CB13. Number of samples (n) is provided for the historical data.

CB13 dissolved oxygen (DO)

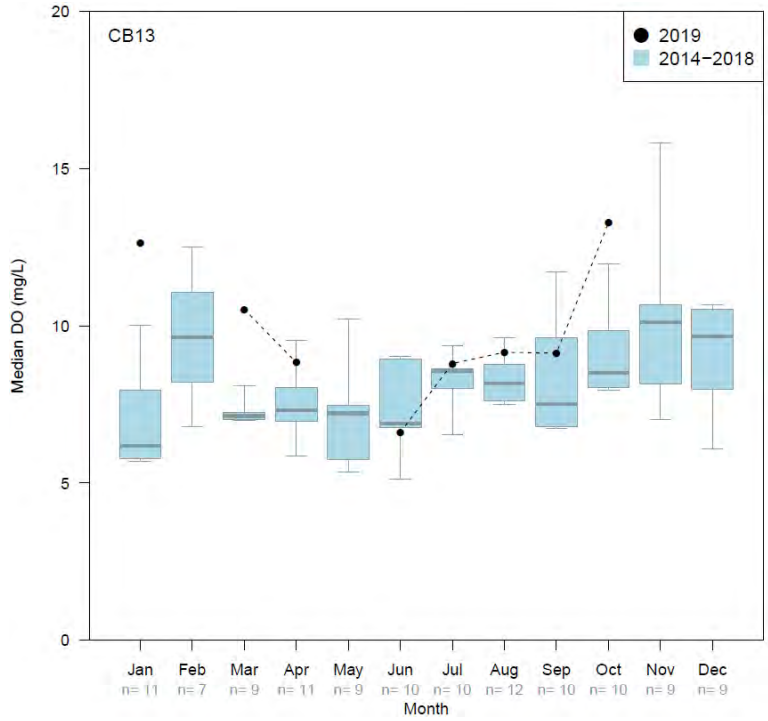

Figure 104. Monthly median 2019 dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CB13. Number of samples (n) is provided for the historical data.

CB13 specific conductivity (Sp. cond)

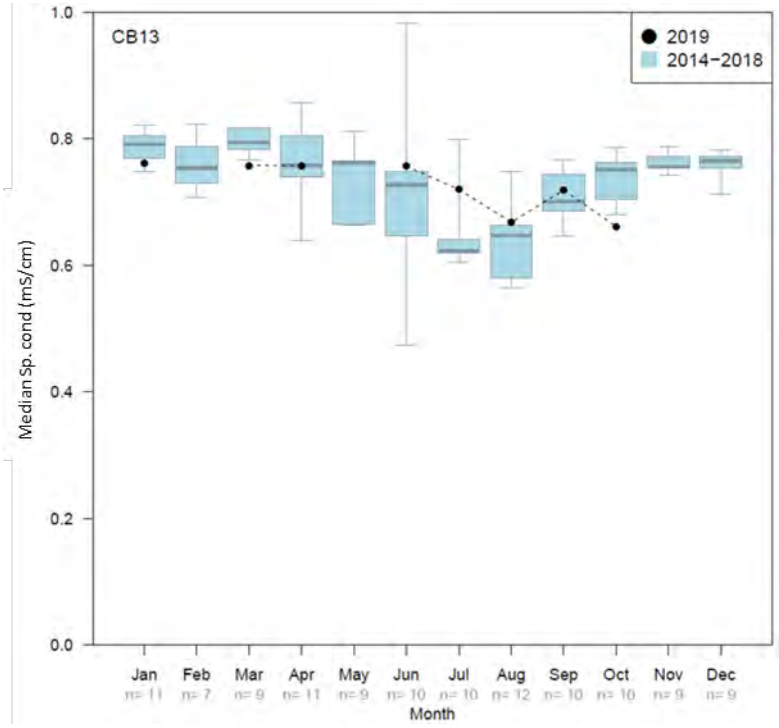

Figure 105. Monthly median 2019 Specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CB13. Number of samples (n) is provided for the historical data.

Table 12. 2019 monthly sample numbers, minimum and maximum values at CB13.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	2	0	2	2	0	2	3	2	3	2	0	0
min	0.780		1.100	1.100		1.200	1.300	1.100	1.000	0.810		
max	0.990		1.200	1.200		1.300	1.600	1.100	1.100	0.810		
med	**0.885**		**1.150**	**1.150**		**1.250**	**1.300**	**1.100**	**1.050**	**0.810**		
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	0	2	2	0	2	3	2	3	2	0	0
min	0.046		0.059	0.098		0.250	0.190	0.140	0.096	0.029		
max	0.089		0.087	0.380		0.340	0.300	0.160	0.200	0.029		
med	**0.068**		**0.073**	**0.239**		**0.295**	**0.270**	**0.150**	**0.148**	**0.029**		
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	0	2	2	0	2	3	2	3	2	0	0
min	0.400		0.560	0.600		0.640	0.640	0.780	0.720	0.460		
max	0.480		0.580	0.650		0.670	0.910	0.790	0.770	0.460		
med	**0.440**		**0.570**	**0.625**		**0.655**	**0.860**	**0.785**	**0.745**	**0.460**		
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	0	2	2	0	2	3	2	3	2	0	0
min	0.220		0.190	0.210		0.190	0.120	0.150	0.074	0.240		
max	0.300		0.250	0.250		0.350	0.480	0.170	0.081	0.240		
med	**0.260**		**0.220**	**0.230**		**0.270**	**0.210**	**0.160**	**0.078**	**0.240**		
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	0	2	2	0	2	3	2	3	2	0	0
min	0.041		0.047	0.060		0.043	0.028	0.030	0.026	0.021		
max	0.048		0.064	0.065		0.057	0.073	0.030	0.035	0.021		
med	**0.045**		**0.056**	**0.063**		**0.050**	**0.045**	**0.030**	**0.031**	**0.021**		
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	0	2	2	0	2	3	2	3	2	0	0
min	0.009		0.011	0.014		0.015	0.012	0.017	0.003	0.007		
max	0.011		0.012	0.017		0.018	0.025	0.020	0.013	0.007		
med	**0.010**		**0.012**	**0.016**		**0.017**	**0.015**	**0.019**	**0.008**	**0.007**		
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	0	2	2	0	2	3	2	3	2	0	0
min	6.000		5.000	5.000		5.000	5.000	6.000	6.000	6.000		
max	7.000		6.000	5.000		5.000	6.000	6.000	6.000	6.000		
med	**6.500**		**5.500**	**5.000**		**5.000**	**6.000**	**6.000**	**6.000**	**6.000**		
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	0	2	2	0	2	3	2	3	2	0	0
min	4.000		5.000	3.000		2.000	1.000	3.000	3.000	2.000		
max	6.000		7.000	5.000		5.000	4.000	3.000	3.000	2.000		
med	**5.000**		**6.000**	**4.000**		**3.500**	**2.000**	**3.000**	**3.000**	**2.000**		
DO (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	2	0	2	2	0	2	3	2	3	2	0	0
min	11.18		10.19	7.280		6.600	7.200	8.980	8.920	13.27		
max	14.06		10.85	10.39		6.630	9.160	9.340	9.340	13.27		
med	**12.62**		**10.52**	**8.835**		**6.615**	**8.800**	**9.160**	**9.130**	**13.27**		
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	0	2	2	0	2	3	2	3	2	0	0
min	0.760		0.754	0.751		0.702	0.691	0.637	0.712	0.662		
max	0.763		0.762	0.764		0.812	0.744	0.700	0.726	0.662		
med	**0.762**		**0.758**	**0.758**		**0.757**	**0.720**	**0.669**	**0.719**	**0.662**		

NB: Daily discharge data is not available for CB13 as this site is not gauged. Due to the ephemeral nature of the Claise Brook site and below average rainfall in 2019, samples were not collected in February, May, November, and December 2019.

Available data for analytes at CB13 appeared to loosely follow the trends of the background data (Figures 96-105, Table 12).

Median NH_3-N (Figure 97) and NO_x-N (Figure 98) were elevated in June and July and corresponded with the highest values for TN during the reporting period (Figure 96). These elevated values are likely related to seasonal flow. Concentrations of TN remained below the ANZECC trigger value of 1.2 mg/L for lowland rivers for most of 2019 (where data was available), except for June and July. Concentrations of NO_x-N however exceeded the ANZECC trigger value of 0.15 mg/L for the entire reporting period, particularly in July (Figure 98).

The 2019 concentrations of TP (Figure 100) were generally similar to background data, except in August to October in which values were slightly lower. Similarly, concentrations of FRP were consistent with background data, except in September and October (Figure 101). Concentrations of TP and FRP were below their respective ANZECC trigger values (0.065 mg/L and 0.04 mg/L) for the entire 2019 reporting period, where data was available (Figure 100 and 101).

Median DOC values for 2019 were within the range of background data (Figure 102), while TSS values were typically towards the bottom end of the range (Figure 103). Dissolved oxygen concentrations were always above 5 mg/L (Figure 104) and median conductivity had a narrow range of only 0.66 to 0.76 mS/cm (Figure 105, Table 12).

11. Ellen Brook (SWN3)

SWN3 total nitrogen (TN)

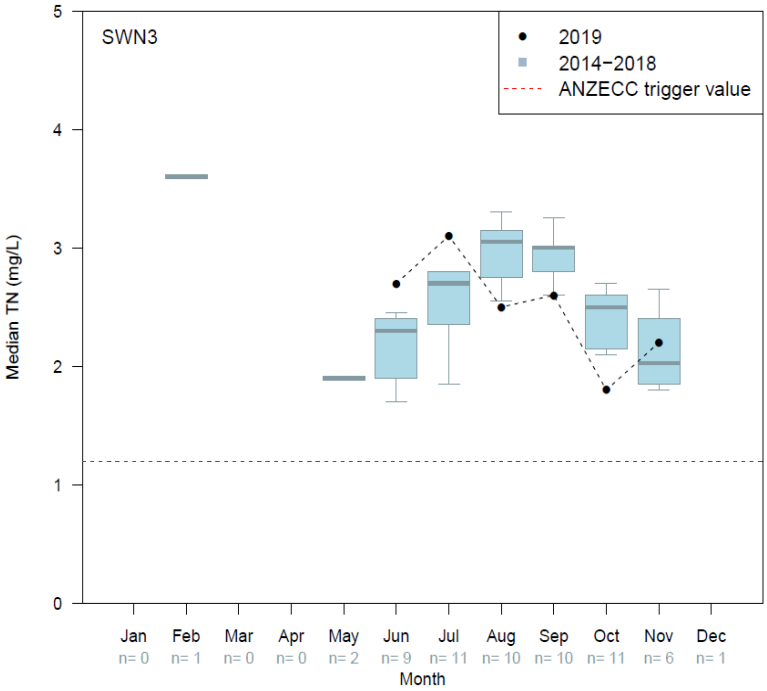

Figure 106. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN3. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

SWN3 ammoniacal nitrogen (NH_3-N)

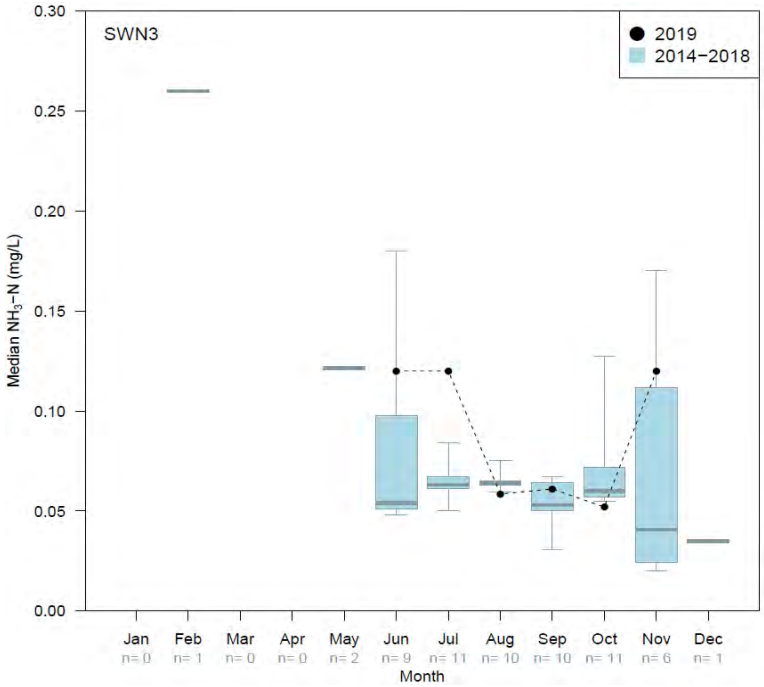

Figure 107. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN3. Number of samples (n) is provided for the historical data.

SWN3 total oxidised nitrogen (NO_x-N)

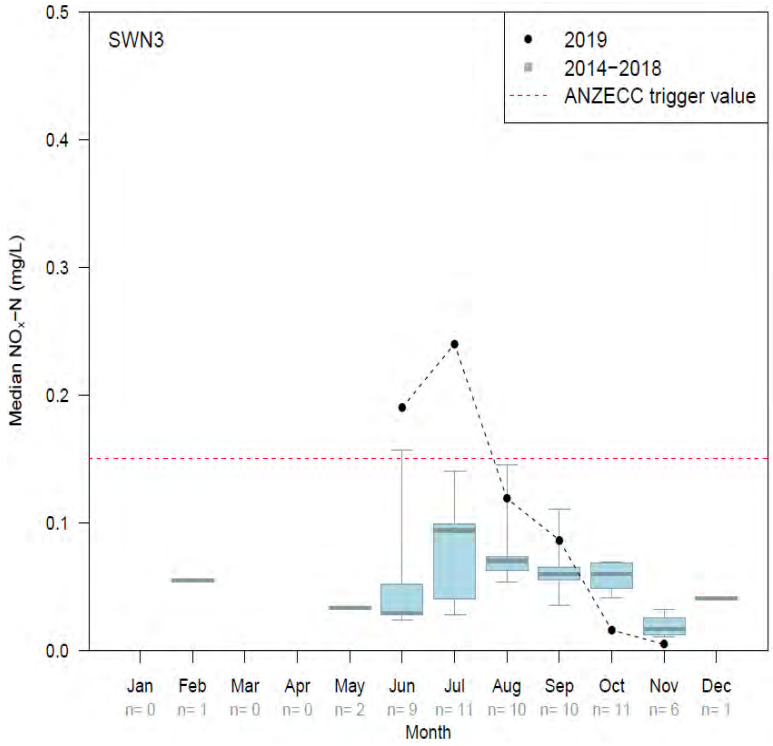

Figure 108. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN3. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

SWN3 dissolved organic nitrogen (DOrgN)

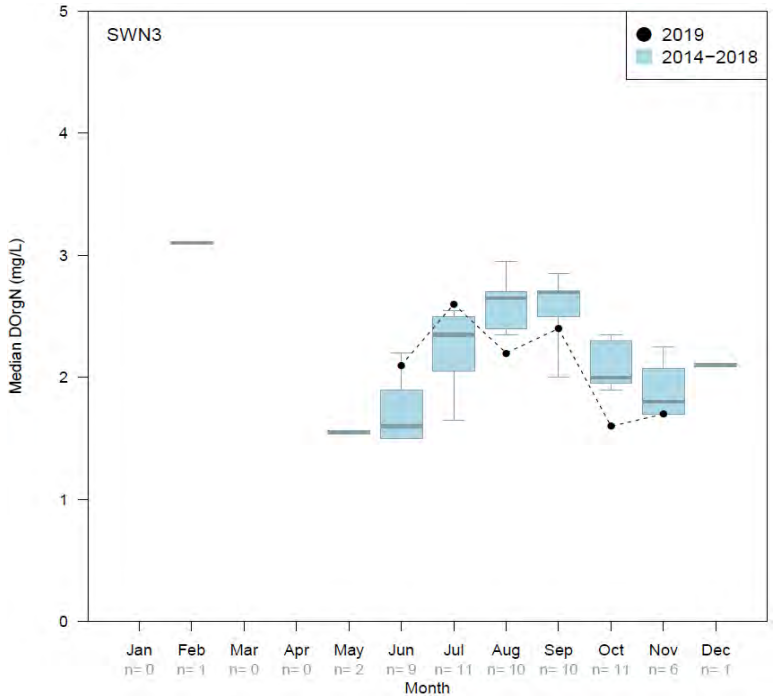

Figure 109. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN3. Number of samples (n) is provided for the historical data.

SWN3 total phosphorus (TP)

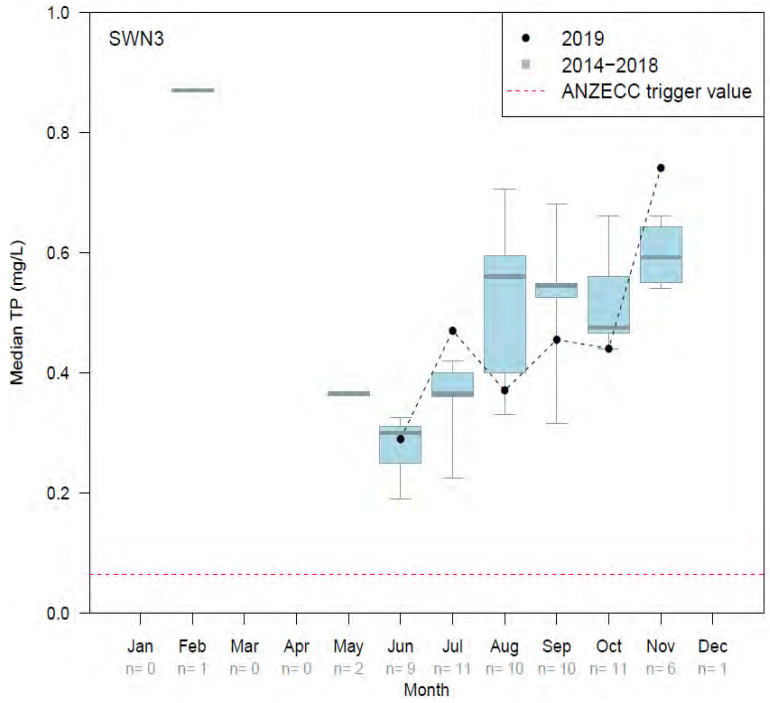

Figure 110. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN3. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

SWN3 filterable reactive phosphorus (FRP)

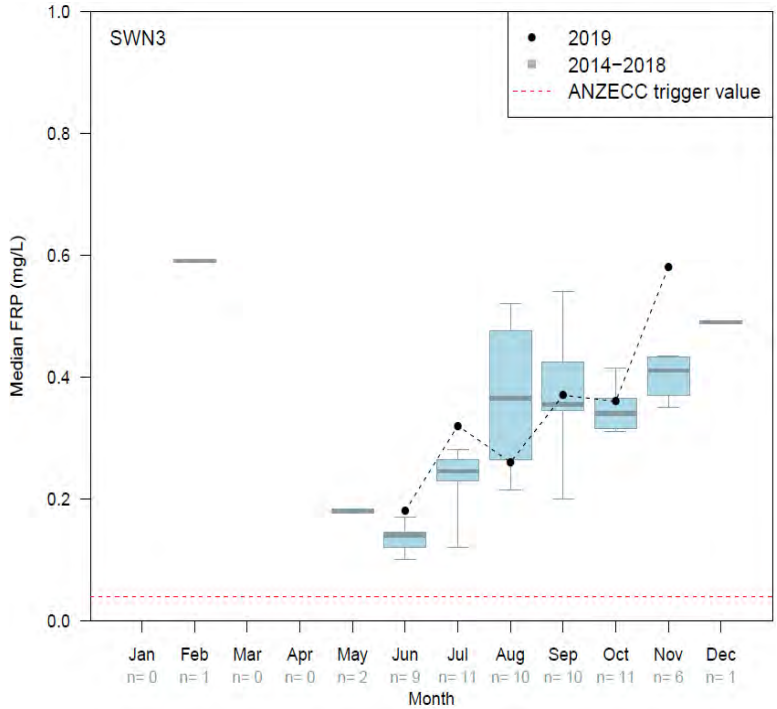

Figure 111. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN3. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

SWN3 dissolved organic carbon (DOC)

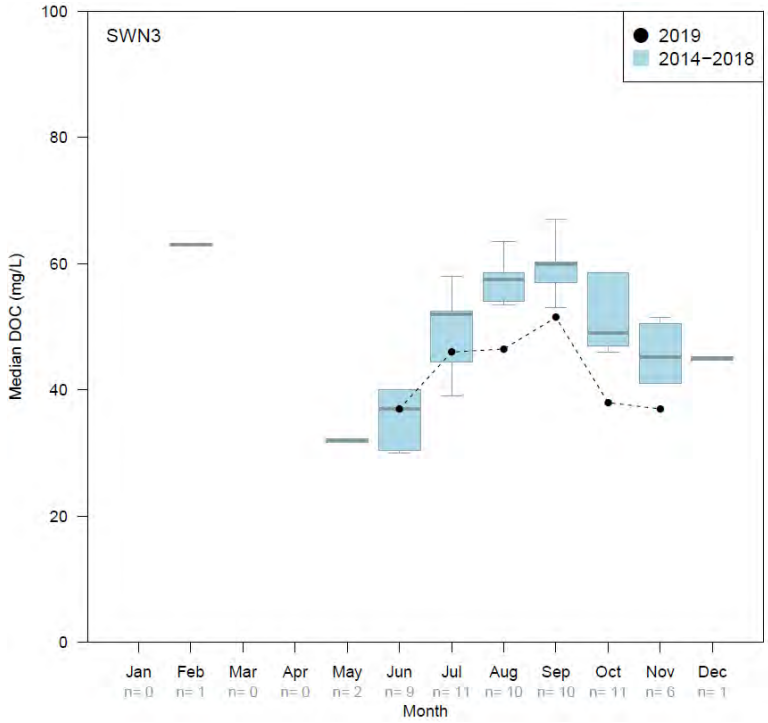

Figure 112. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN3. Number of samples (n) is provided for the historical data.

SWN3 total suspended solids (TSS)

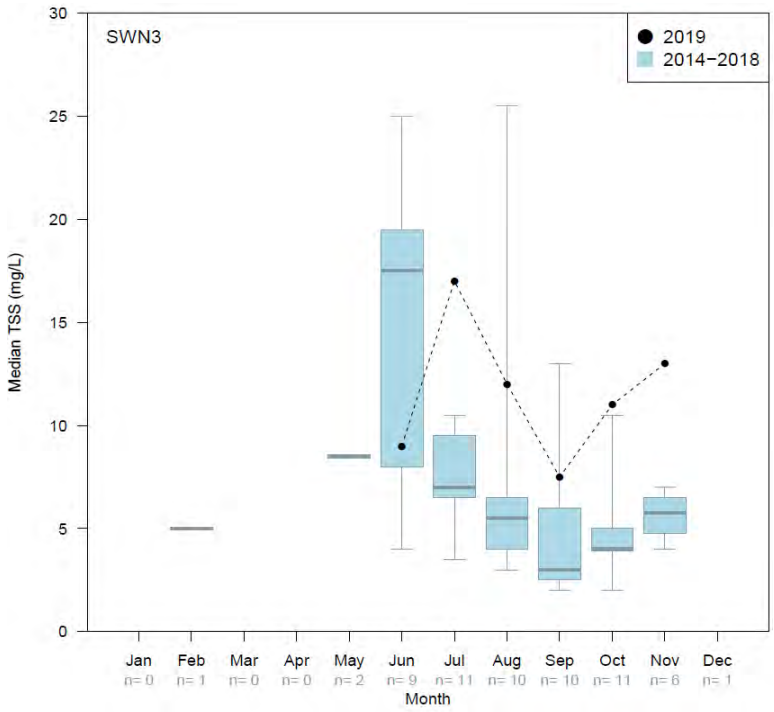

Figure 113. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN3. Number of samples (n) is provided for the historical data.

SWN3 dissolved oxygen (DO)

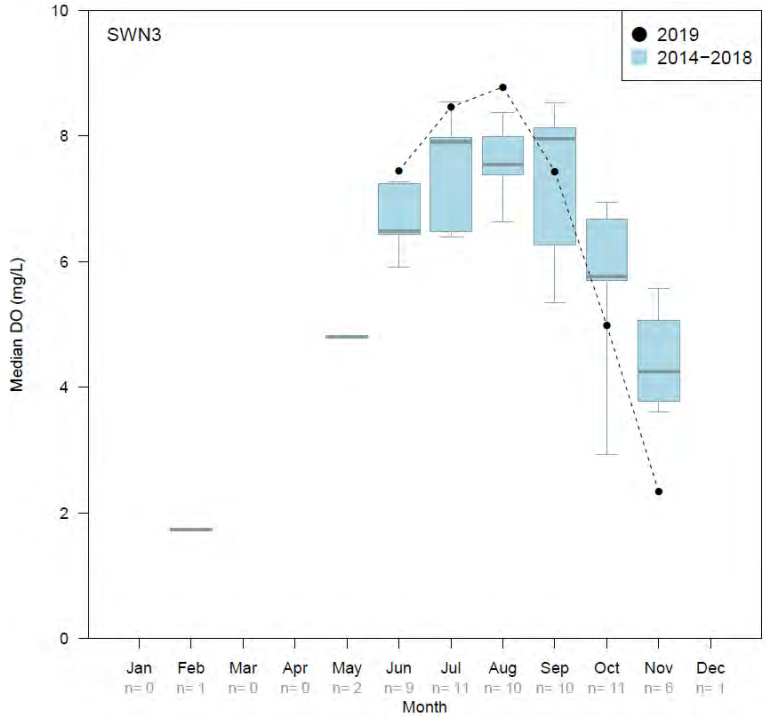

Figure 114. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN3. Number of samples (n) is provided for the historical data.

SWN3 specific conductivity (Sp. cond)

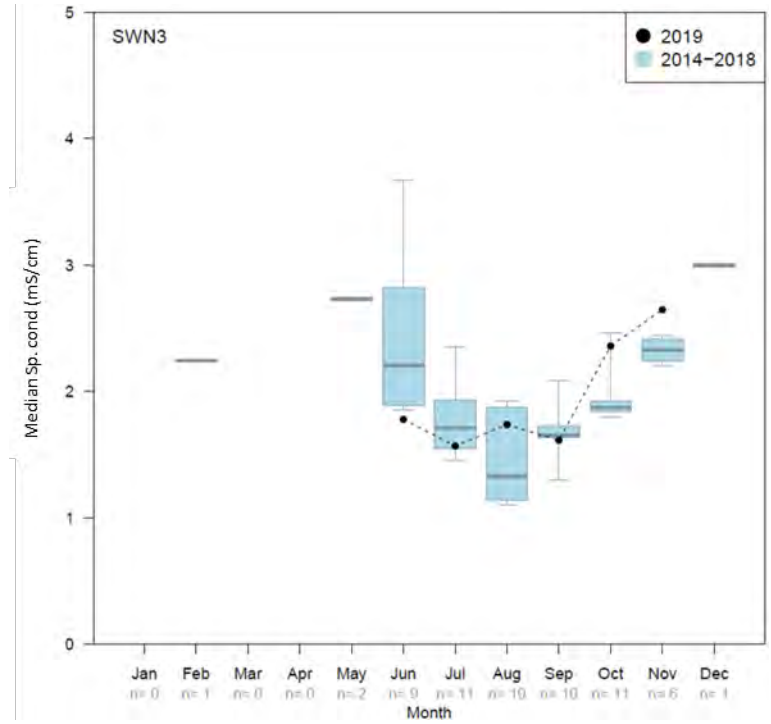

Figure 115. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN3. Number of samples (n) is provided for the historical data.

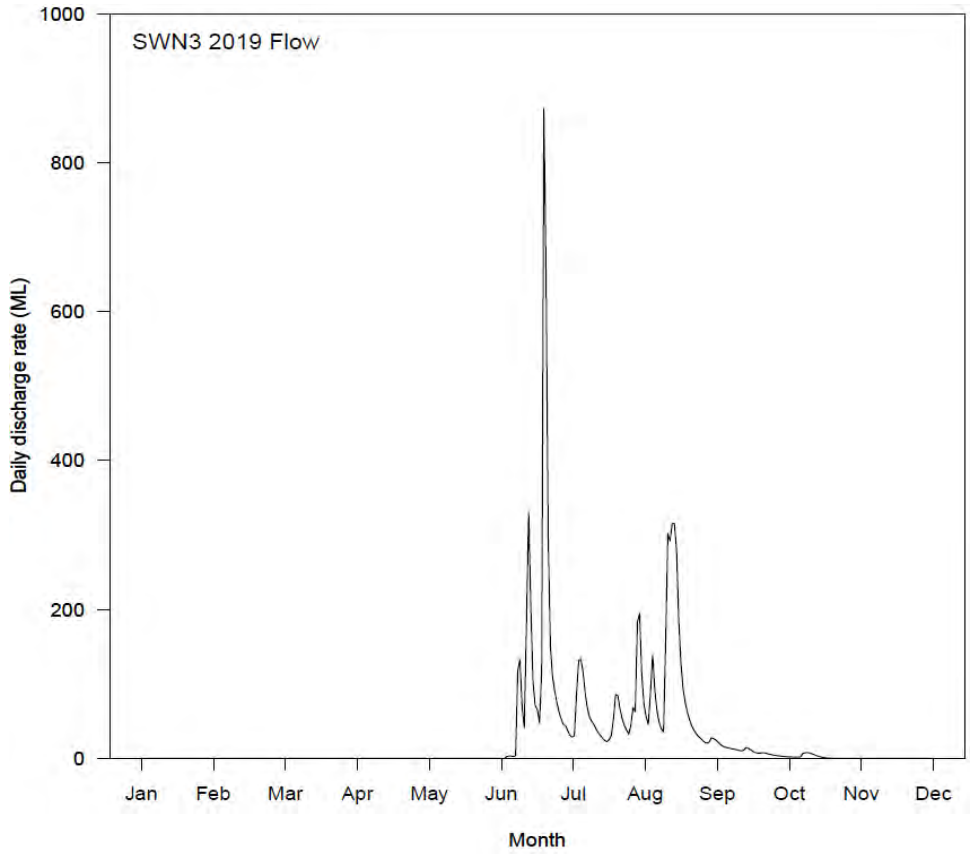

Figure 116. Daily discharge (ML) at Ellen Brook gauging station (616189 – at site of SWN3).

Table 13. 2019 monthly sample numbers, minimum and maximum values at SWN3.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	1	1	2	2	3	1	0
min						2.700	3.100	2.400	2.100	1.700	2.200	
max						2.700	3.100	2.600	3.100	1.900	2.200	
med						**2.700**	**3.100**	**2.500**	**2.600**	**1.800**	**2.200**	
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	1	2	2	3	1	0
min						0.120	0.120	0.051	0.054	0.039	0.120	
max						0.120	0.120	0.066	0.068	0.089	0.120	
med						**0.120**	**0.120**	**0.059**	**0.061**	**0.052**	**0.120**	
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	1	2	2	3	1	0
min						0.190	0.240	0.098	0.075	0.010	0.005	
max						0.190	0.240	0.140	0.098	0.053	0.005	
med						**0.190**	**0.240**	**0.119**	**0.087**	**0.016**	**0.005**	
DOrgN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	1	1	2	2	3	1	0
min						2.100	2.600	2.000	1.900	1.500	1.700	
max						2.100	2.600	2.400	2.900	1.600	1.700	
med						**2.100**	**2.600**	**2.200**	**2.400**	**1.600**	**1.700**	
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	1	2	2	3	1	0
min						0.290	0.470	0.350	0.450	0.410	0.740	
max						0.290	0.470	0.390	0.460	0.560	0.740	
med						**0.290**	**0.470**	**0.370**	**0.455**	**0.440**	**0.740**	
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	1	2	2	3	1	0
min						0.180	0.320	0.250	0.340	0.320	0.580	
max						0.180	0.320	0.270	0.400	0.410	0.580	
med						**0.180**	**0.320**	**0.260**	**0.370**	**0.360**	**0.580**	
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	1	2	2	3	1	0
min						37.00	46.00	43.00	47.00	36.00	37.00	
max						37.00	46.00	50.00	56.00	41.00	37.00	
med						**37.00**	**46.00**	**46.50**	**51.50**	**38.00**	**37.00**	
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	1	2	2	3	1	0
min						9.000	17.00	8.000	7.00	9.00	13.00	
max						9.000	17.00	16.00	8.00	11.00	13.00	
med						**9.000**	**17.00**	**12.00**	**7.50**	**11.00**	**13.00**	
DO (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	1	2	2	3	1	0
min						7.450	8.460	8.770	6.520	1.450	2.340	
max						7.450	8.460	8.790	8.350	5.990	2.340	
med						**7.450**	**8.460**	**8.780**	**7.435**	**4.990**	**2.340**	
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	1	2	2	3	1	0
min						1.778	1.568	1.647	1.233	1.912	2.646	
max						1.778	1.568	1.826	1.995	2.662	2.646	
med						**1.778**	**1.568**	**1.736**	**1.614**	**2.358**	**2.646**	

NB: Due to the ephemeral nature of flow at the SWN3 site in Ellen Brook and the below average rainfall in 2019, samples were only collected between June and November 2019.

The available data for SWN3 in 2019 generally followed the trends of the 2014-2018 background data (Figures 106 to 113). Concentrations were consistently greater than the background data for TN, NH_3-N, NO_x-N, DOrgN, TP, FRP and TSS in July 2019 (Figures 106-111 and 113). These elevated concentrations coincided with increased discharge resultant from high rainfall in June and July (212.0 and 108.6 mm, respectively) (Figure 116).

The influence of agricultural land-use in the catchment in the immediate vicinity of the SWN3 site may have some influence on notably elevated concentrations of TN, NH_3-N, TP, FRP and TSS in November 2019. Field notes refer to a noticeable reduction in flow and observations that cattle had unrestricted access to the waterway. Groundwater inputs from neighbouring agricultural lands and sediment disturbance by cattle may therefore account for these elevated concentrations.

Concentrations of TN always exceeded the ANZECC trigger values of 1.2 mg/L for lowland rivers where data were available for the 2019 reporting period (Figure 106). NO_x-N concentrations exceeded the ANZECC trigger value of 0.15 mg/L in June and July and were likely influenced by the rainfall events in those months (Figure 108). TP and FRP concentrations greatly exceeded their respective ANZECC trigger values of 0.065 mg/L and 0.04 mg/L for the entire reporting period, where data was available (Figures 110 and 111).

DOC was high throughout the monitoring period (>20 mg/L) but was often lower than the range of background data (Figure 112). TSS was highest in July and was also elevated in November (Figure 113). Dissolved oxygen was >6 mg/L during periods of high flow (June to September) but fell to 2.3 mg/L in November as river flows began to subside (Figures 114 and 116, Table 13).

12. Ellen Brook (SWN9)

SWN9 total nitrogen (TN)

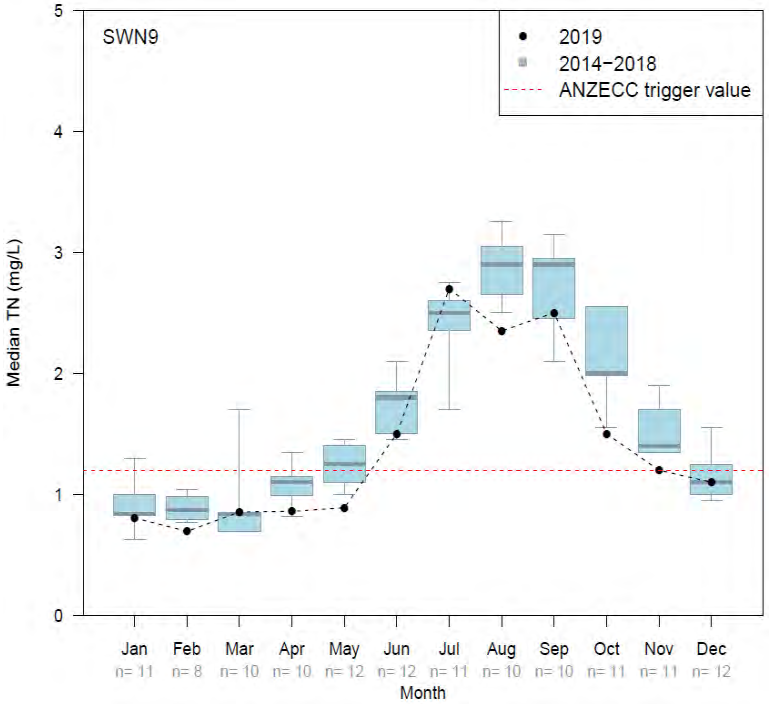

Figure 117. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN9. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

SWN9 ammoniacal nitrogen (NH_3-N)

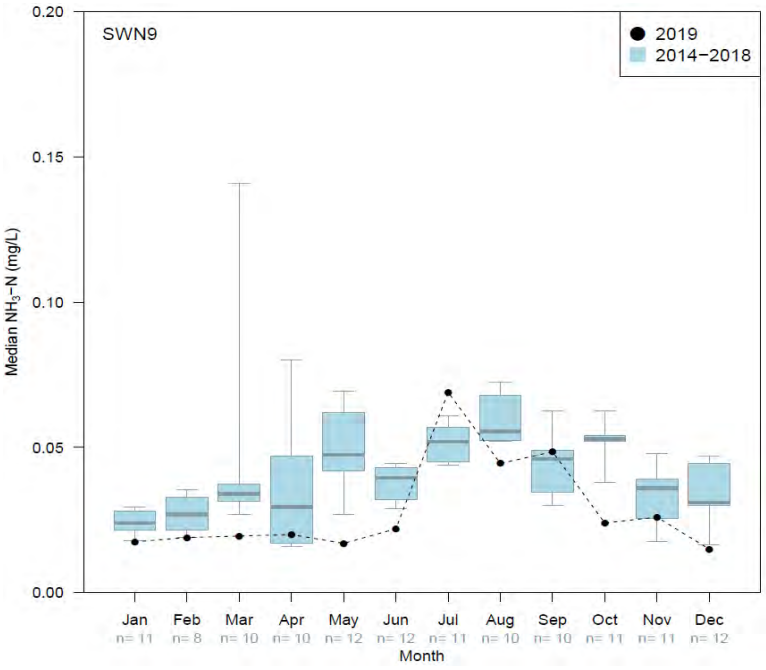

Figure 118. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN9. Number of samples (n) is provided for the historical data.

SWN9 total oxidised nitrogen (NO_x-N)

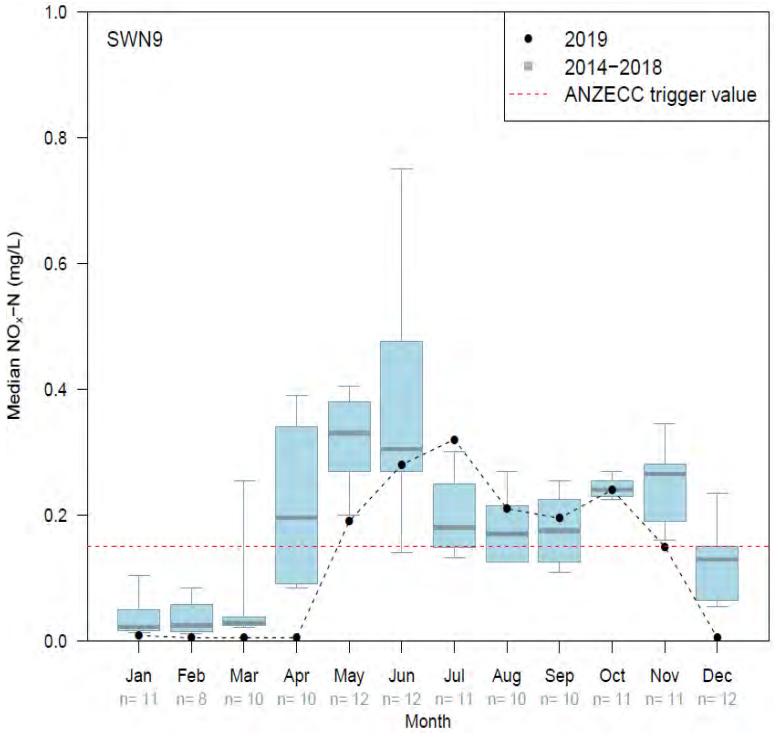

Figure 119. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN9. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

SWN9 dissolved organic nitrogen (DOrgN)

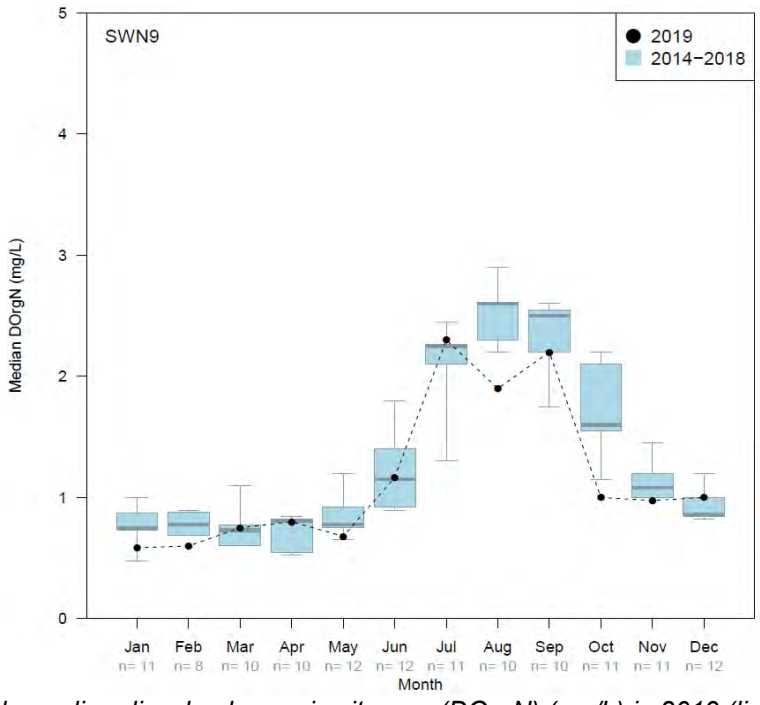

Figure 120. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN9. Number of samples (n) is provided for the historical data.

SWN9 total phosphorus (TP)

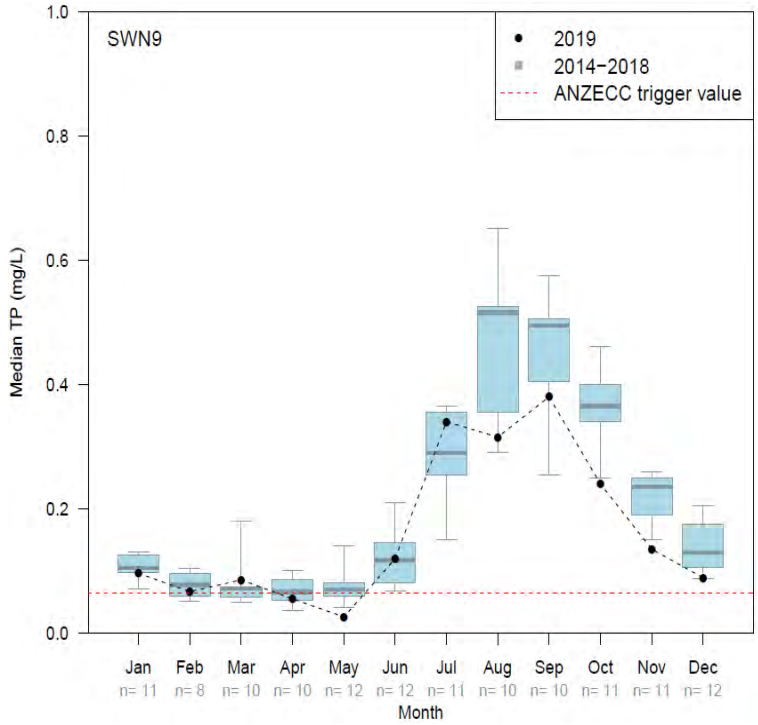

Figure 121. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN9. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

SWN9 filterable reactive phosphorus (FRP)

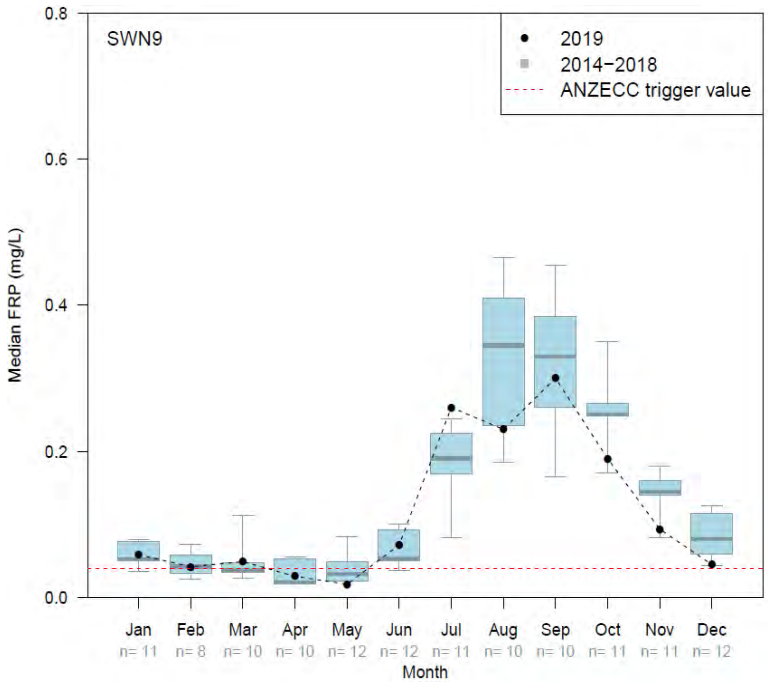

Figure 122. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN9. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

SWN9 dissolved organic carbon (DOC)

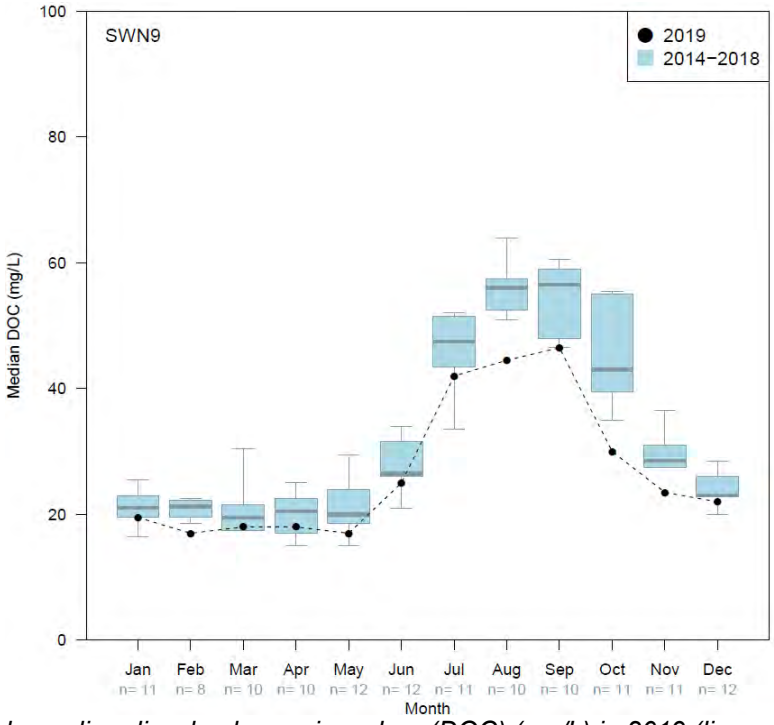

Figure 123. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN9. Number of samples (n) is provided for the historical data.

SWN9 total suspended solids (TSS)

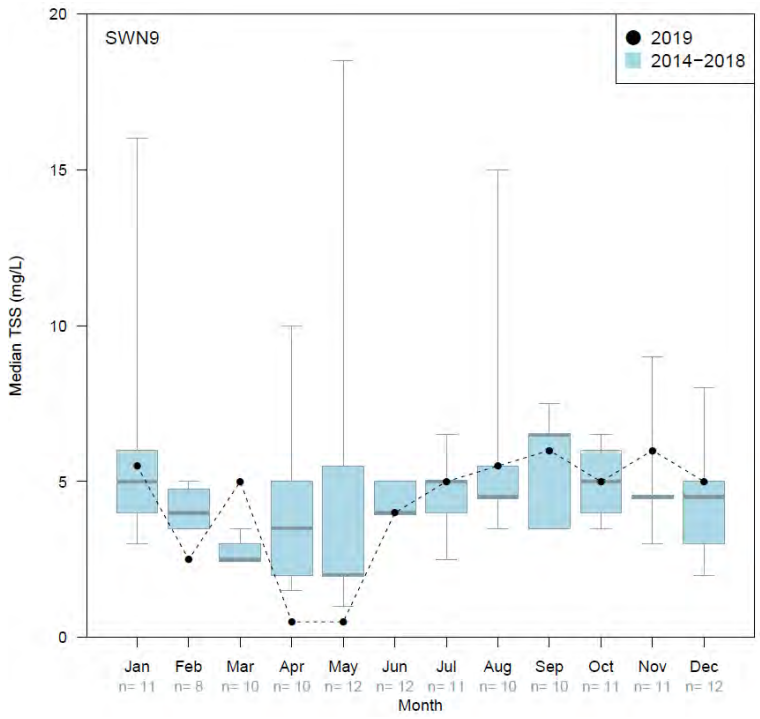

Figure 124. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN9. Number of samples (n) is provided for the historical data.

SWN9 dissolved oxygen (DO)

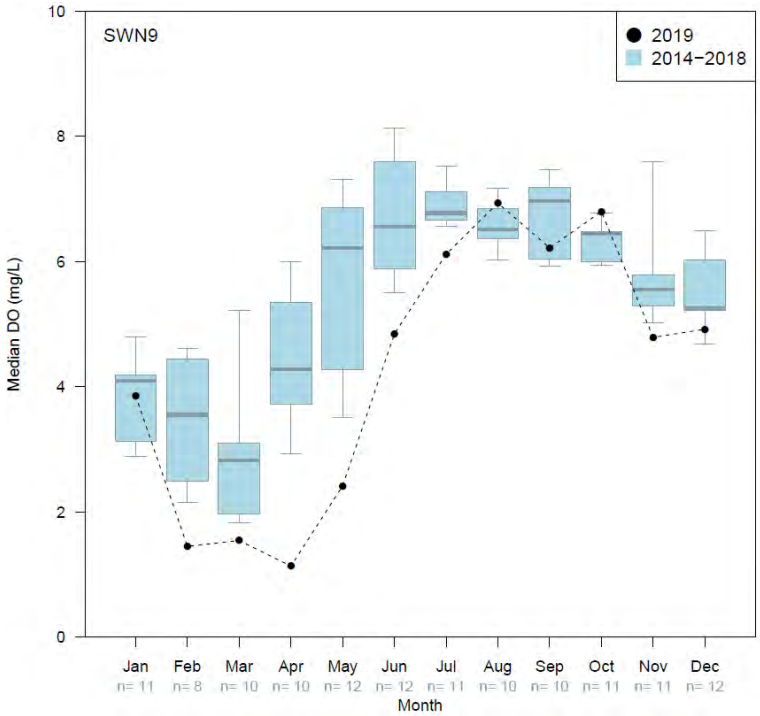

Figure 125. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN9. Number of samples (n) is provided for the historical data.

SWN9 specific conductivity (Sp. cond)

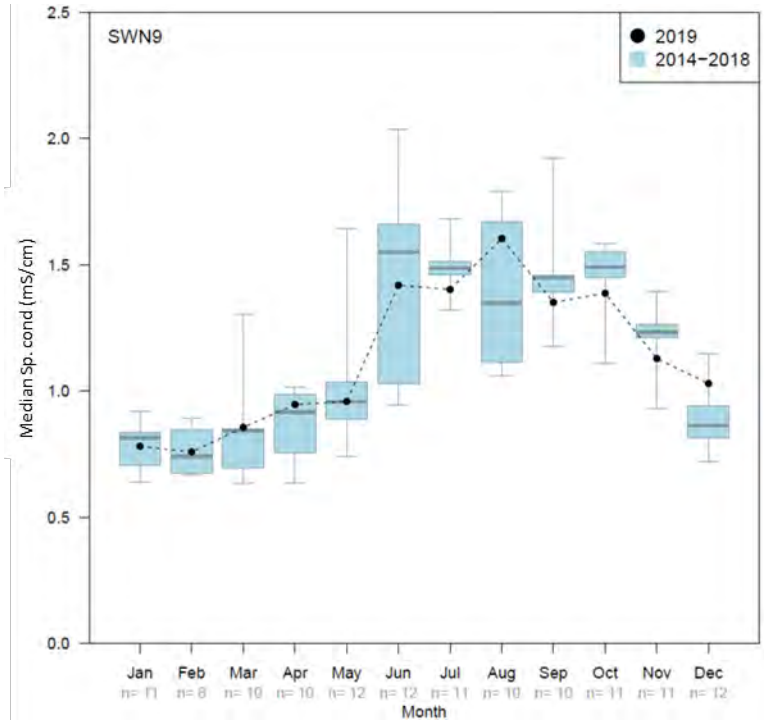

Figure 126. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN9. Number of samples (n) is provided for the historical data.

Table 14. 2019 monthly sample numbers, minimum and maximum values at SWN9.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	3	2	1	2	2	3	2	1
min	0.770	0.650	0.710	0.860	0.710	1.200	2.700	2.300	2.000	1.200	1.000	1.100
max	0.840	0.740	1.000	0.860	1.100	1.800	2.700	2.400	3.000	1.600	1.400	1.100
med	**0.805**	**0.695**	**0.855**	**0.860**	**0.890**	**1.500**	**2.700**	**2.350**	**2.500**	**1.500**	**1.200**	**1.100**
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	3	2	1	2	2	3	2	1
min	0.015	0.011	0.018	0.020	0.011	0.014	0.069	0.043	0.047	0.023	0.024	0.015
max	0.020	0.027	0.021	0.020	0.021	0.030	0.069	0.046	0.050	0.026	0.028	0.015
med	**0.018**	**0.019**	**0.020**	**0.020**	**0.017**	**0.022**	**0.069**	**0.045**	**0.049**	**0.024**	**0.026**	**0.015**
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	3	2	1	2	2	3	2	1
min	0.005	0.005	0.005	0.005	0.066	0.270	0.320	0.200	0.110	0.180	0.110	0.005
max	0.012	0.005	0.005	0.005	0.260	0.290	0.320	0.220	0.280	0.280	0.190	0.005
med	**0.009**	**0.005**	**0.005**	**0.005**	**0.190**	**0.280**	**0.320**	**0.210**	**0.195**	**0.240**	**0.150**	**0.005**
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	3	2	1	2	2	3	2	1
min	0.460	0.590	0.680	0.800	0.590	0.830	2.300	1.800	1.600	0.940	0.850	1.000
max	0.710	0.610	0.820	0.800	0.750	1.500	2.300	2.000	2.800	1.300	1.100	1.000
med	**0.585**	**0.600**	**0.750**	**0.800**	**0.680**	**1.165**	**2.300**	**1.900**	**2.200**	**1.000**	**0.975**	**1.000**
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	3	2	1	2	2	3	2	1
min	0.082	0.059	0.051	0.055	0.021	0.079	0.340	0.310	0.360	0.160	0.110	0.089
max	0.110	0.074	0.120	0.055	0.033	0.160	0.340	0.320	0.400	0.270	0.160	0.089
med	**0.096**	**0.067**	**0.086**	**0.055**	**0.026**	**0.120**	**0.340**	**0.315**	**0.380**	**0.240**	**0.135**	**0.089**
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	3	2	1	2	2	3	2	1
min	0.046	0.042	0.035	0.029	0.013	0.050	0.260	0.220	0.290	0.130	0.087	0.045
max	0.071	0.042	0.063	0.029	0.020	0.094	0.260	0.240	0.310	0.230	0.100	0.045
med	**0.059**	**0.042**	**0.049**	**0.029**	**0.018**	**0.072**	**0.260**	**0.230**	**0.300**	**0.190**	**0.094**	**0.045**
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	3	2	1	2	2	3	2	1
min	19.00	16.00	16.00	18.00	16.00	21.00	42.00	44.00	41.00	26.00	21.00	22.00
max	20.00	18.00	20.00	18.00	17.00	29.00	42.00	45.00	52.00	34.00	26.00	22.00
med	**19.50**	**17.00**	**18.00**	**18.00**	**17.00**	**25.00**	**42.00**	**44.50**	**46.50**	**30.00**	**23.50**	**22.00**
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	3	2	1	2	2	3	2	1
min	5.000	2.000	2.000	0.500	0.500	2.000	5.000	3.000	5.000	5.000	4.000	5.000
max	6.000	3.000	8.000	0.500	1.000	6.000	5.000	8.000	7.000	7.000	8.000	5.000
med	**5.500**	**2.500**	**5.000**	**0.500**	**0.500**	**4.000**	**5.000**	**5.500**	**6.000**	**5.000**	**6.000**	**5.000**
DO (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	3	2	1	2	2	3	2	1
min	2.960	1.100	0.530	1.050	1.840	4.300	6.120	6.730	5.460	6.560	3.710	4.920
max	4.750	1.800	2.560	1.220	3.480	5.390	6.120	7.140	6.980	8.180	5.870	4.920
med	**3.855**	**1.450**	**1.545**	**1.135**	**2.420**	**4.845**	**6.120**	**6.935**	**6.220**	**6.800**	**4.790**	**4.920**
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	3	2	1	2	2	3	2	1
min	0.754	0.726	0.815	0.925	0.929	1.186	1.402	1.435	1.096	1.327	1.040	1.029
max	0.807	0.790	0.896	0.967	0.990	1.651	1.402	1.773	1.605	1.418	1.216	1.029
med	**0.781**	**0.758**	**0.856**	**0.946**	**0.958**	**1.419**	**1.402**	**1.604**	**1.351**	**1.387**	**1.128**	**1.029**

NB: Daily discharge data is not available for SWN9 as this site is not gauged.

The 2019 SWN9 data exhibited a seasonal trend with increased concentrations during the winter months for all nitrogen (Figures 117-120) and phosphorus analytes (Figures 121 and 122, Table 14).

Median concentrations of TN and NO_x-N exceeded ANZECC trigger values for lowland rivers of 1.2 mg/L and 0.15 mg/L, respectively from June to October for TN and May to October for NO_x-N, which is likely a response to seasonal flow (Figures 117 and 119). Concentrations of TP and FRP exceeded their respective trigger values (0.065 mg/L and 0.04 mg/L) in all months in 2019, except April and May (Figures 121 and 122).

In 2019, although DOC was typically high (>20 mg/L), median concentrations were often below the 25th percentile and in some months below the range of background data (Figure 123). TSS at this site is historically highly variable and in 2019 was outside the background range between February and May (Figure 124). Dissolved oxygen concentrations were <4 mg/L in January and May and < 2mg/L from February to April but were >4 mg/L for the remainder for the year (Figure 125, Table 14). Conductivity values in 2019 were generally consistent with those of the previous five years (Figure 126).

13. Ellis Brook (EBGS01)

EBGS01 total nitrogen (TN)

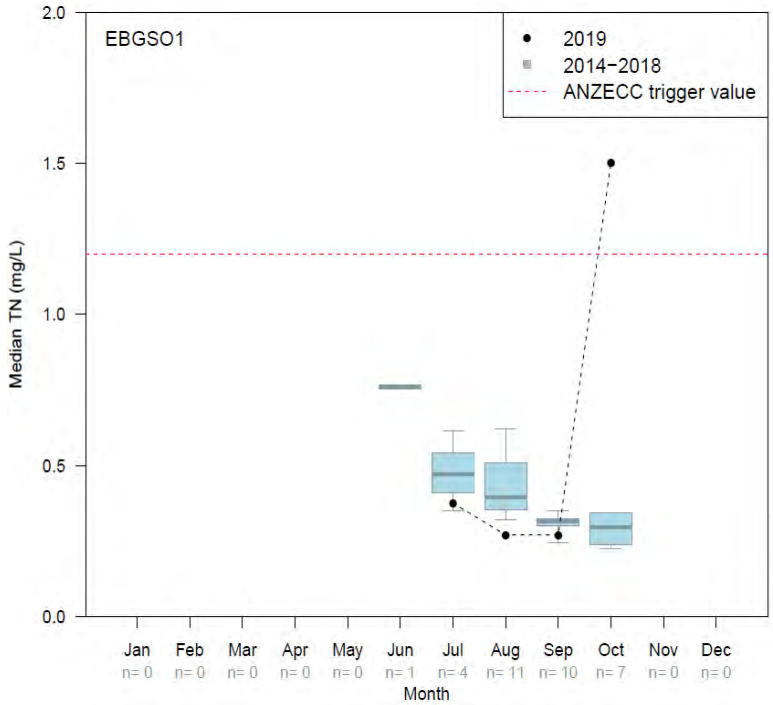

Figure 127. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site EBGS01. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

EBGS01 ammoniacal nitrogen (NH_3-N)

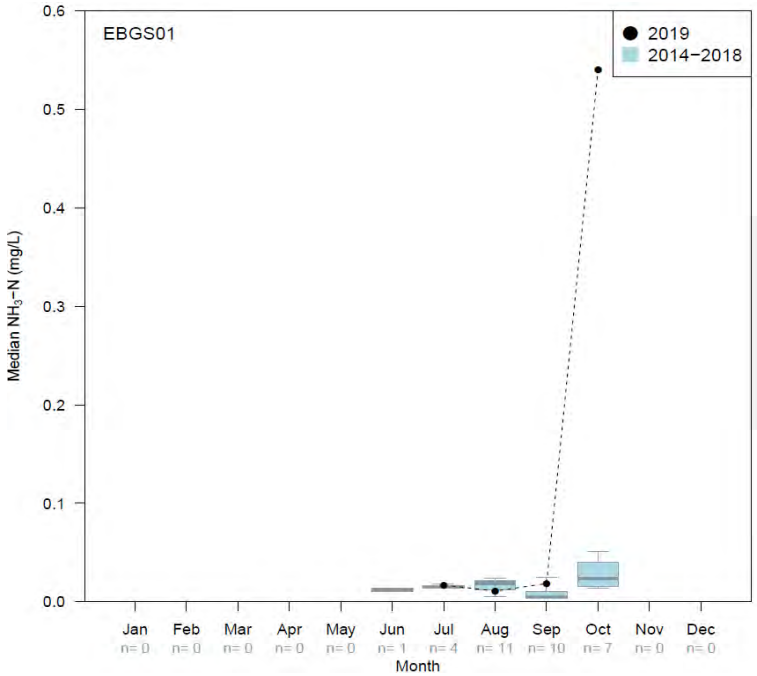

Figure 128. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site EBGS01. Number of samples (n) is provided for the historical data.

EBGS01 total oxidised nitrogen (NO_x-N)

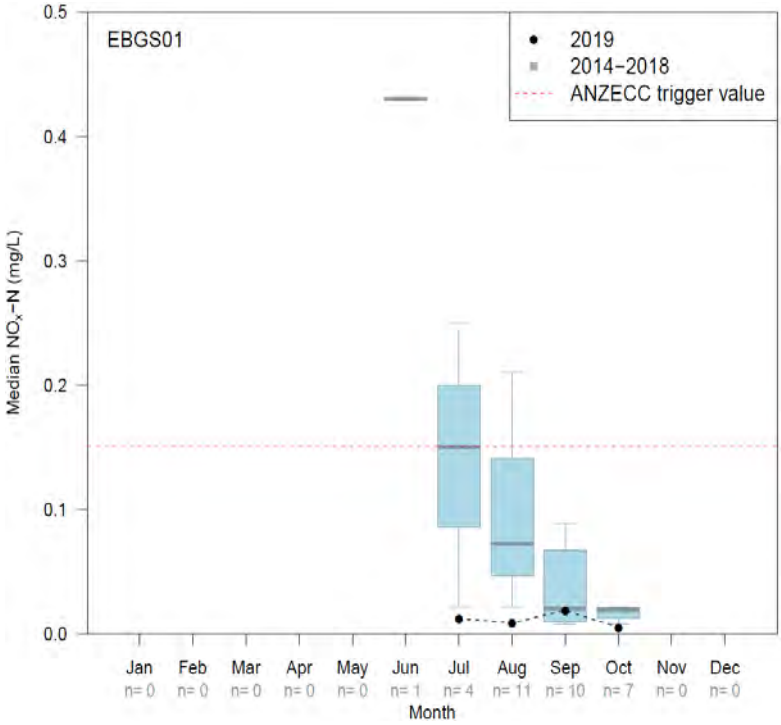

Figure 129. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site EBGS01. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

EBGS01 dissolved organic nitrogen (DOrgN)

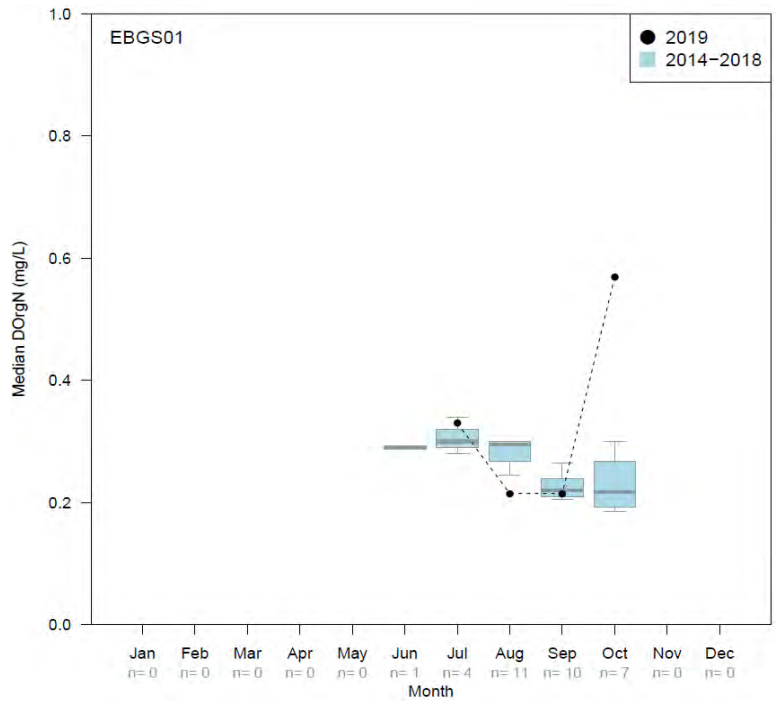

Figure 130. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site EBGS01. Number of samples (n) is provided for the historical data.

EBGS01 total phosphorus (TP)

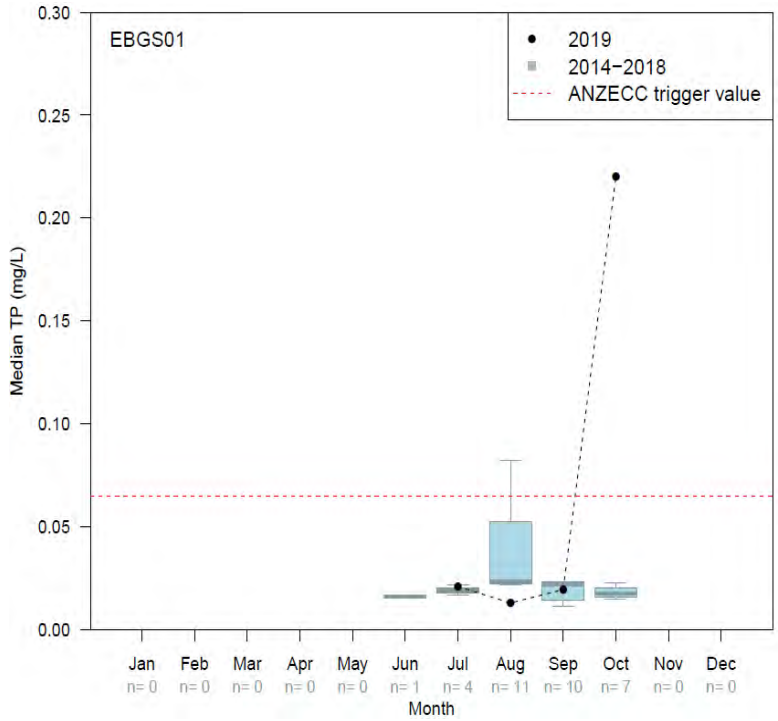

Figure 131. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site EBGS01. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

EBGS01 filterable reactive phosphorus (FRP)

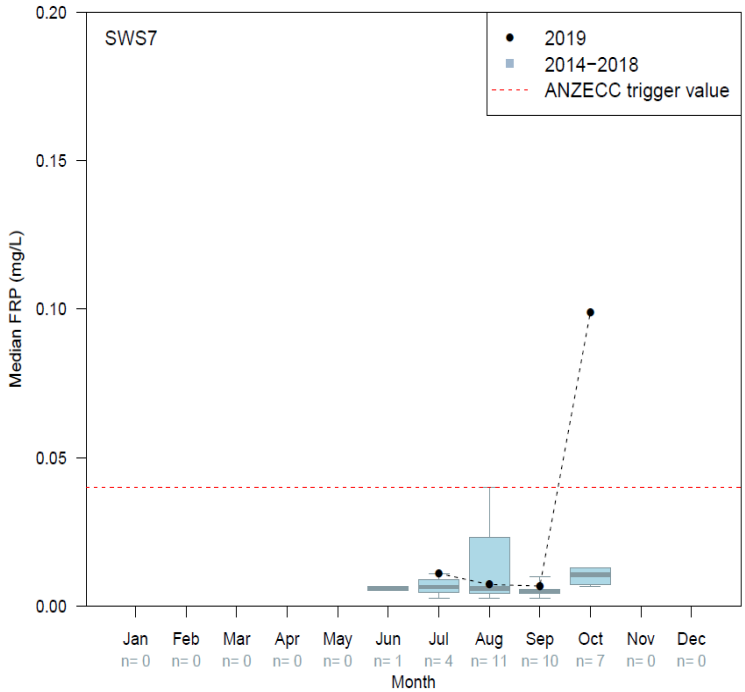

Figure 132. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site EBGS01. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

EBGS01 dissolved organic carbon (DOC)

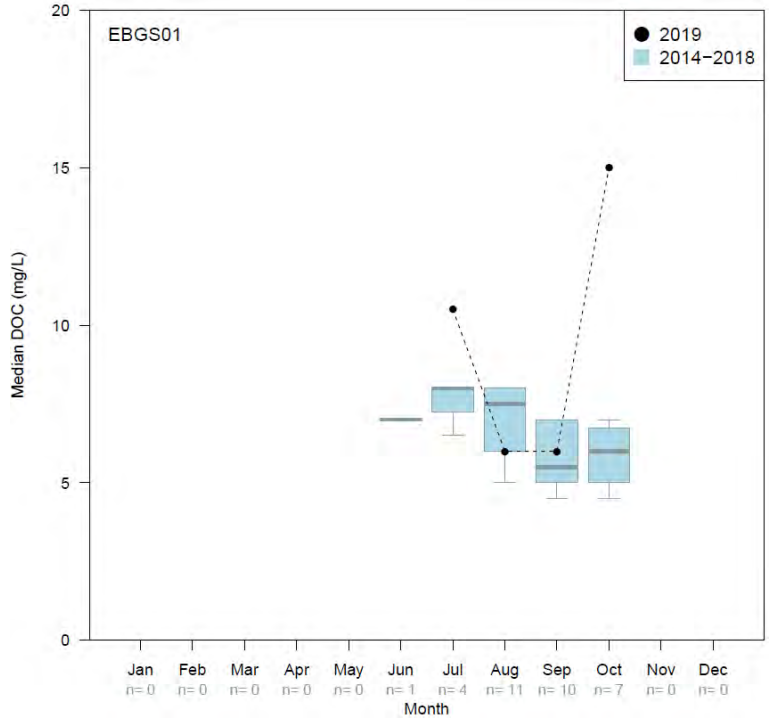

Figure 133. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site EBGS01. Number of samples (n) is provided for the historical data.

EBGS01 total suspended solids (TSS)

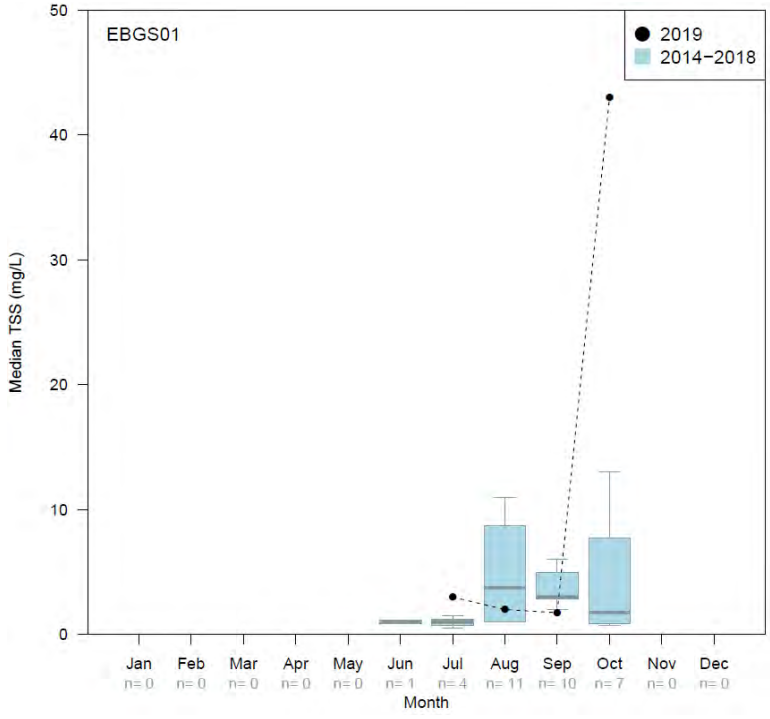

Figure 134. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site EBGS01. Number of samples (n) is provided for the historical data.

EBGS01 dissolved oxygen (DO)

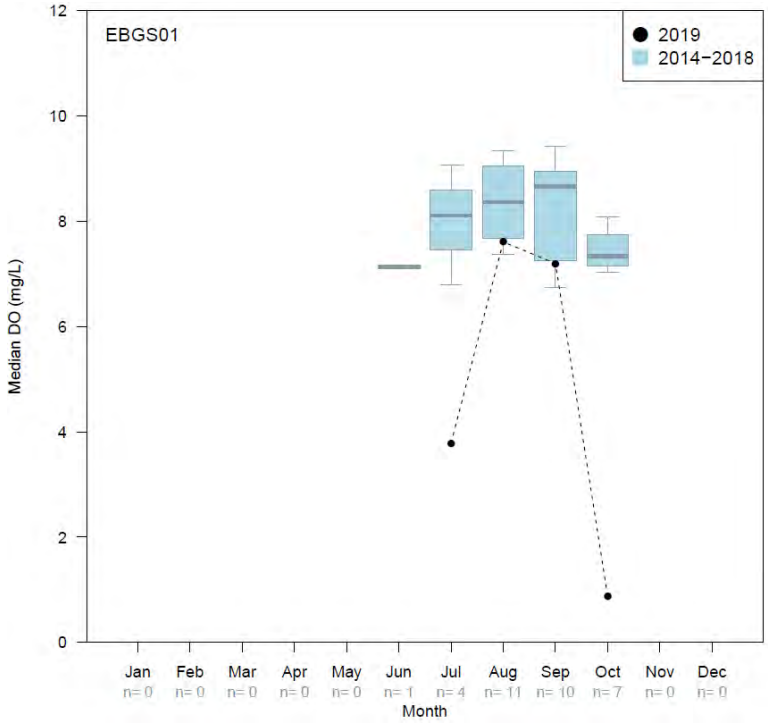

Figure 135. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site EBGS01. Number of samples (n) is provided for the historical data.

EBGS01 specific conductivity (Sp. cond)

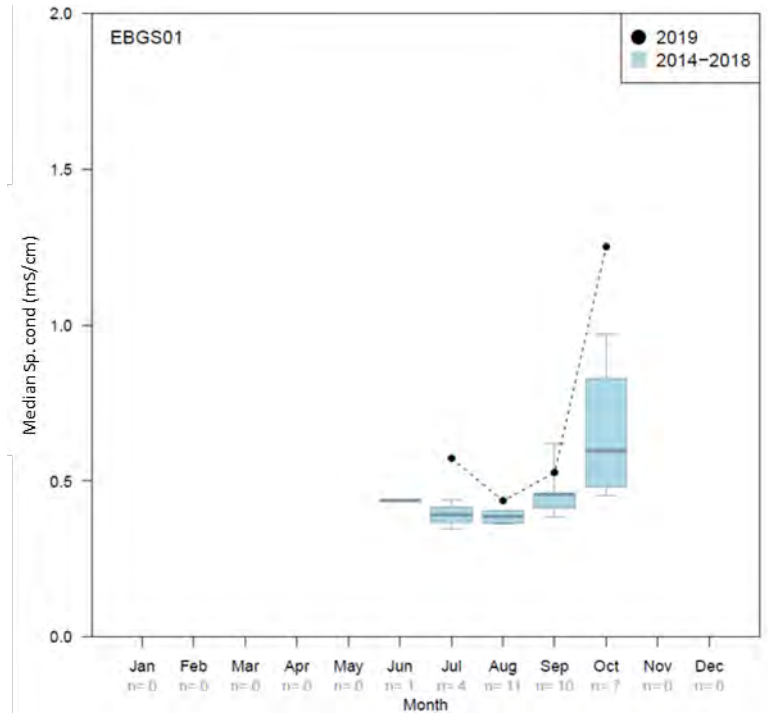

Figure 136. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site EBGS01. Number of samples (n) is provided for the historical data.

Table 15. 2019 monthly sample numbers, minimum and maximum values at EBGS01.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	0	2	2	2	1	0	0
min							0.310	0.230	0.240	1.500		
max							0.440	0.310	0.300	1.500		
med							**0.375**	**0.270**	**0.270**	**1.500**		
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	2	2	2	1	0	0
min							0.005	0.005	0.014	0.540		
max							0.029	0.017	0.023	0.540		
med							**0.017**	**0.011**	**0.019**	**0.540**		
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	2	2	2	1	0	0
min							0.005	0.005	0.012	0.005		
max							0.019	0.012	0.025	0.005		
med							**0.012**	**0.009**	**0.019**	**0.005**		
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	2	2	2	1	0	0
min							0.300	0.190	0.190	0.570		
max							0.360	0.240	0.240	0.570		
med							**0.330**	**0.215**	**0.215**	**0.570**		
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	2	2	2	1	0	0
min							0.016	0.013	0.016	0.220		
max							0.026	0.013	0.023	0.220		
med							**0.021**	**0.013**	**0.020**	**0.220**		
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	2	2	2	1	0	0
min							0.010	0.003	0.003	0.099		
max							0.012	0.012	0.011	0.099		
med							**0.011**	**0.007**	**0.007**	**0.099**		
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	2	2	2	1	0	0
min							9.000	5.000	6.000	15.00		
max							12.00	7.000	6.000	15.00		
med							**10.50**	**6.000**	**6.000**	**15.00**		
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	2	2	2	1	0	0
min							2.000	2.000	0.500	43.00		
max							4.000	2.000	3.000	43.00		
med							**3.000**	**2.000**	**1.750**	**43.00**		
DO (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	0	2	2	2	1	0	0
min							2.770	7.190	6.540	0.880		
max							4.800	8.020	7.850	0.880		
med							**3.785**	**7.605**	**7.195**	**0.880**		
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	2	2	2	1	0	0
min							0.510	0.432	0.440	1.251		
max							0.636	0.441	0.614	1.251		
med							**0.573**	**0.436**	**0.527**	**1.251**		

NB: Daily discharge data is not available for EBGS01 as this site is not gauged. Due to the highly ephemeral nature of flow in Ellis Brook and below average rainfall in 2019, samples were only collected between July and October 2019.

During the period of flow in 2019, the data for TN (Figure 127), NH_3-N (Figure 128), DOrgN (Figure 130), TP (Figure 131) and FRP (Figure 132) generally followed those of the background data from July to September but were highly elevated in October. Median values for NO_x-N however were consistently low and often below the range of background data (Figure 129).

The highly elevated concentrations of TN, TP and FRP in October exceeded their respective ANZECC trigger values of 1.2 mg/L, 0.065 mg/L and 0.04 mg/L for lowland rivers (Figures 127, 131 and 132). Concentrations of NO_x-N remained well below the trigger value of 0.15 mg/L in those months where data was available (Figure 129).

As with the nutrient data (except for NO_x-N), values for DOC (Figure 133), TSS (Figure 134) and specific conductivity (Figure 134) were highly elevated in October, however dissolved oxygen was greatly reduced (0.88 mg/L) (Figure 135, Table 15). Collectively, these data suggest that during the single sampling event in October, flow in Ellis Brook had greatly reduced, likely resulting in evaporative water loss, a depletion in dissolved oxygen and the release of nutrients from sediments.

14. Helena River (SWN10)

SWN10 total nitrogen (TN)

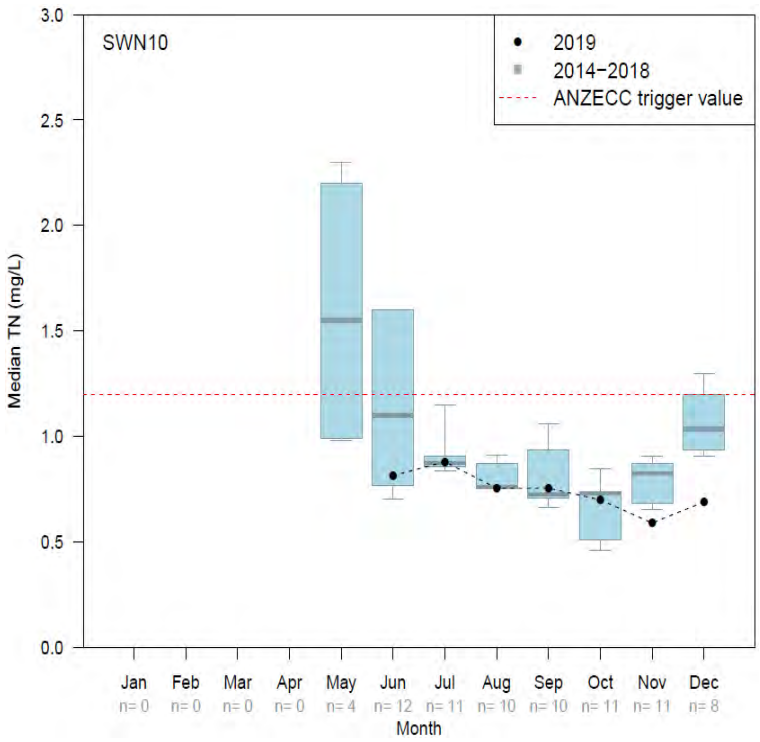

Figure 137. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN10. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

SWN10 ammoniacal nitrogen (NH_3-N)

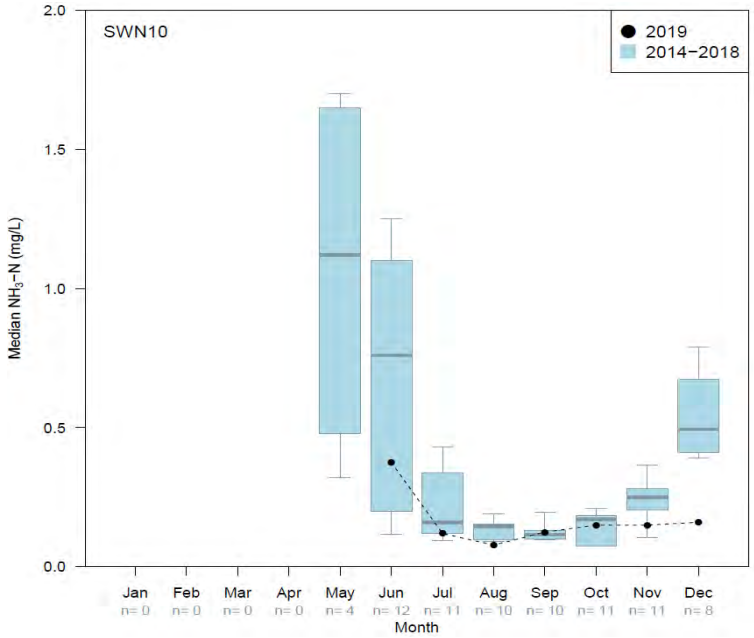

Figure 138. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN10. Number of samples (n) is provided for the historical data.

SWN10 total oxidised nitrogen (NO_x-N)

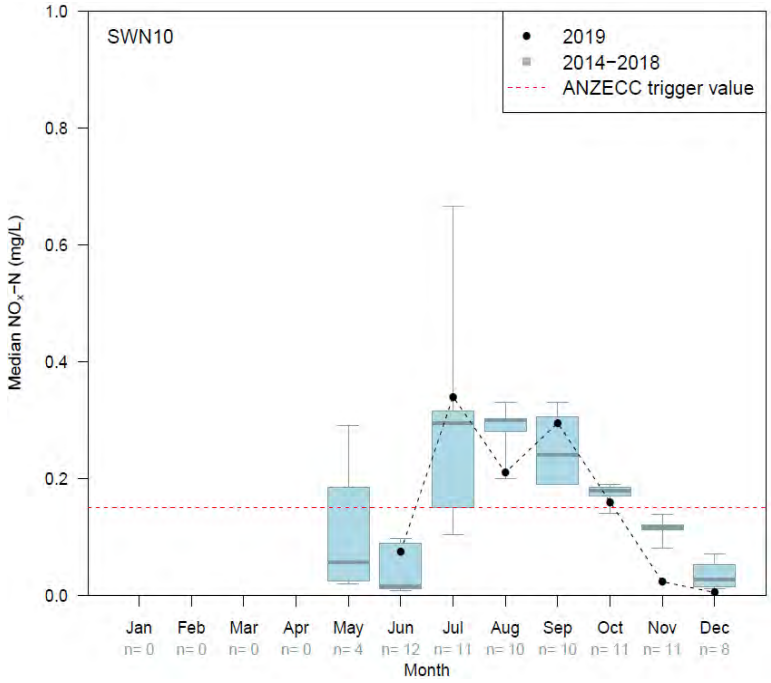

Figure 139. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN10. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

SWN10 dissolved organic nitrogen (DOrgN)

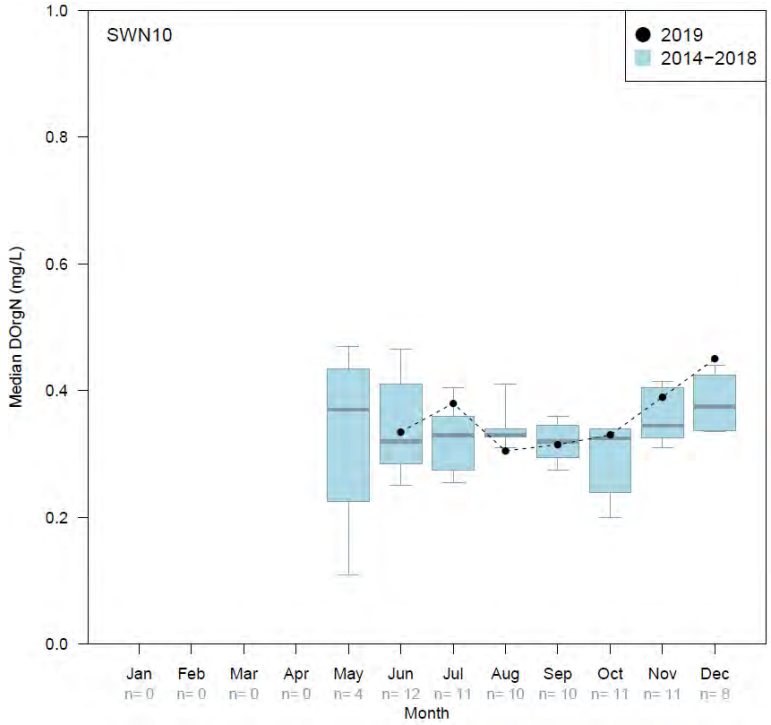

Figure 140. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN10. Number of samples (n) is provided for the historical data.

SWN10 total phosphorus (TP)

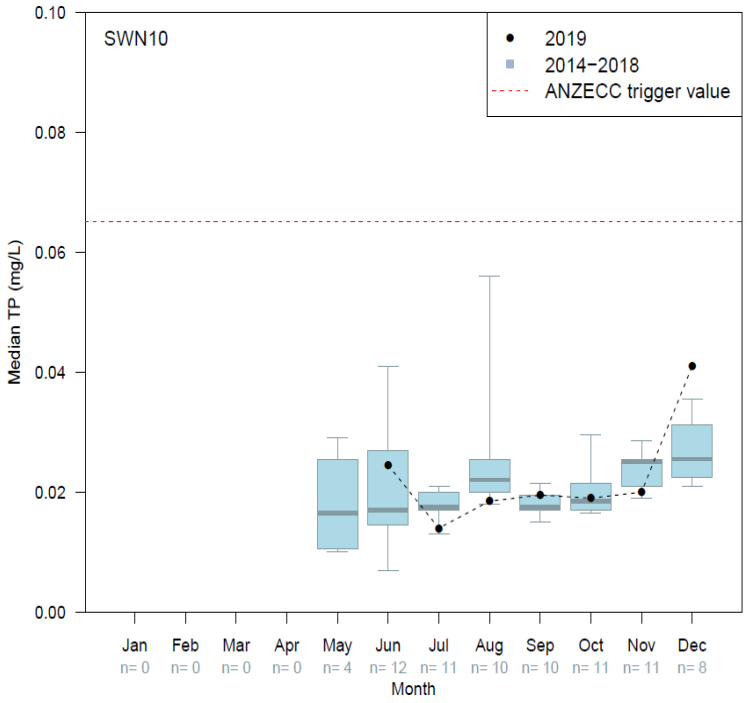

Figure 141. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN10. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

SWN10 filterable reactive phosphorus (FRP)

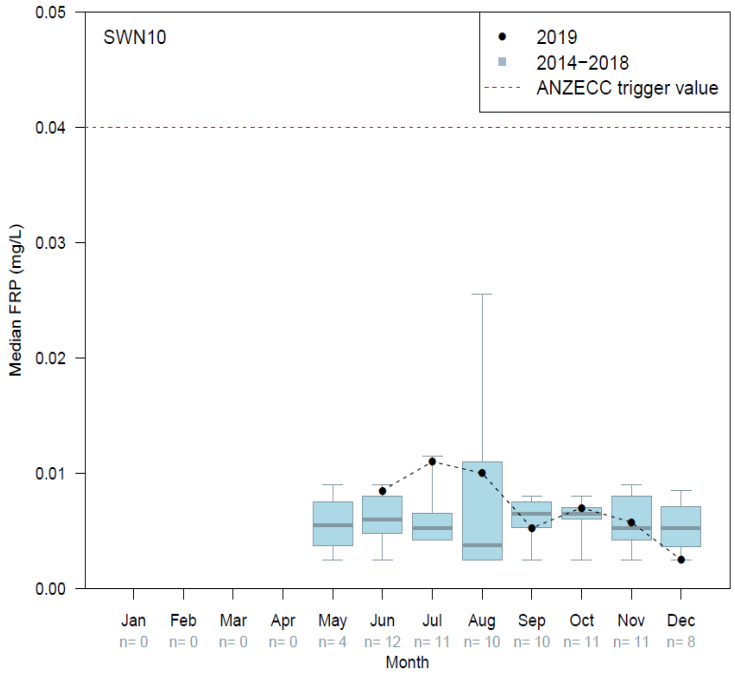

Figure 142. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN10. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

SWN10 dissolved organic carbon (DOC)

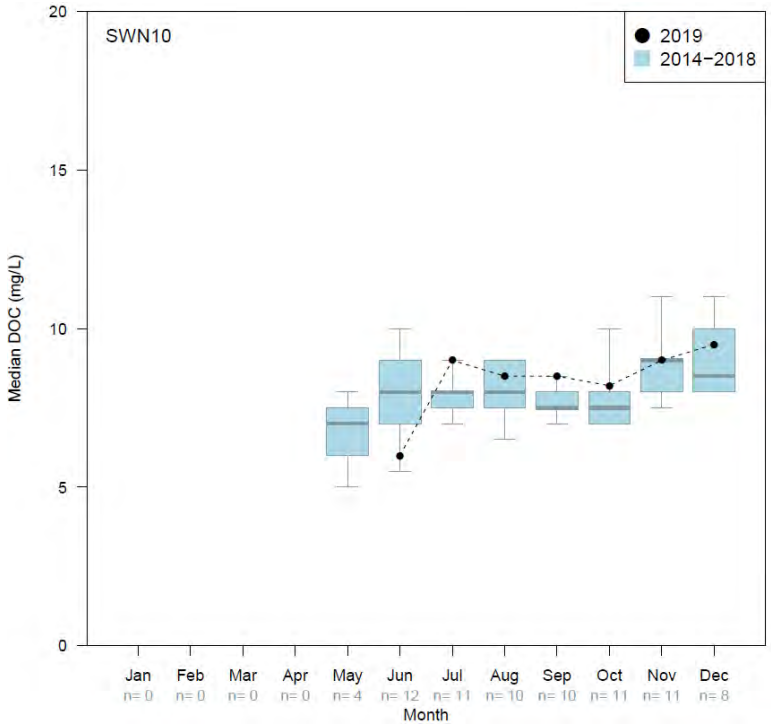

Figure 143. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN10. Number of samples (n) is provided for the historical data.

SWN10 total suspended solids (TSS)

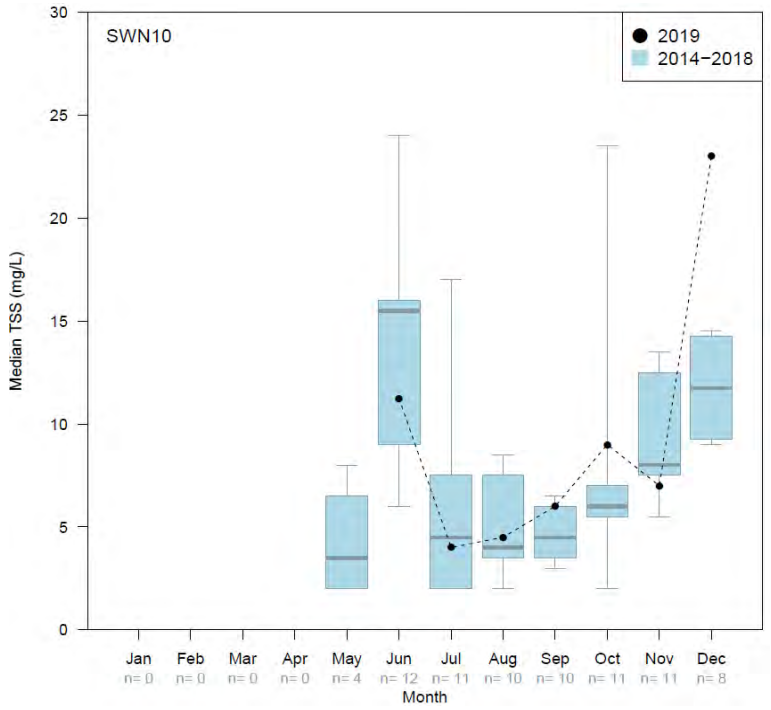

Figure 144. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN10. Number of samples (n) is provided for the historical data.

SWN10 dissolved oxygen (DO)

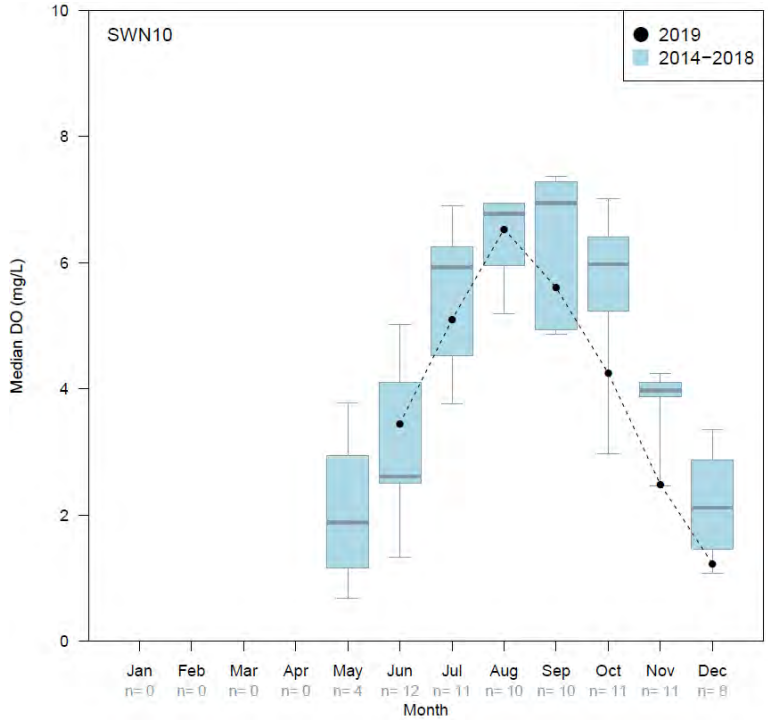

Figure 145. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN10. Number of samples (n) is provided for the historical data.

SWN10 specific conductivity (Sp. cond)

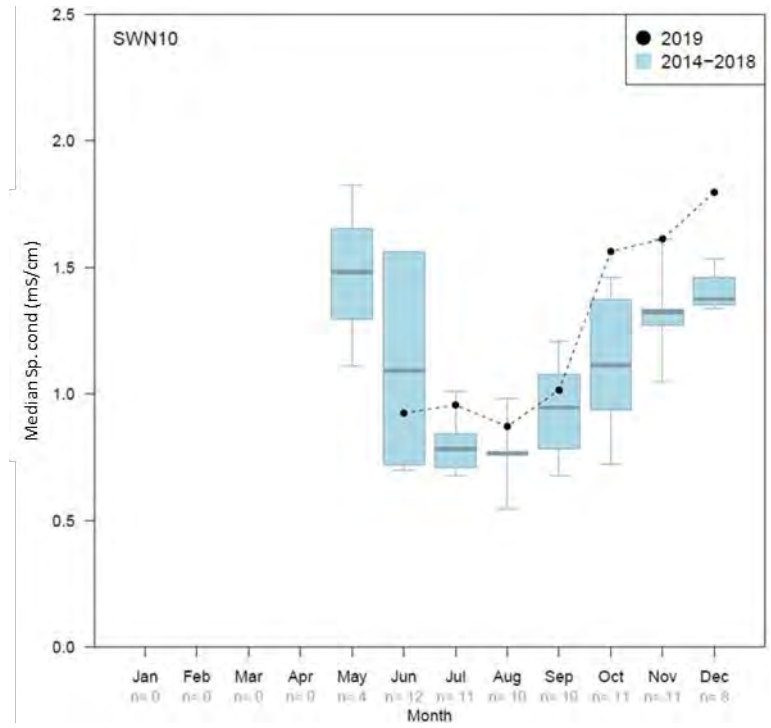

Figure 146. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN10. Number of samples (n) is provided for the historical data.

Table 16. 2019 monthly sample numbers, minimum and maximum values at SWN10.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	2	1	2	2	3	2	1
min						0.650	0.880	0.700	0.740	0.620	0.580	0.690
max						0.980	0.880	0.810	0.770	0.800	0.600	0.690
med						**0.815**	**0.880**	**0.755**	**0.755**	**0.700**	**0.590**	**0.690**
NH_3-N (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	2	1	2	2	3	2	1
min						0.240	0.120	0.046	0.100	0.150	0.150	0.160
max						0.510	0.120	0.110	0.150	0.220	0.150	0.160
med						**0.375**	**0.120**	**0.078**	**0.125**	**0.150**	**0.150**	**0.160**
NO_x-N (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	2	1	2	2	3	2	1
min						0.041	0.340	0.130	0.260	0.059	0.023	0.005
max						0.110	0.340	0.290	0.330	0.220	0.024	0.005
med						**0.076**	**0.340**	**0.210**	**0.295**	**0.160**	**0.024**	**0.005**
DOrgN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	2	1	2	2	3	2	1
min						0.260	0.380	0.230	0.270	0.320	0.370	0.450
max						0.410	0.380	0.380	0.360	0.370	0.410	0.450
med						**0.335**	**0.380**	**0.305**	**0.315**	**0.330**	**0.390**	**0.450**
TP (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	2	1	2	2	3	2	1
min						0.020	0.014	0.014	0.014	0.017	0.019	0.041
max						0.029	0.014	0.023	0.025	0.030	0.021	0.041
med						**0.025**	**0.014**	**0.019**	**0.020**	**0.019**	**0.020**	**0.041**
FRP (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	2	1	2	2	3	2	1
min						0.007	0.011	0.008	0.003	0.003	0.003	0.003
max						0.010	0.011	0.012	0.008	0.008	0.009	0.003
med						**0.009**	**0.011**	**0.010**	**0.005**	**0.007**	**0.006**	**0.003**
DOC (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	2	1	2	2	3	2	1
min						5.000	9.000	8.000	8.000	8.000	8.300	9.500
max						7.000	9.000	9.000	9.000	8.800	9.700	9.500
med						**6.000**	**9.000**	**8.500**	**8.500**	**8.200**	**9.000**	**9.500**
TSS (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	2	1	2	2	3	2	1
min						0.500	4.000	3.000	5.000	9.000	6.000	23.00
max						22.00	4.000	6.000	7.000	10.00	8.000	23.00
med						**11.25**	**4.000**	**4.500**	**6.000**	**9.000**	**7.000**	**23.00**
DO (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	2	1	2	2	3	2	1
min						2.570	5.100	6.410	4.280	3.020	2.110	1.230
max						4.330	5.100	6.660	6.930	5.160	2.870	1.230
med						**3.450**	**5.100**	**6.535**	**5.605**	**4.250**	**2.490**	**1.230**
Sp. cond (mS/cm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	2	1	2	2	3	2	1
min						0.798	0.956	0.756	0.691	1.274	1.479	1.797
max						1.050	0.956	0.987	1.339	1.745	1.746	1.797
med						**0.924**	**0.956**	**0.871**	**1.015**	**1.562**	**1.612**	**1.797**

NB: Daily discharge data was not available for SWN10 in 2019 as the gauge did not produce reliable data over this period. Due to the ephemeral nature of flow in the Helena River and the below average rainfall in 2019, samples were only collected between June and December 2019.

The concentrations of the various nutrients generally followed the trends in background data, except for those in November and/or December when most analytes were close to or outside of the range of the 2014-2018 data (Figures 137-142).

Where data were available, TN concentrations remained below the ANZECC trigger values of 1.2 mg/L for lowland rivers in 2019 (Figure 137). Concentrations of NO_x-N, however exceeded the trigger value of 0.15 mg/L between July and October (Figure 139). Concentrations of TP and FRP remained well below their respective ANZECC trigger values of 0.065 mg/L and 0.04 mg/L for the 2019 reporting period, where data were available (Figures 141 and 142).

DOC and TSS values were within the range of background data, except for a marked increase in TSS in December (Figure 143 and 144, Table 16). This notable increase in TSS and an associated decrease in dissolved oxygen (Figure 145) and progressive increase in conductivity (Figure 146) may have been associated with decreased flow at this site in December.

15. Helm Street Main Drain (SCCIS4)

SCCIS4 total nitrogen (TN)

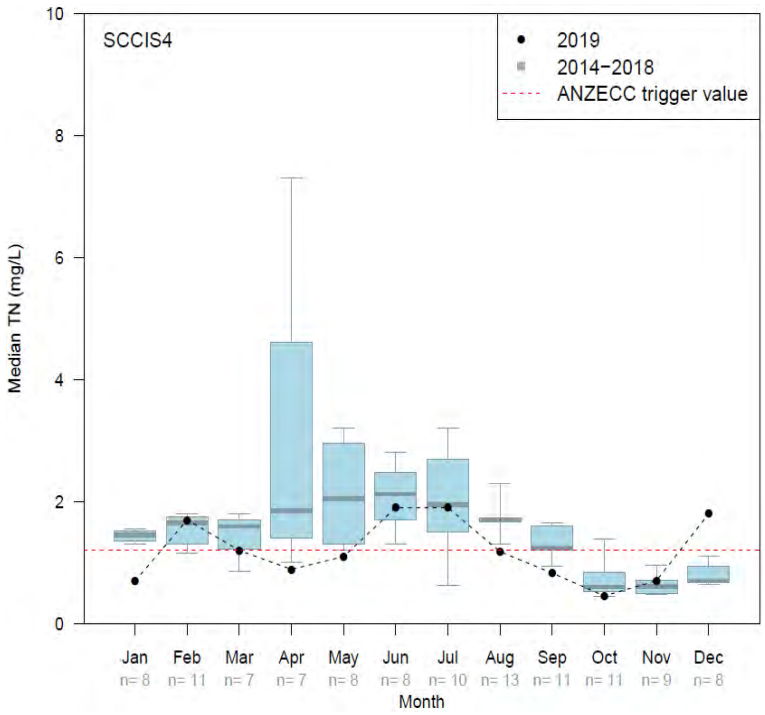

Figure 147. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS4. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

SCCIS4 ammoniacal nitrogen (NH_3-N)

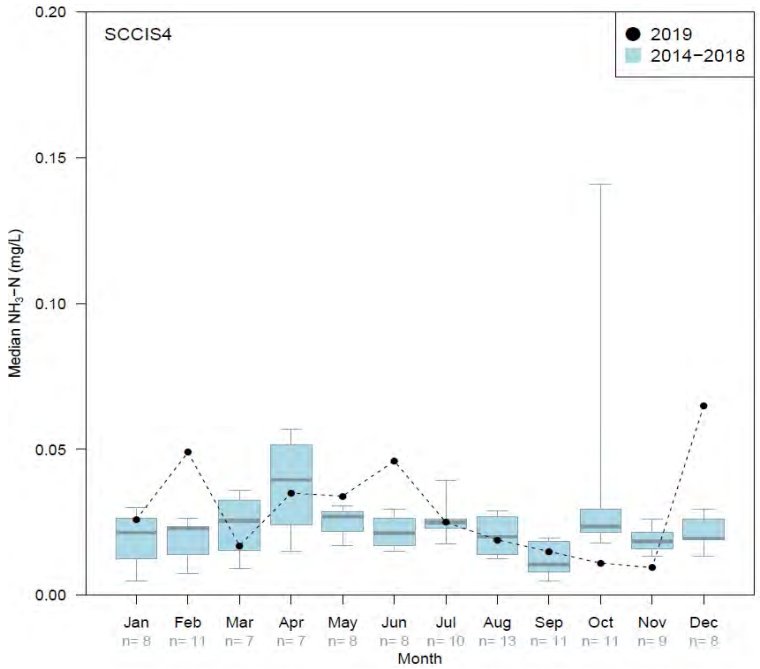

Figure 148. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS4. Number of samples (n) is provided for the historical data.

SCCIS4 total oxidised nitrogen (NO_x-N)

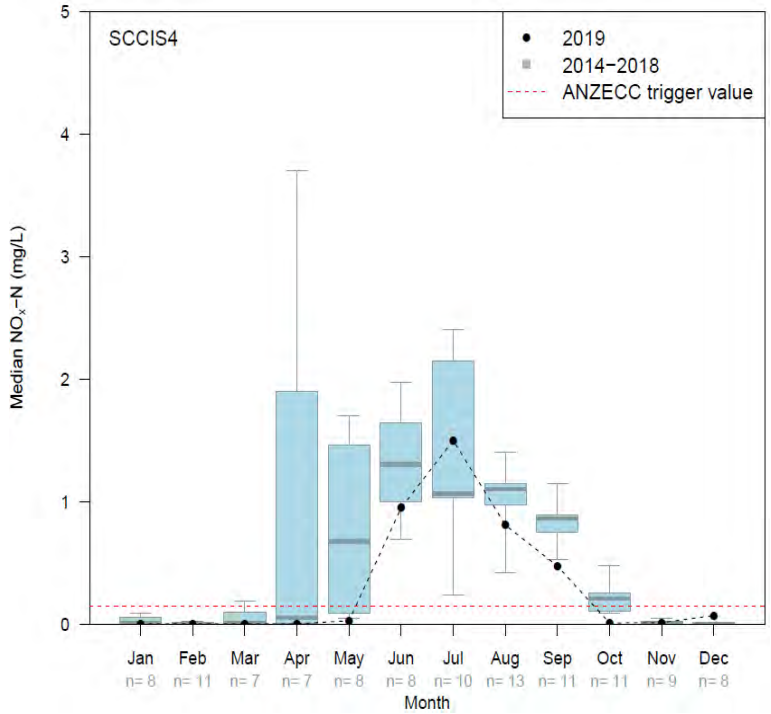

Figure 149. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS4. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

SCCIS4 dissolved organic nitrogen (DOrgN)

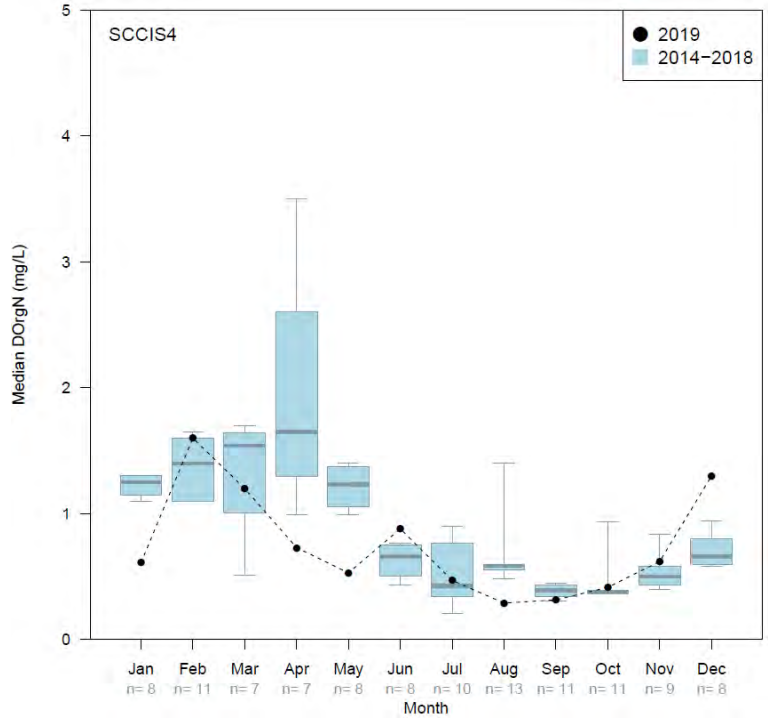

Figure 150. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS4. Number of samples (n) is provided for the historical data.

SCCIS4 total phosphorus (TP)

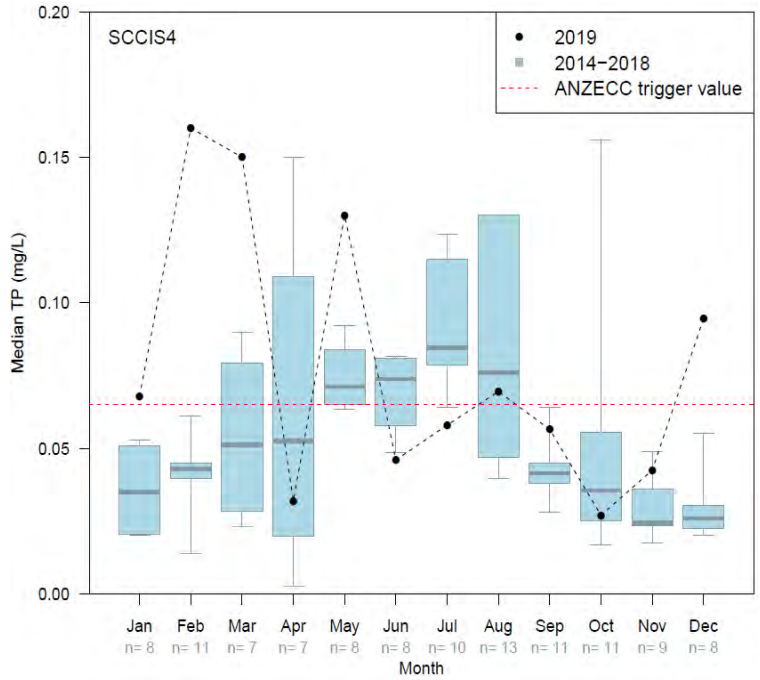

Figure 151. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS4. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

SCCIS4 filterable reactive phosphorus (FRP)

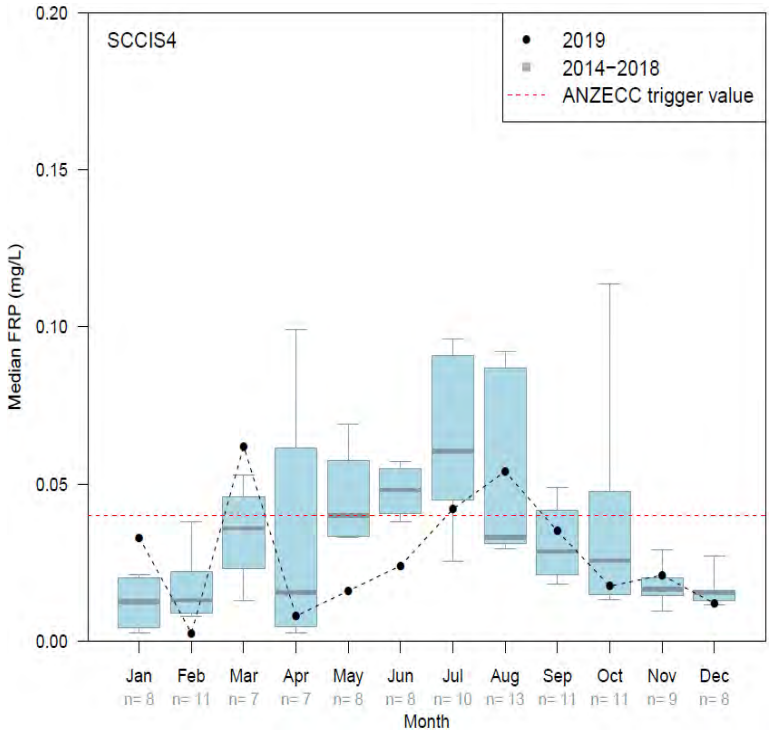

Figure 152. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS4. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

SCCIS4 dissolved organic carbon (DOC)

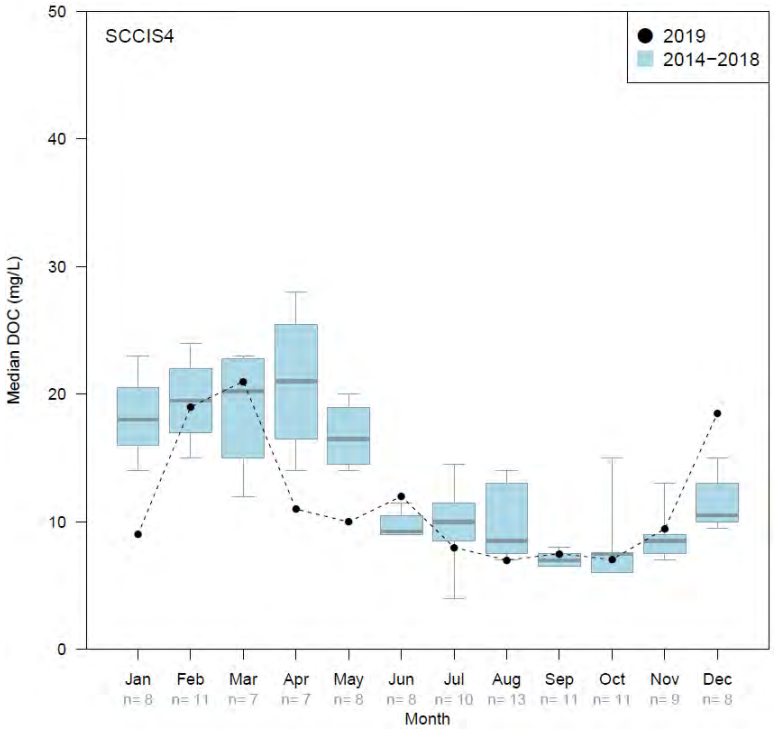

Figure 153. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS4. Number of samples (n) is provided for the historical data.

SCCIS4 total suspended solids (TSS)

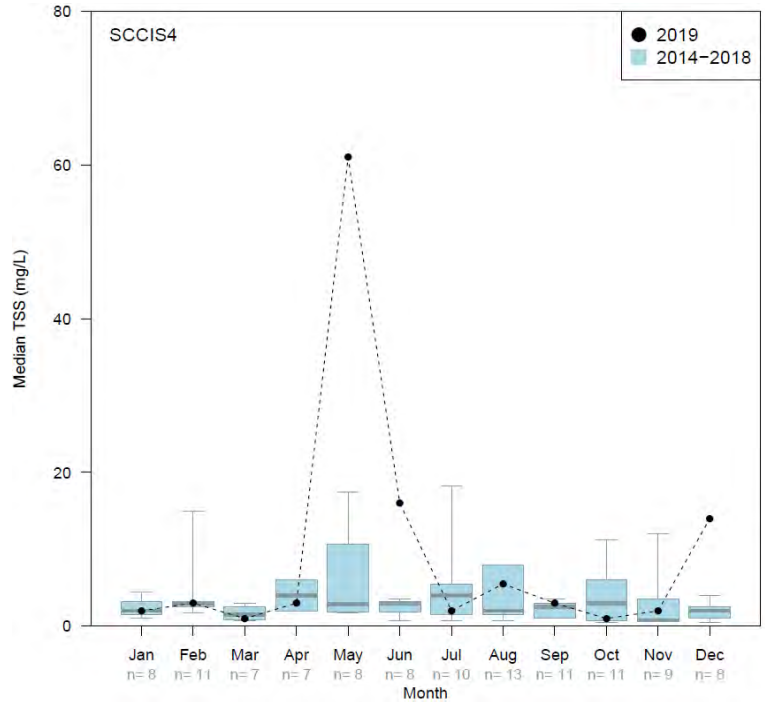

Figure 154. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS4. Number of samples (n) is provided for the historical data.

SCCIS4 dissolved oxygen (DO)

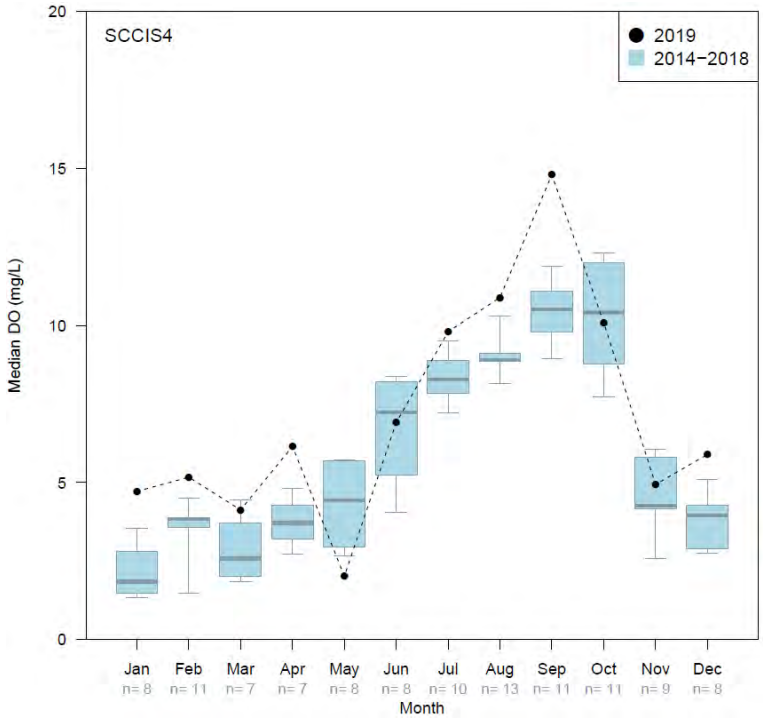

Figure 155. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS4. Number of samples (n) is provided for the historical data.

SCCIS4 specific conductivity (Sp. cond)

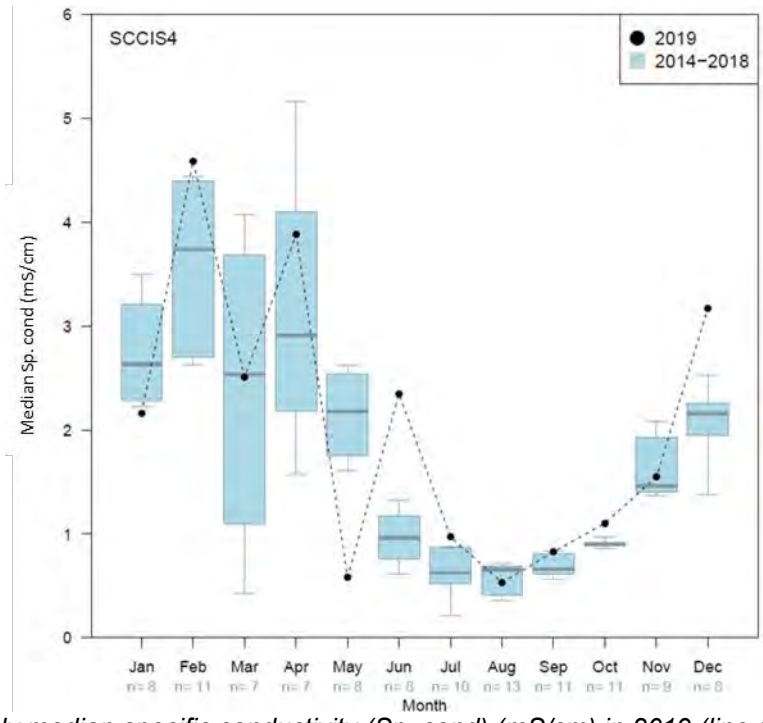

Figure 156. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS4. Number of samples (n) is provided for the historical data.

Table 17. 2019 monthly sample numbers, minimum and maximum values at SCCIS4.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	1	1	1	1	1	1	3	2	2	2	2	2
min	0.700	1.700	1.200	0.890	1.100	1.900	1.500	0.660	0.670	0.450	0.550	1.300
max	0.700	1.700	1.200	0.890	1.100	1.900	3.400	1.700	0.990	0.460	0.860	2.300
med	**0.700**	**1.700**	**1.200**	**0.890**	**1.100**	**1.900**	**1.900**	**1.180**	**0.830**	**0.455**	**0.705**	**1.800**
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	1	1	1	1	1	1	3	2	2	2	2	2
min	0.026	0.049	0.017	0.035	0.034	0.046	0.019	0.018	0.013	0.010	0.005	0.020
max	0.026	0.049	0.017	0.035	0.034	0.046	0.026	0.020	0.017	0.012	0.014	0.110
med	**0.026**	**0.049**	**0.017**	**0.035**	**0.034**	**0.046**	**0.025**	**0.019**	**0.015**	**0.011**	**0.010**	**0.065**
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	1	1	1	1	1	1	3	2	2	2	2	2
min	0.005	0.005	0.005	0.005	0.029	0.950	1.000	0.420	0.270	0.005	0.005	0.005
max	0.005	0.005	0.005	0.005	0.029	0.950	1.900	1.200	0.680	0.018	0.022	0.140
med	**0.005**	**0.005**	**0.005**	**0.005**	**0.029**	**0.950**	**1.500**	**0.810**	**0.475**	**0.012**	**0.014**	**0.073**
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	1	1	1	1	1	1	3	2	2	2	2	2
min	0.610	1.600	1.200	0.730	0.530	0.880	0.380	0.210	0.270	0.410	0.490	1.000
max	0.610	1.600	1.200	0.730	0.530	0.880	1.500	0.370	0.360	0.420	0.750	1.600
med	**0.610**	**1.600**	**1.200**	**0.730**	**0.530**	**0.880**	**0.470**	**0.290**	**0.315**	**0.415**	**0.620**	**1.300**
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	1	1	1	1	1	1	3	2	2	2	2	2
min	0.068	0.160	0.150	0.032	0.130	0.046	0.057	0.042	0.054	0.026	0.042	0.069
max	0.068	0.160	0.150	0.032	0.130	0.046	0.160	0.097	0.059	0.028	0.043	0.120
med	**0.068**	**0.160**	**0.150**	**0.032**	**0.130**	**0.046**	**0.058**	**0.070**	**0.057**	**0.027**	**0.043**	**0.095**
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	1	1	1	1	1	1	3	2	2	2	2	2
min	0.033	0.003	0.062	0.008	0.016	0.024	0.040	0.039	0.026	0.013	0.019	0.010
max	0.033	0.003	0.062	0.008	0.016	0.024	0.120	0.069	0.044	0.022	0.023	0.014
med	**0.033**	**0.003**	**0.062**	**0.008**	**0.016**	**0.024**	**0.042**	**0.054**	**0.035**	**0.018**	**0.021**	**0.012**
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	1	1	1	1	1	1	3	2	2	2	2	2
min	9.000	19.00	21.00	11.00	10.00	12.00	8.000	5.000	7.000	7.000	7.900	15.00
max	9.000	19.00	21.00	11.00	10.00	12.00	14.00	9.000	8.000	7.100	11.00	22.00
med	**9.000**	**19.00**	**21.00**	**11.00**	**10.00**	**12.00**	**8.000**	**7.000**	**7.500**	**7.050**	**9.450**	**18.50**
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	1	1	1	1	1	1	3	2	2	2	2	2
min	2.000	3.000	1.000	3.000	61.00	16.00	2.000	2.000	3.000	1.000	1.000	7.000
max	2.000	3.000	1.000	3.000	61.00	16.00	2.000	9.000	3.000	1.000	3.000	21.00
med	**2.000**	**3.000**	**1.000**	**3.000**	**61.00**	**16.00**	**2.000**	**5.500**	**3.000**	**1.000**	**2.000**	**14.00**
DO (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	1	1	1	1	1	1	3	2	2	2	2	2
min	4.720	5.170	4.130	6.150	2.020	6.910	7.620	10.15	12.05	6.460	4.250	2.790
max	4.720	5.170	4.130	6.150	2.020	6.910	12.85	11.63	17.55	13.73	5.630	9.000
med	**4.720**	**5.170**	**4.130**	**6.150**	**2.020**	**6.910**	**9.800**	**10.89**	**14.80**	**10.10**	**4.940**	**5.895**
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	1	1	1	1	1	1	3	2	2	2	2	2
min	2.164	4.587	2.507	3.882	0.581	2.349	0.900	0.264	0.717	0.976	1.225	2.721
max	2.164	4.587	2.507	3.882	0.581	2.349	1.130	0.797	0.934	1.231	1.870	3.619
med	**2.164**	**4.587**	**2.507**	**3.882**	**0.581**	**2.349**	**0.971**	**0.531**	**0.826**	**1.104**	**1.548**	**3.170**

NB: Daily discharge data is not available for SCCIS4 as this site is not gauged.

Nutrient concentrations in 2019 at SCCIS4 generally fell within the range of background data, noting however that background concentrations of TN, NO_x-N and DOrgN were highly variable in autumn and winter and those of TP and FRP ranged widely throughout the year (Figures 147 to 152). This variability may be attributed to the highly modified nature of this catchment causing it to respond unpredictably to rainfall events. In 2019, intermittent flow was observed between January and June, resulting in only one sample being collected in each of those months (Table 17).

Concentrations of TN exceeded the ANZECC trigger value of 1.2 mg/L in February, June, July, and December (Figure 147), while concentrations of NO_x-N exceeded the ANZECC trigger value of 0.15 mg/L from June to September (Figure 149). The variability in concentrations of TP and FRP over the 2019 reporting period saw exceedances of their respective ANZECC trigger values (0.065 mg/L and 0.04 mg/L) between January and March and in May, August, and December for TP and in March, July and August for FRP (Figures 151 and 152).

Dissolved organic carbon (DOC) concentrations in 2019 generally followed the trends of background data except for January, April, May, and December (Figure 153). TSS was elevation in May, June, and December 2019 (Figure 154) and markedly so in May, which may be related to a rainfall event of 7.2 mm in an otherwise dry month (Figure 341). Dissolved oxygen levels were generally above 4 mg/L, particularly between July and October when they exceeded 10 mg/L, but were low in May, when they declined to 2.02 mg/L (Figure 155, Table 17). Conductivity was historically highly variable between January and April, and this was also the case in 2019 between January and June when rainfall and therefore flows were intermittent (Figure 156).

16. Henley Brook (HBBROCK)

HBBROCK total nitrogen (TN)

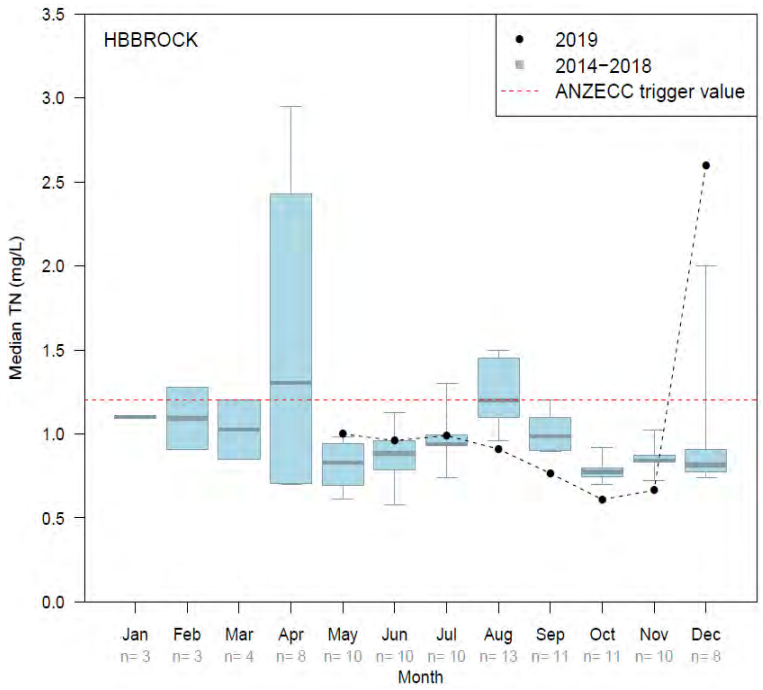

Figure 157. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site HBBROCK. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

HBBROCK ammoniacal nitrogen (NH_3-N)

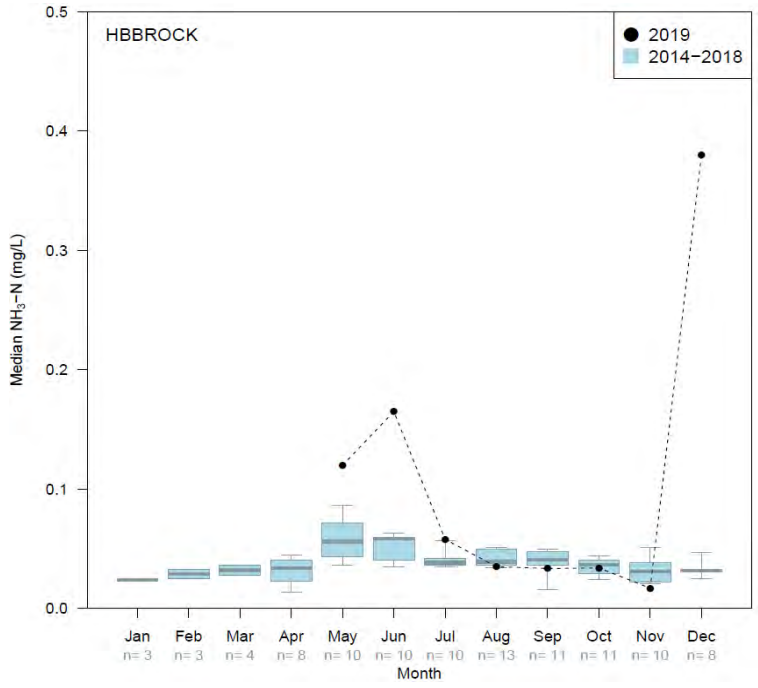

Figure 158. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site HBBROCK. Number of samples (n) is provided for the historical data.

HBBROCK total oxidised nitrogen (NO_x-N)

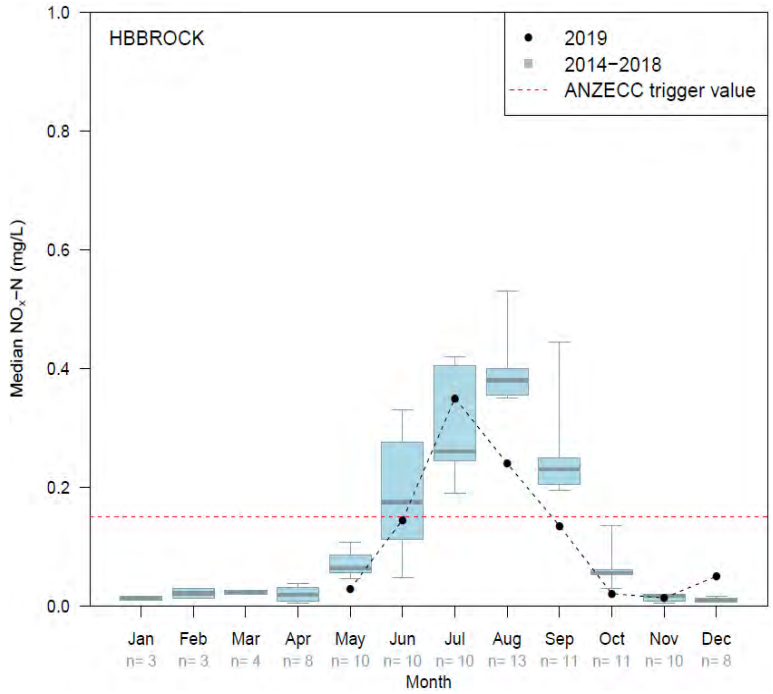

Figure 159. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site HBBROCK. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

HBBROCK dissolved organic nitrogen (DOrgN)

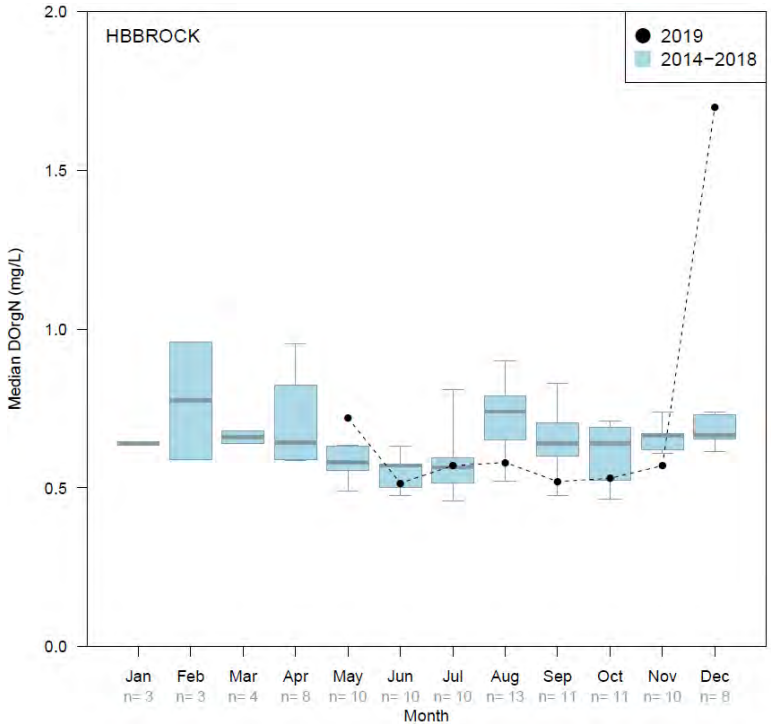

Figure 160. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site HBBROCK. Number of samples (n) is provided for the historical data.

HBBROCK total phosphorus (TP)

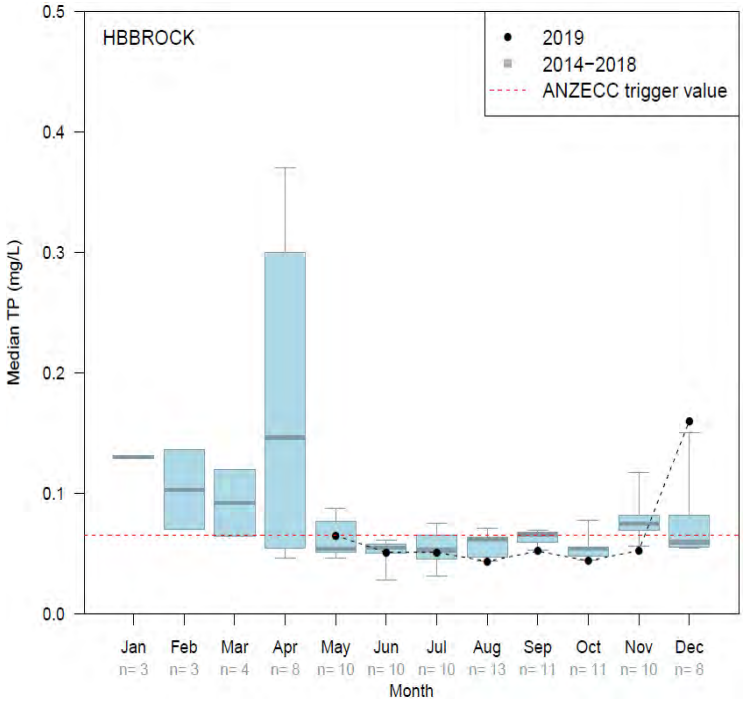

Figure 161. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site HBBROCK. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

HBBROCK filterable reactive phosphorus (FRP)

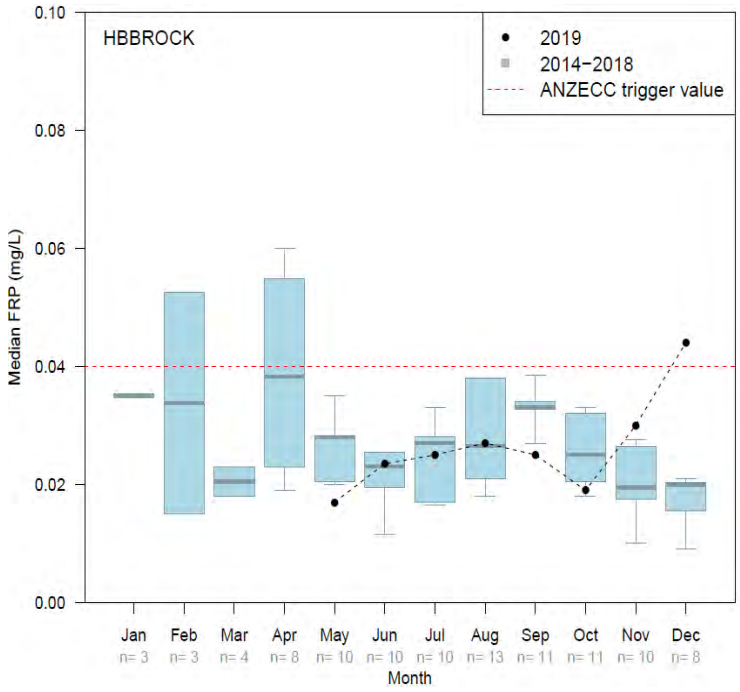

Figure 162. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site HBBROCK. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

HBBROCK dissolved organic carbon (DOC)

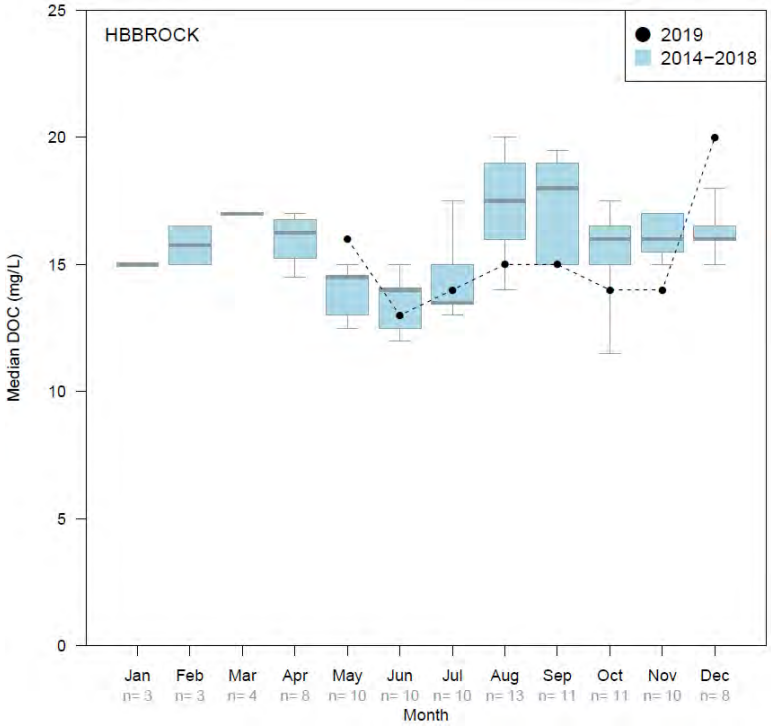

Figure 163. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site HBBROCK. Number of samples (n) is provided for the historical data.

HBBROCK total suspended solids (TSS)

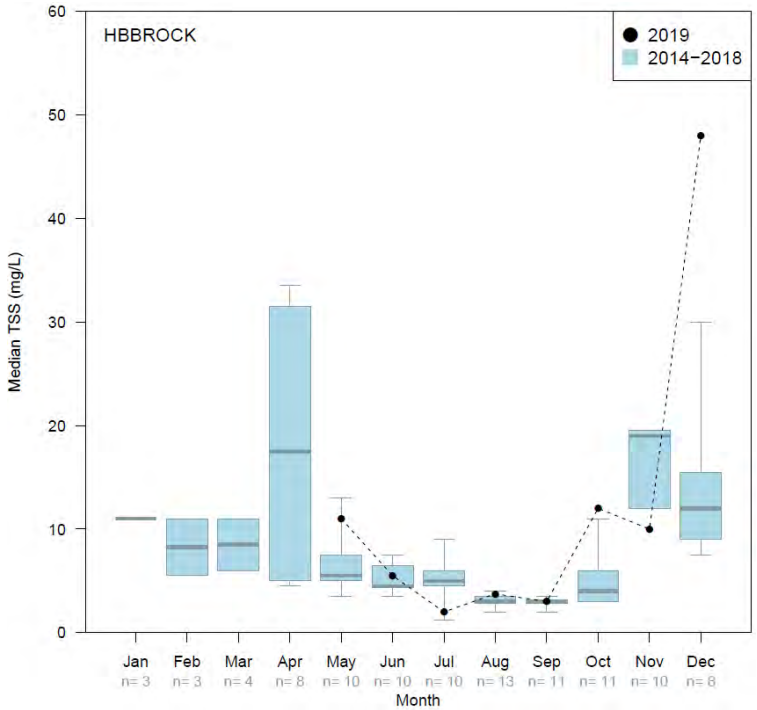

Figure 164. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site HBBROCK. Number of samples (n) is provided for the historical data.

HBBROCK dissolved oxygen (DO)

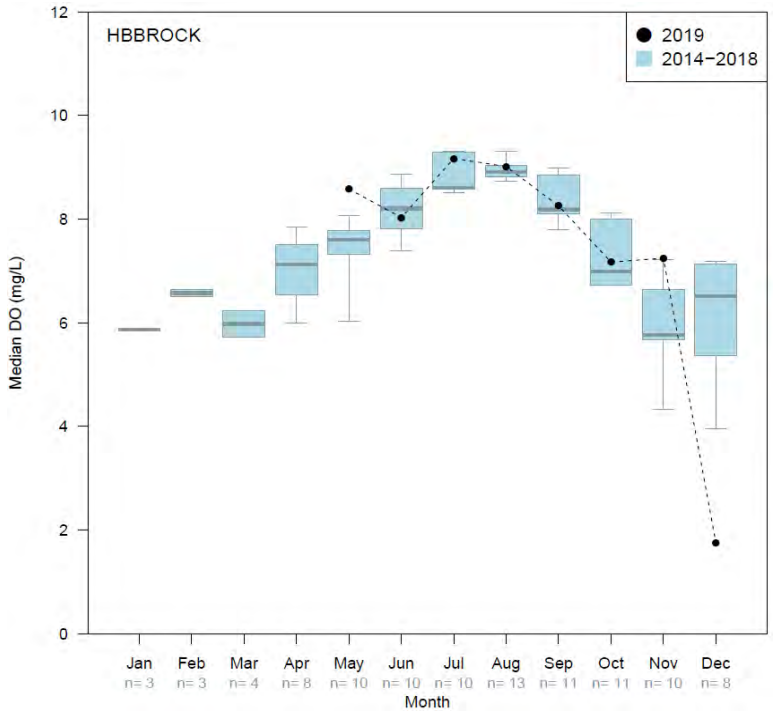

Figure 165. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site HBBROCK. Number of samples (n) is provided for the historical data.

HBBROCK specific conductivity (Sp. cond)

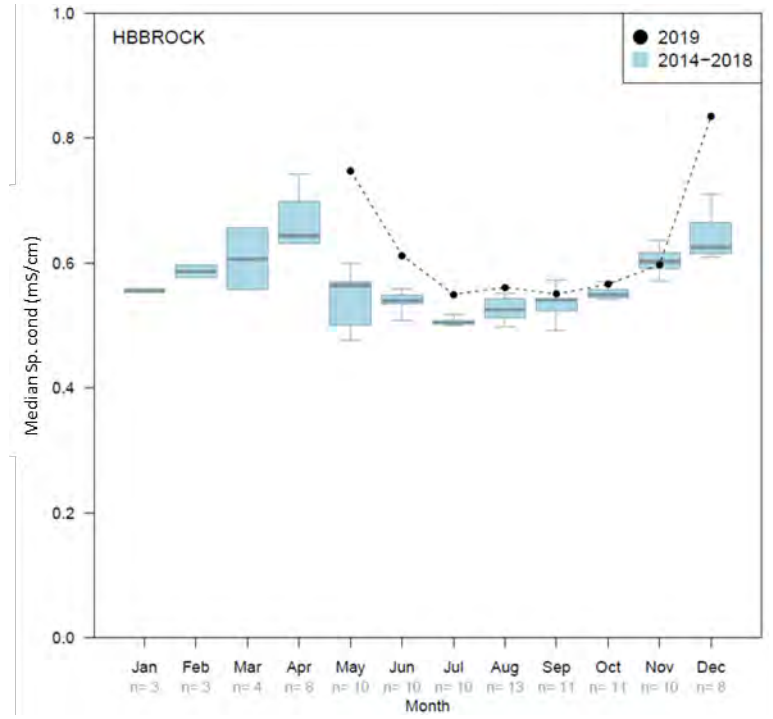

Figure 166. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site HBBROCK. Number of samples (n) is provided for the historical data.

Table 18. 2019 monthly sample numbers, minimum and maximum values at HBBROCK.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	1	2	3	2	2	1	2	1
min					1.000	0.820	0.930	0.880	0.680	0.610	0.630	2.600
max					1.000	1.100	1.100	0.940	0.850	0.610	0.700	2.600
med					**1.000**	**0.960**	**0.990**	**0.910**	**0.765**	**0.610**	**0.665**	**2.600**
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	1	2	3	2	2	1	2	1
min					0.120	0.130	0.036	0.031	0.032	0.034	0.005	0.380
max					0.120	0.200	0.075	0.039	0.035	0.034	0.029	0.380
med					**0.120**	**0.165**	**0.058**	**0.035**	**0.034**	**0.034**	**0.017**	**0.380**
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	1	2	3	2	2	1	2	1
min					0.029	0.130	0.290	0.200	0.100	0.021	0.012	0.050
max					0.029	0.160	0.360	0.280	0.170	0.021	0.015	0.050
med					**0.029**	**0.145**	**0.350**	**0.240**	**0.135**	**0.021**	**0.014**	**0.050**
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	1	2	3	2	2	1	2	1
min					0.720	0.490	0.490	0.580	0.510	0.530	0.540	1.700
max					0.720	0.540	0.640	0.580	0.530	0.530	0.600	1.700
med					**0.720**	**0.515**	**0.570**	**0.580**	**0.520**	**0.530**	**0.570**	**1.700**
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	1	2	3	2	2	1	2	1
min					0.065	0.050	0.047	0.043	0.049	0.044	0.043	0.160
max					0.065	0.052	0.055	0.044	0.055	0.044	0.062	0.160
med					**0.065**	**0.051**	**0.051**	**0.044**	**0.052**	**0.044**	**0.053**	**0.160**
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	1	2	3	2	2	1	2	1
min					0.017	0.023	0.015	0.024	0.024	0.019	0.026	0.044
max					0.017	0.024	0.025	0.030	0.026	0.019	0.034	0.044
med					**0.017**	**0.024**	**0.025**	**0.027**	**0.025**	**0.019**	**0.030**	**0.044**
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	1	2	3	2	2	1	2	1
min					16.00	12.00	13.00	15.00	14.00	14.00	14.00	20.00
max					16.00	14.00	15.00	15.00	16.00	14.00	14.00	20.00
med					**16.00**	**13.00**	**14.00**	**15.00**	**15.00**	**14.00**	**14.00**	**20.00**
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	1	2	3	2	2	1	2	1
min					11.00	1.000	2.000	0.500	2.000	12.00	7.000	48.00
max					11.00	10.00	2.000	7.000	4.000	12.00	13.00	48.00
med					**11.00**	**5.500**	**2.000**	**3.750**	**3.000**	**12.00**	**10.00**	**48.00**
DO (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	1	2	3	2	2	1	2	1
min					8.580	7.590	8.880	8.800	8.100	7.170	7.120	1.760
max					8.580	8.470	9.360	9.230	8.410	7.170	7.370	1.760
med					**8.580**	**8.030**	**9.170**	**9.015**	**8.255**	**7.170**	**7.245**	**1.760**
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	1	2	3	2	2	1	2	1
min					0.748	0.573	0.547	0.561	0.530	0.566	0.586	0.835
max					0.748	0.652	0.569	0.561	0.571	0.566	0.609	0.835
med					**0.748**	**0.613**	**0.550**	**0.561**	**0.551**	**0.566**	**0.598**	**0.835**

NB: Daily discharge data is not available for HBBROCK as this site is not gauged. Due to the ephemeral nature of flow in Henley Brook and the below average rainfall in 2019, samples were only collected between May and December 2019.

In 2019, data for the analytes examined in Henley Brook tended to follow the trend of background data and remained largely within the historical range (Figures 157-164). Marked increases in nutrients (Figures 157, 158, 159, 161 and 162), DOC (Figure 163), TSS (Figure 164) and specific conductivity (Figure 166) in December corresponded with a dramatic decrease in dissolved oxygen concentrations from greater than 7 mg/L to below 2 mg/L (Figure 165, Table 18). This decrease in oxygen and increase in nutrients, turbidity and conductivity likely represents a pronounced decrease in flow and associated evaporative water loss prior to flows ceasing at this site in early summer. Elevated concentrations of NH_3-N (Figure 158) and NO_x-N (Figure 159) were also observed in May-June and June-July, respectively, and likely represent a response to the onset of winter rainfall and subsequent increase in flow (Figure 341).

The highly elevated concentrations of TN, TP and FRP exceeded their respective ANZECC trigger values of 1.2 mg/L, 0.065 mg/L and 0.04 mg/L in December, whereas concentrations of NO_x-N only exceed the ANZECC trigger of 0.15 mg/L in July and August (Figures 157,159, 161 and 162).

17. Jane Brook (SWN7)

SWN7 total nitrogen (TN)

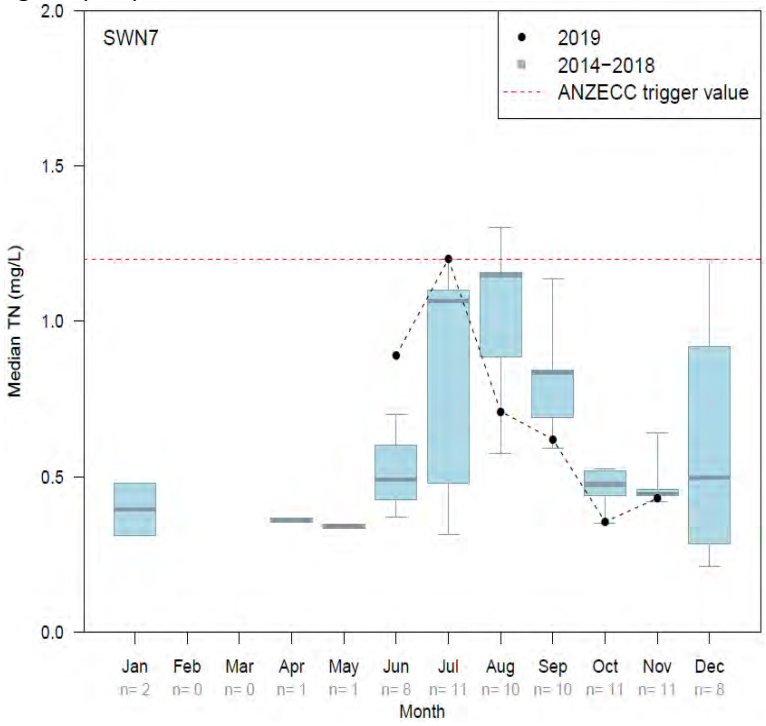

Figure 167. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN7. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

SWN7 ammoniacal nitrogen (NH_3-N)

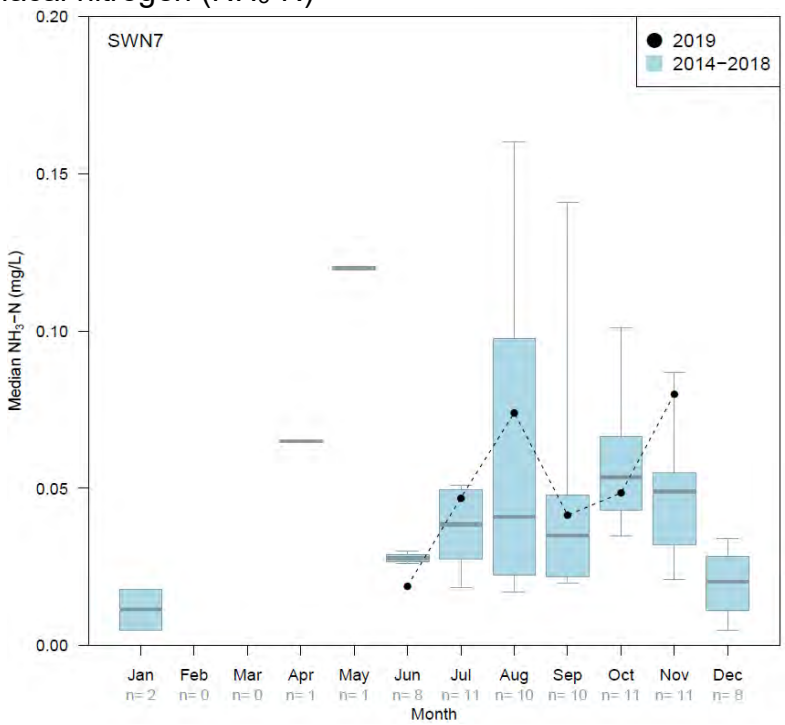

Figure 168. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN7. Number of samples (n) is provided for the historical data.

SWN7 total oxidised nitrogen (NO_x-N)

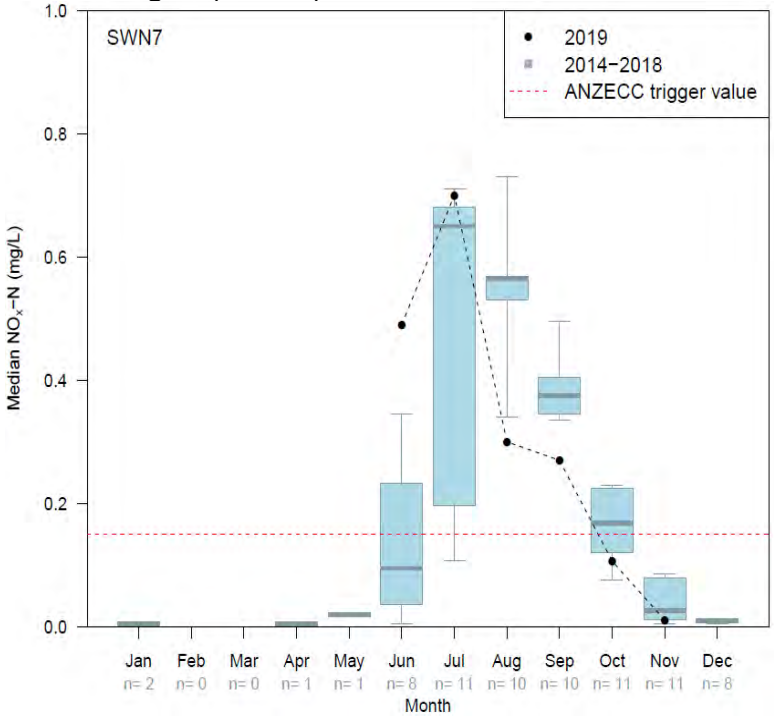

Figure 169. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN7. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

SWN7 dissolved organic nitrogen (DOrgN)

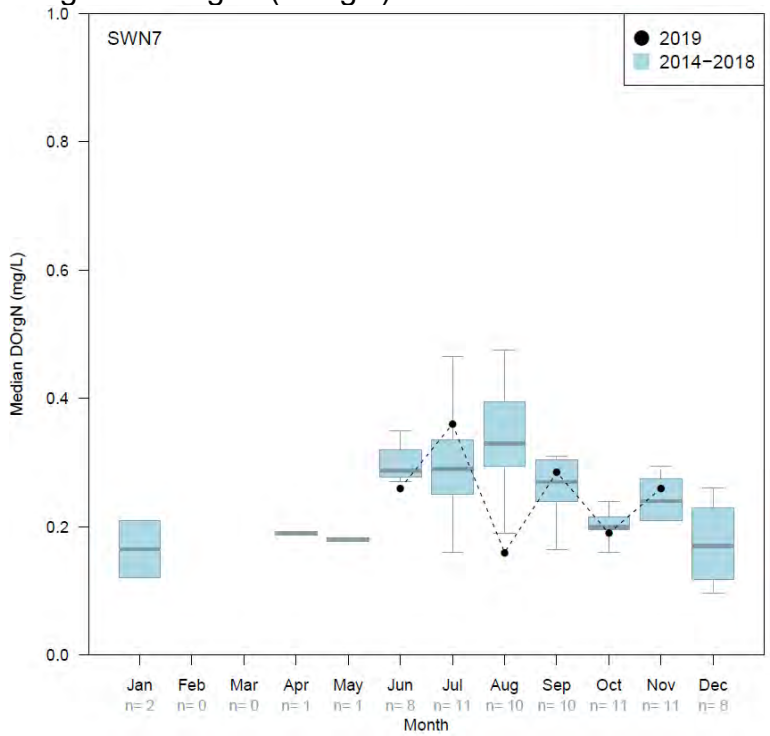

Figure 170. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN7. Number of samples (n) is provided for the historical data.

SWN7 total phosphorus (TP)

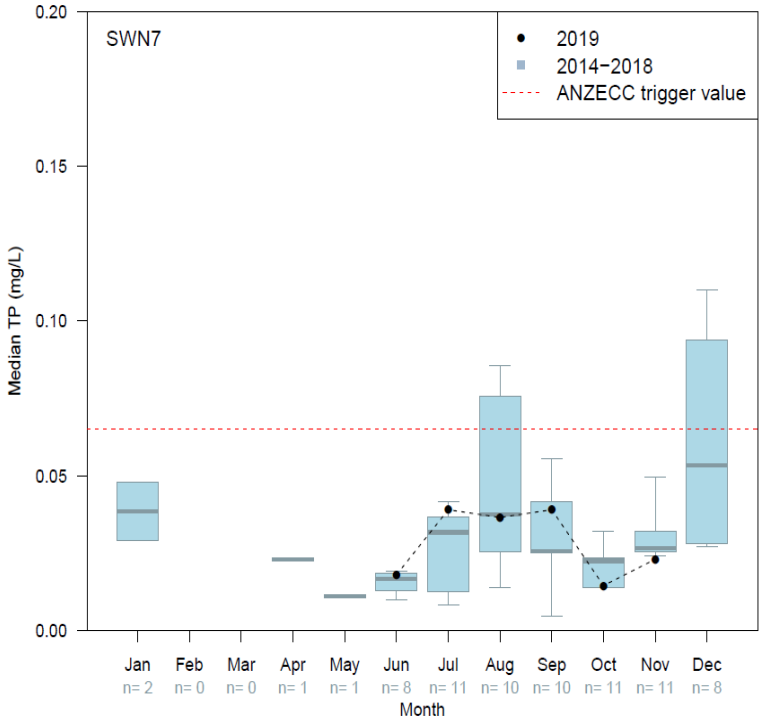

Figure 171. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN7. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

SWN7 filterable reactive phosphorus (FRP)

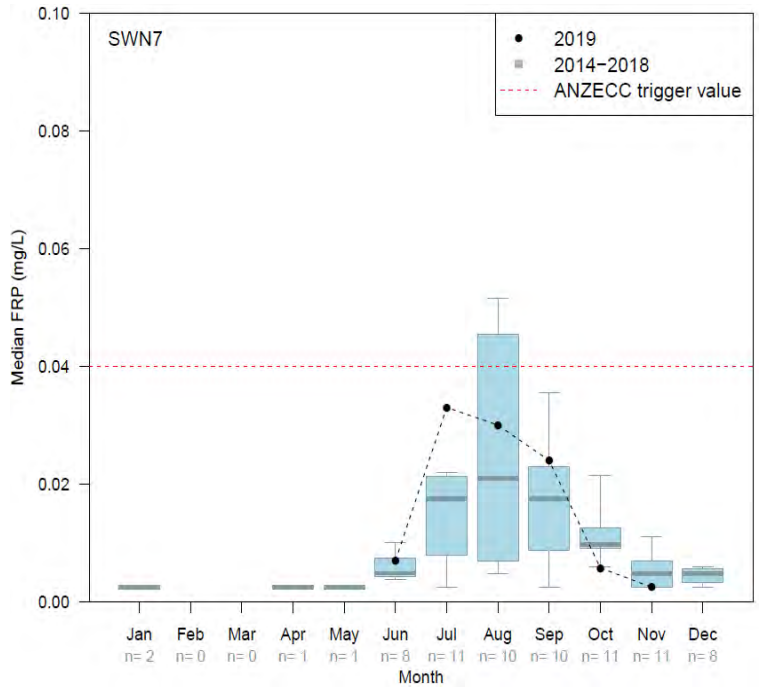

Figure 172. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN7. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

SWN7 dissolved organic carbon (DOC)

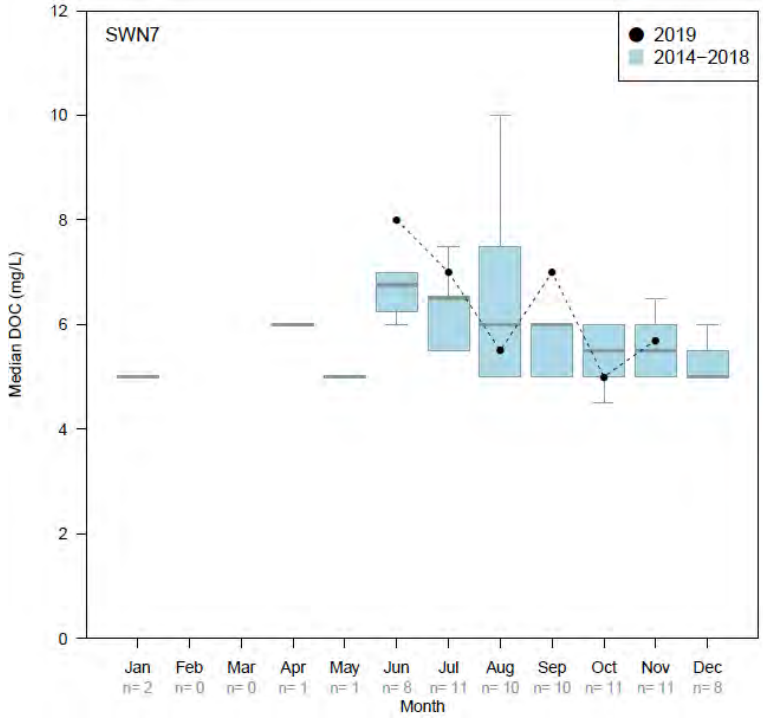

Figure 173. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN7. Number of samples (n) is provided for the historical data.

SWN7 total suspended solids (TSS)

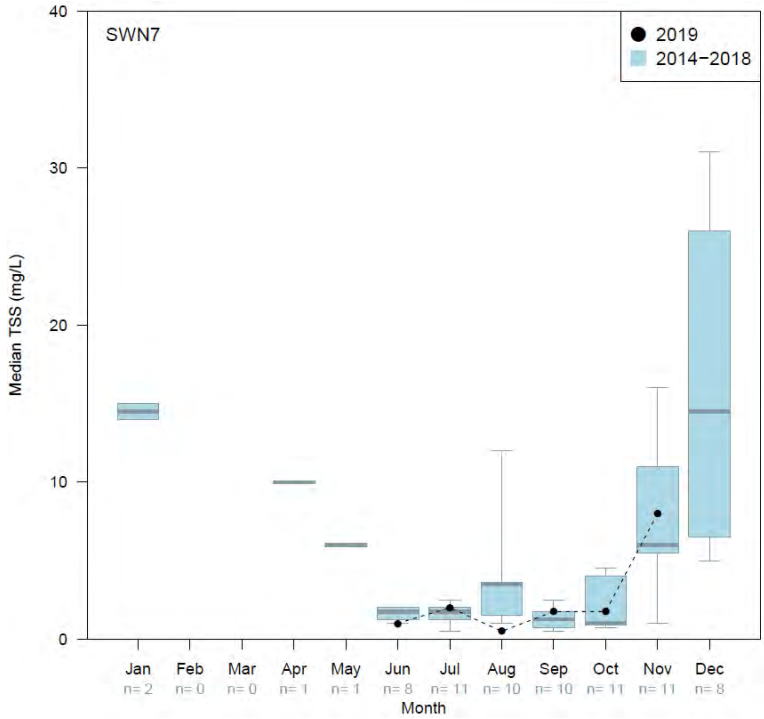

Figure 174. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN7. Number of samples (n) is provided for the historical data.

SWN7 dissolved oxygen (DO)

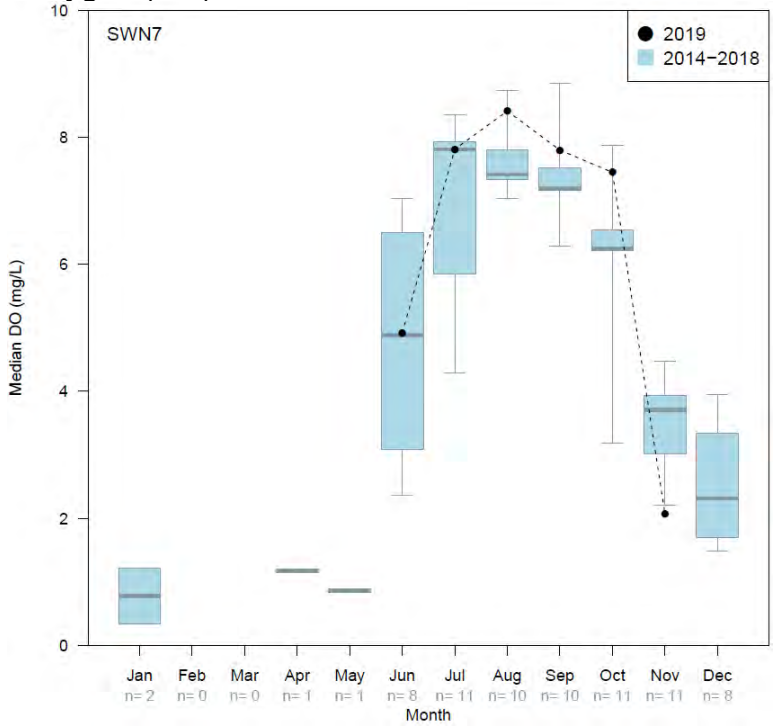

Figure 175. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN7. Number of samples (n) is provided for the historical data.

SWN7 specific conductivity (Sp. cond)

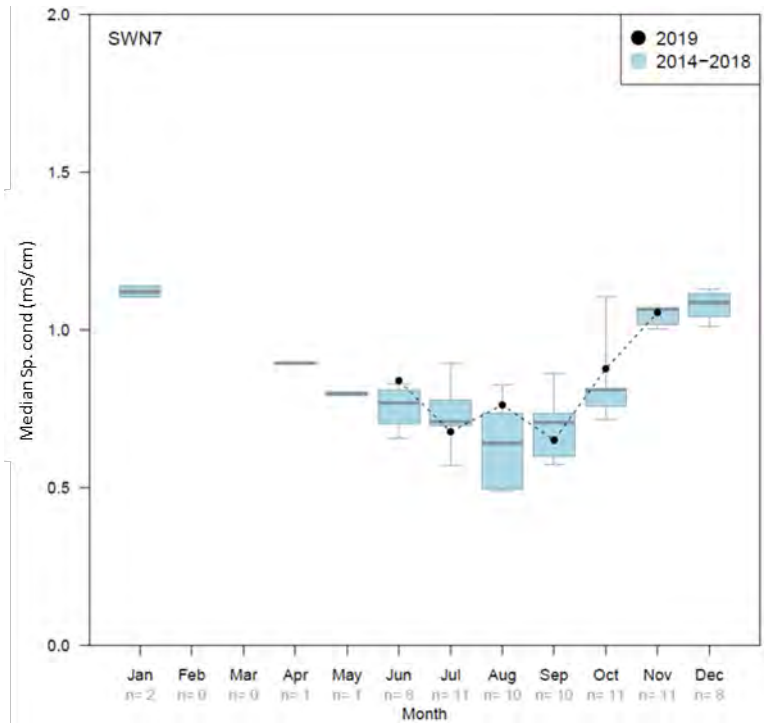

Figure 176. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN7. Number of samples (n) is provided for the historical data.

Table 19. 2019 monthly sample numbers, minimum and maximum values at SWN7.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	1	1	2	2	2	1	0
min						0.890	1.200	0.680	0.440	0.340	0.430	
max						0.890	1.200	0.740	0.800	0.370	0.430	
med						**0.890**	**1.200**	**0.710**	**0.620**	**0.355**	**0.430**	
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	1	2	2	2	1	0
min						0.019	0.047	0.038	0.035	0.044	0.080	
max						0.019	0.047	0.110	0.048	0.053	0.080	
med						**0.019**	**0.047**	**0.074**	**0.042**	**0.049**	**0.080**	
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	1	2	2	2	1	0
min						0.490	0.700	0.250	0.220	0.083	0.011	
max						0.490	0.700	0.350	0.320	0.130	0.011	
med						**0.490**	**0.700**	**0.300**	**0.270**	**0.107**	**0.011**	
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	1	2	2	2	1	0
min						0.260	0.360	0.120	0.180	0.180	0.260	
max						0.260	0.360	0.200	0.390	0.200	0.260	
med						**0.260**	**0.360**	**0.160**	**0.285**	**0.190**	**0.260**	
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	1	2	2	2	1	0
min						0.018	0.039	0.018	0.023	0.012	0.023	
max						0.018	0.039	0.055	0.055	0.017	0.023	
med						**0.018**	**0.039**	**0.037**	**0.039**	**0.015**	**0.023**	
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	1	2	2	2	1	0
min						0.007	0.033	0.015	0.014	0.003	0.003	
max						0.007	0.033	0.045	0.034	0.009	0.003	
med						**0.007**	**0.033**	**0.030**	**0.024**	**0.006**	**0.003**	
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	1	2	2	2	1	0
min						8.000	7.000	5.000	6.000	5.000	5.700	
max						8.000	7.000	6.000	8.000	5.000	5.700	
med						**8.000**	**7.000**	**5.500**	**7.000**	**5.000**	**5.700**	
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	1	2	2	2	1	0
min						1.000	2.000	0.500	0.500	0.500	8.000	
max						1.000	2.000	0.500	3.000	3.000	8.000	
med						**1.000**	**2.000**	**0.500**	**1.750**	**1.750**	**8.000**	
DO (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	1	2	2	2	1	0
min						4.920	7.810	8.190	7.290	7.310	2.070	
max						4.920	7.810	8.630	8.300	7.580	2.070	
med						**4.920**	**7.810**	**8.410**	**7.795**	**7.445**	**2.070**	
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	1	2	2	2	1	0
min						0.839	0.677	0.708	0.527	0.775	1.055	
max						0.839	0.677	0.815	0.774	0.979	1.055	
med						**0.839**	**0.677**	**0.762**	**0.651**	**0.877**	**1.055**	

NB: Daily discharge data was not available in 2019 for SWN7 as this site is not currently gauged. Due to the ephemeral nature of flow in Jane Brook and the below average rainfall in 2019, samples were only collected between June and November 2019.

In those months where data was available, all parameters in Jane Brook tended to follow the trends of background data and typically fell within the historic range (Figures 167-173, Table 19).

Concentration of TN, TP and FRP remained below their respective ANZECC trigger value of 1.2 mg/L, 0.065 mg/L and 0.04 mg/L for lowland rivers in the 2019 reporting period, where data was available. Concentrations of NO_x-N however, greatly exceeded its trigger value of 0.15 mg/L between June and September 2019 and is a likely response to increased seasonal flow.

Although within the range of background data, TSS (Figure 174) and conductivity (Figure 176) increased and dissolved oxygen decreased (Figure 175) markedly in November, prior to flows ceasing in Jane Brook. Field notes indicate that the appearance of waters in Jane Brook were notably turbid at that time. This site lies above heavy clay soils that form some of the Swan Coastal Plain and it is thought that fine clay particles are left in solution as the rate of flow decreases at this site during summer.

18. Lower Canning (SCCIS3)

SCCIS3 total nitrogen (TN)

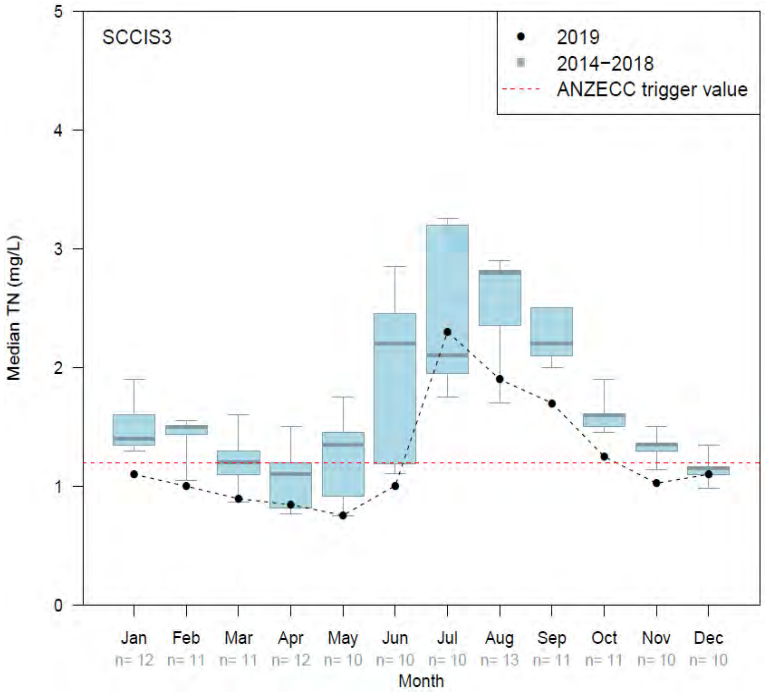

Figure 177. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS3. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

SCCIS3 ammoniacal nitrogen (NH_3-N)

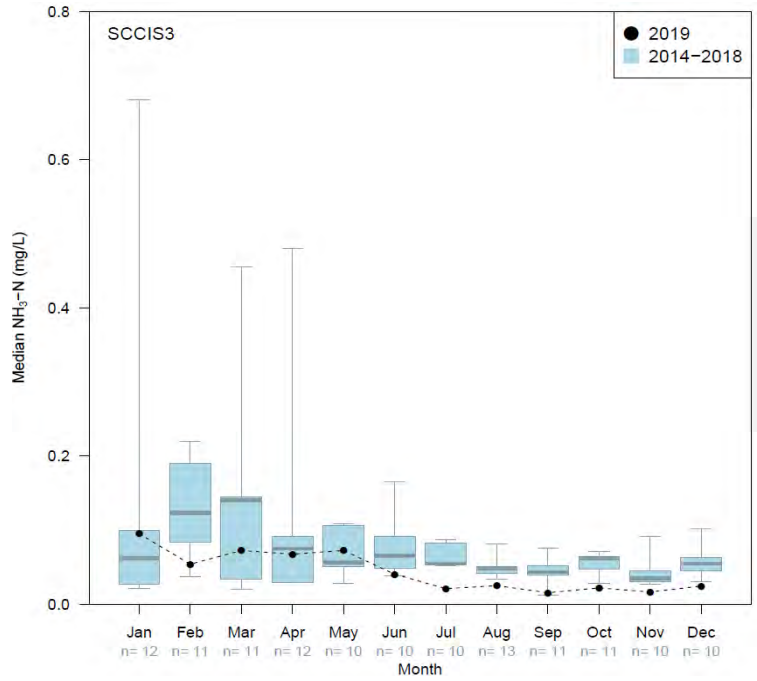

Figure 178. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS3. Number of samples (n) is provided for the historical data.

SCCIS3 total oxidised nitrogen (NO_x-N)

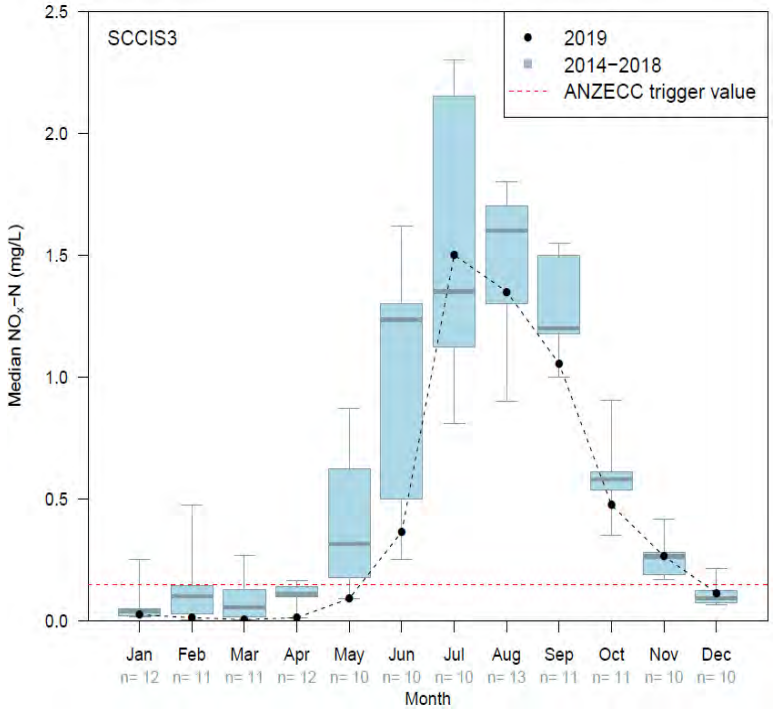

Figure 179. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS3. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

SCCIS3 dissolved organic nitrogen (DOrgN)

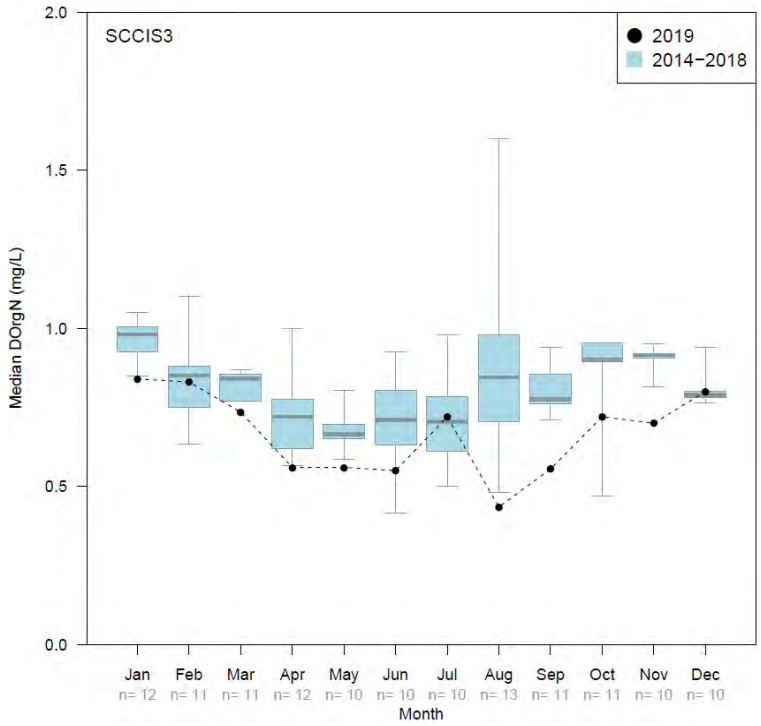

Figure 180. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS3. Number of samples (n) is provided for the historical data.

SCCIS3 total phosphorus (TP)

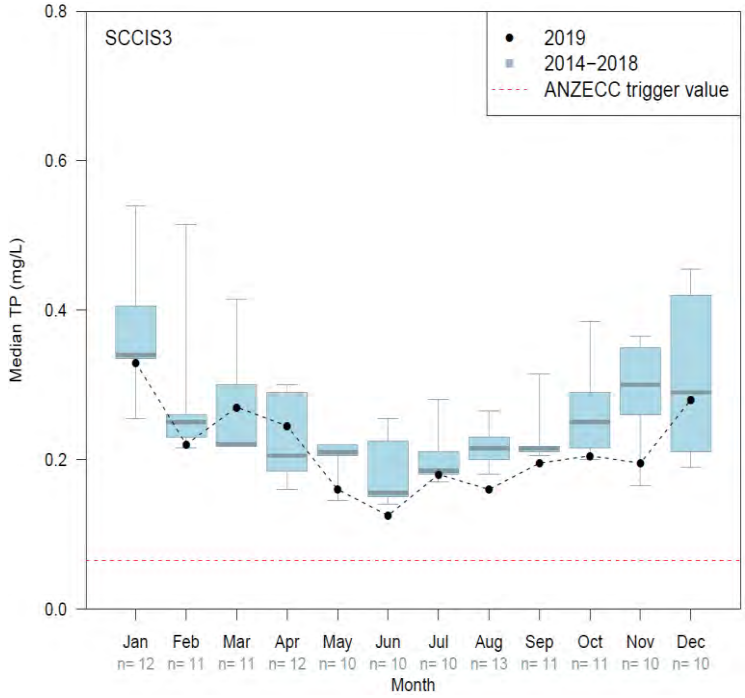

Figure 181. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS3. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

SCCIS3 filterable reactive phosphorus (FRP)

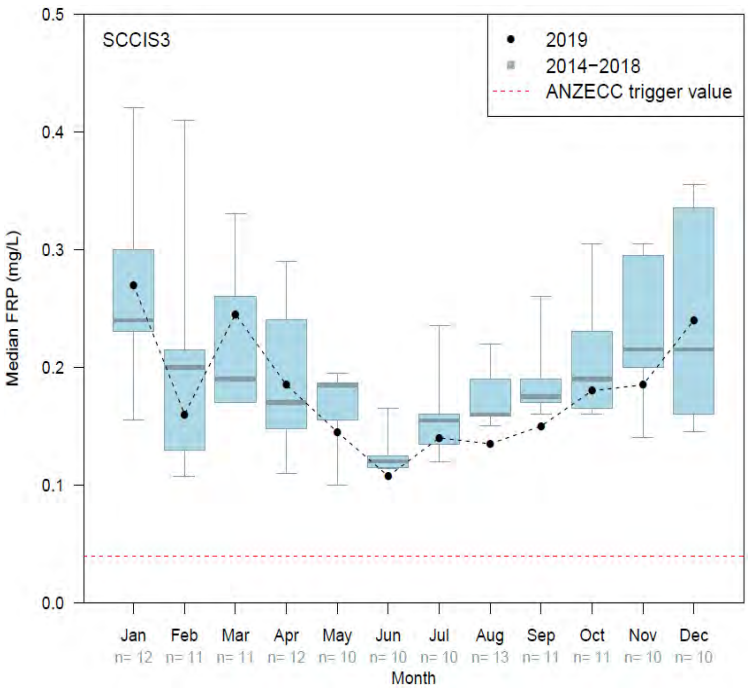

Figure 182. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS3. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

SCCIS3 dissolved organic carbon (DOC)

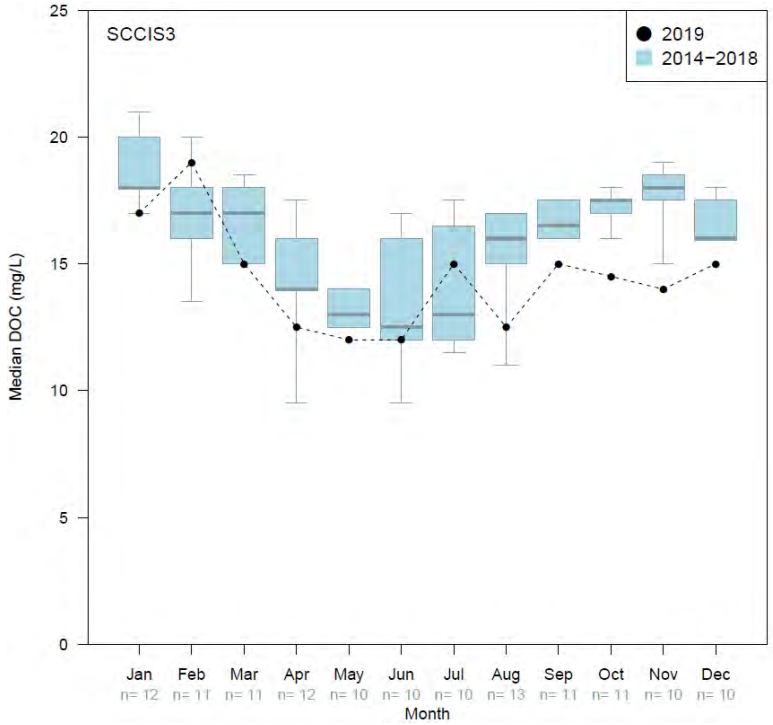

Figure 183. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS3. Number of samples (n) is provided for the historical data.

SCCIS3 total suspended solids (TSS)

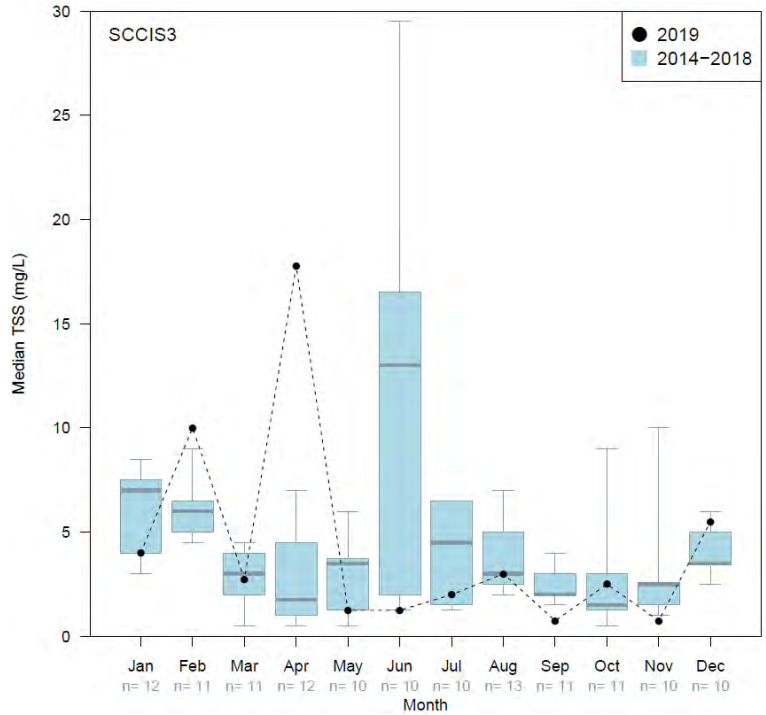

Figure 184. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS3. Number of samples (n) is provided for the historical data.

SCCIS3 dissolved oxygen (DO)

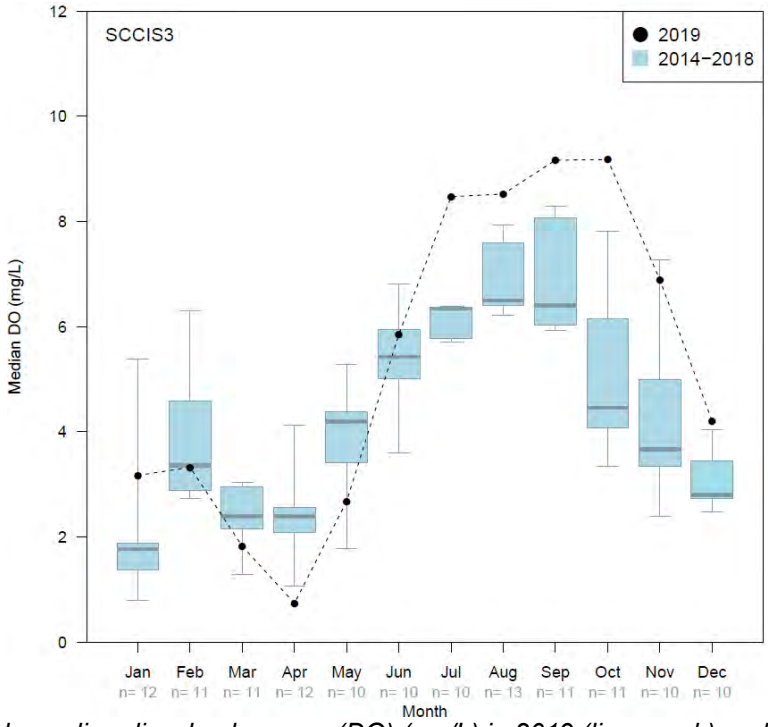

Figure 185. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS3. Number of samples (n) is provided for the historical data.

SCCIS3 specific conductivity (Sp. cond)

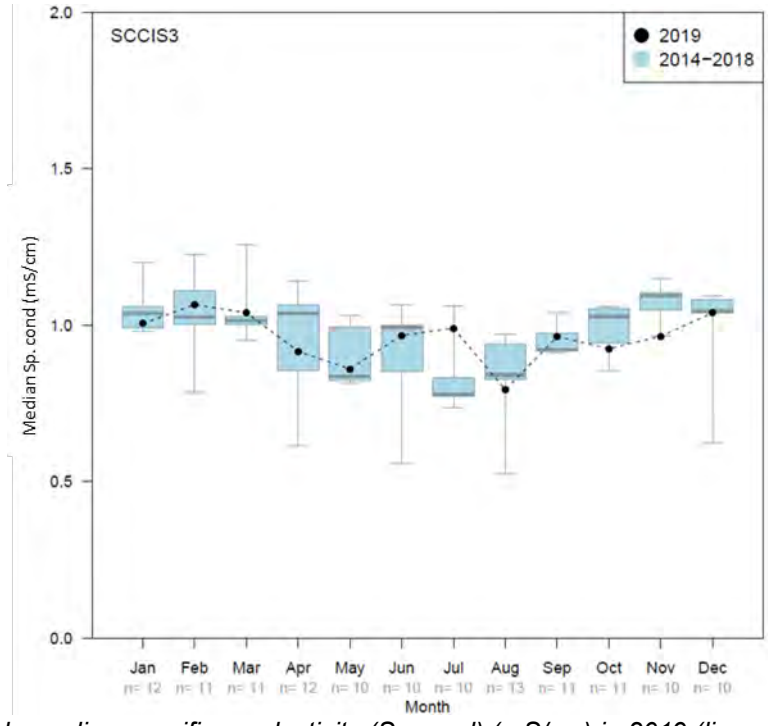

Figure 186. Monthly median specific conductivity (Sp.cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS3. Number of samples (n) is provided for the historical data.

Table 20. 2019 monthly sample numbers, minimum and maximum values at SCCIS3.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	2	2	2	2	2
min	1.100	1.000	0.820	0.590	0.740	0.810	2.200	1.800	1.400	1.200	0.950	1.100
max	1.100	1.000	0.970	1.100	0.770	1.200	2.500	2.000	2.000	1.300	1.100	1.100
med	**1.100**	**1.000**	**0.895**	**0.845**	**0.755**	**1.005**	**2.300**	**1.900**	**1.700**	**1.250**	**1.025**	**1.100**
NH_3-N (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.076	0.054	0.067	0.064	0.067	0.035	0.005	0.014	0.005	0.016	0.005	0.005
max	0.140	0.054	0.078	0.071	0.078	0.046	0.035	0.036	0.026	0.028	0.028	0.044
med	**0.095**	**0.054**	**0.073**	**0.068**	**0.073**	**0.041**	**0.021**	**0.025**	**0.016**	**0.022**	**0.017**	**0.025**
NO_x-N (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.017	0.013	0.005	0.013	0.052	0.140	1.300	1.300	0.810	0.380	0.230	0.069
max	0.057	0.013	0.005	0.013	0.130	0.590	1.600	1.400	1.300	0.570	0.300	0.160
med	**0.025**	**0.013**	**0.005**	**0.013**	**0.091**	**0.365**	**1.500**	**1.350**	**1.055**	**0.475**	**0.265**	**0.115**
DOrgN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.750	0.830	0.720	0.440	0.530	0.550	0.690	0.310	0.550	0.700	0.620	0.720
max	0.840	0.830	0.750	0.680	0.590	0.550	1.100	0.560	0.560	0.740	0.780	0.880
med	**0.840**	**0.830**	**0.735**	**0.560**	**0.560**	**0.550**	**0.720**	**0.435**	**0.555**	**0.720**	**0.700**	**0.800**
TP (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.300	0.220	0.200	0.230	0.150	0.110	0.170	0.130	0.180	0.200	0.180	0.240
max	0.430	0.220	0.340	0.260	0.170	0.140	0.180	0.190	0.210	0.210	0.210	0.320
med	**0.330**	**0.220**	**0.270**	**0.245**	**0.160**	**0.125**	**0.180**	**0.160**	**0.195**	**0.205**	**0.195**	**0.280**
FRP (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.260	0.160	0.190	0.130	0.130	0.095	0.130	0.110	0.150	0.180	0.170	0.200
max	0.380	0.160	0.300	0.240	0.160	0.120	0.150	0.160	0.150	0.180	0.200	0.280
med	**0.270**	**0.160**	**0.245**	**0.185**	**0.145**	**0.108**	**0.140**	**0.135**	**0.150**	**0.180**	**0.185**	**0.240**
DOC (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	2	2	2	2	2
min	16.00	19.00	15.00	11.00	12.00	12.00	14.00	10.00	15.00	14.00	13.00	15.00
max	18.00	19.00	15.00	14.00	12.00	12.00	15.00	15.00	15.00	15.00	15.00	15.00
med	**17.00**	**19.00**	**15.00**	**12.50**	**12.00**	**12.00**	**15.00**	**12.50**	**15.00**	**14.50**	**14.00**	**15.00**
TSS (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	2	2	2	2	2
min	4.000	10.00	0.500	0.500	0.500	0.500	2.000	2.000	0.500	1.000	0.500	1.000
max	4.000	10.00	5.000	35.00	2.000	2.000	4.000	4.000	1.000	4.000	1.000	10.00
med	**4.000**	**10.00**	**2.750**	**17.75**	**1.250**	**1.250**	**2.000**	**3.000**	**0.750**	**2.500**	**0.750**	**5.500**
DO (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	2	2	2	2	2
min	2.720	2.900	1.480	0.250	2.430	4.740	7.540	7.940	8.310	8.110	5.970	3.300
max	3.260	3.750	2.170	1.230	2.930	6.960	8.990	9.100	10.02	10.24	7.810	5.110
med	**3.170**	**3.325**	**1.825**	**0.740**	**2.680**	**5.850**	**8.470**	**8.520**	**9.165**	**9.175**	**6.890**	**4.205**
Sp. cond (mS/cm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.994	1.063	1.031	0.807	0.860	0.910	0.945	0.629	0.959	0.861	0.869	1.017
max	1.027	1.067	1.048	1.025	0.860	1.024	1.017	0.958	0.967	0.988	1.060	1.060
med	**1.005**	**1.065**	**1.040**	**0.916**	**0.860**	**0.967**	**0.990**	**0.794**	**0.963**	**0.925**	**0.964**	**1.039**

NB: Daily discharge data is not available for SCCIS3 as this site is not gauged.

Nutrient concentrations at SCCIS3 tended to follow the trends of background data and typically fell within the range of historic concentrations (Figure 177-182, Table 20). Concentrations of TN and NO_x-N were highly elevated from mid-winter to early spring likely in response to increased rainfall and run off from this catchment during that period (Figure 177 and 179). Concentrations of TP and FRP were elevated throughout 2019 but tended to be relatively lower in winter (Figure 181-182).

Concentrations of TN and NO_x-N exceeded their respective ANZECC trigger values of 1.2 mg/L and 0.15 mg/L between July and October for TN and between June and November for NO_x-N (Figure 177 and 179). The concentrations of both TP and FRP exceeded their respective trigger values of 0.065 mg/L and 0.040 mg/L for the entire 2019 reporting period (Figure 181-182).

Concentrations of DOC fell largely within the range of background data, except from September to December in which concentrations were consistently lower (Figure 183). TSS was also largely within the range of background data, with the exceptions of February (10.0 mg/L) and particularly April (17.75 mg/L) in which concentrations were highly elevated (Figure 184, Table 20). The elevated TSS concentration in April corresponded with hypoxic conditions (dissolved oxygen < 1 mg/L), possibly indicating a localised disturbance at the site prior to monitoring (Figure 184, Table 20). In 2019, dissolved oxygen concentrations were below 4 mg/L from January to May but were greater than 4 mg/L for the remainder of the reporting period, particularly between July and October when concentrations were greater than 8 mg/L (Figure 185). Specific conductivity was within the range of the historical dataset (Figure 186).

Previous annual reports have suggested that phosphorus at this site is more likely influenced by groundwater than winter flows (see Swan Canning catchment data report 2018). The dilution of TP and FRP over winter months, together with consistent conductivity, low TSS and high DOC support the conclusion that groundwater strongly influences the characteristics of this site.

19. Maylands-Inglewood MD (MIMDOUT)

MIMDOUT total nitrogen (TN)

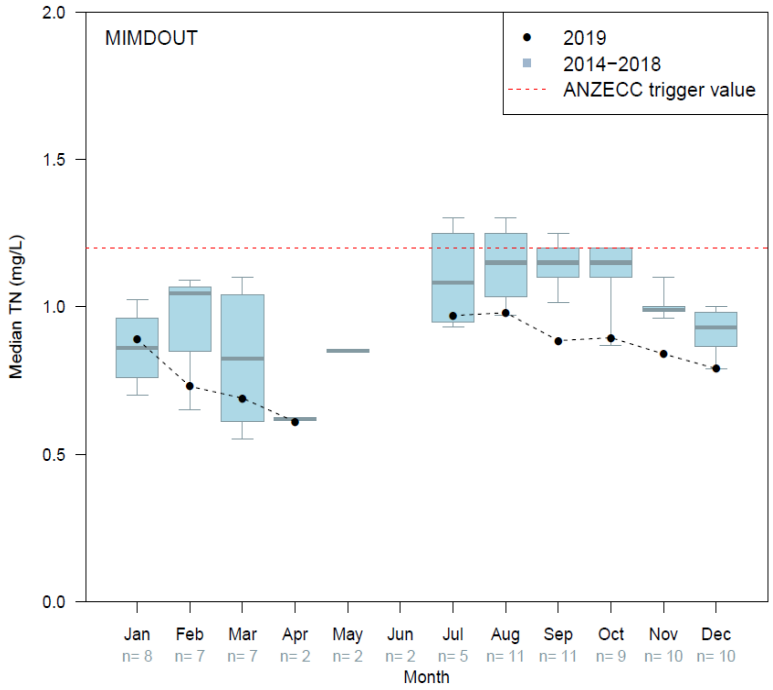

Figure 187. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site MIMDOUT. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

MIMDOUT ammoniacal nitrogen (NH_3-N)

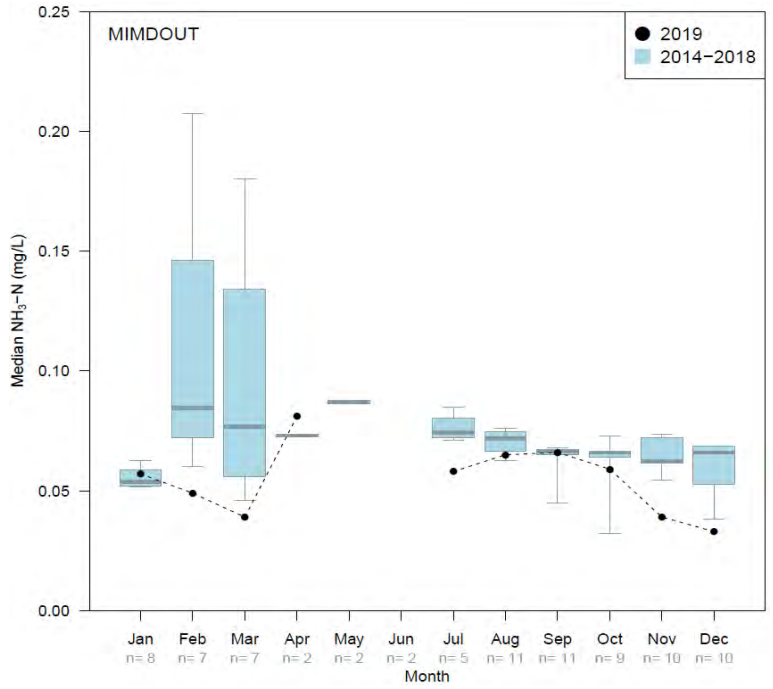

Figure 188. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site MIMDOUT. Number of samples (n) is provided for the historical data.

MIMDOUT total oxidised nitrogen (NO_x-N)

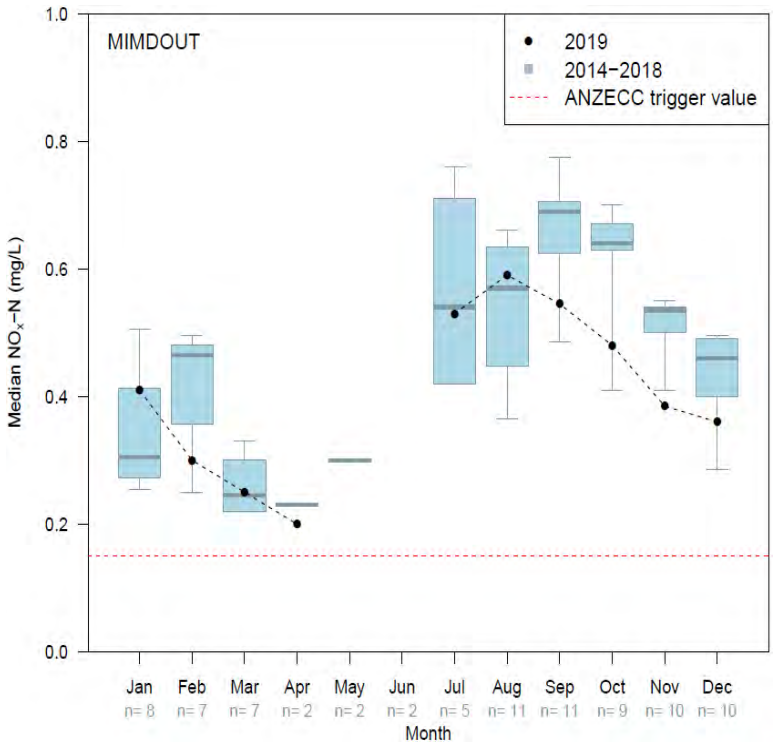

Figure 189. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site MIMDOUT. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

MIMDOUT dissolved organic nitrogen (DOrgN)

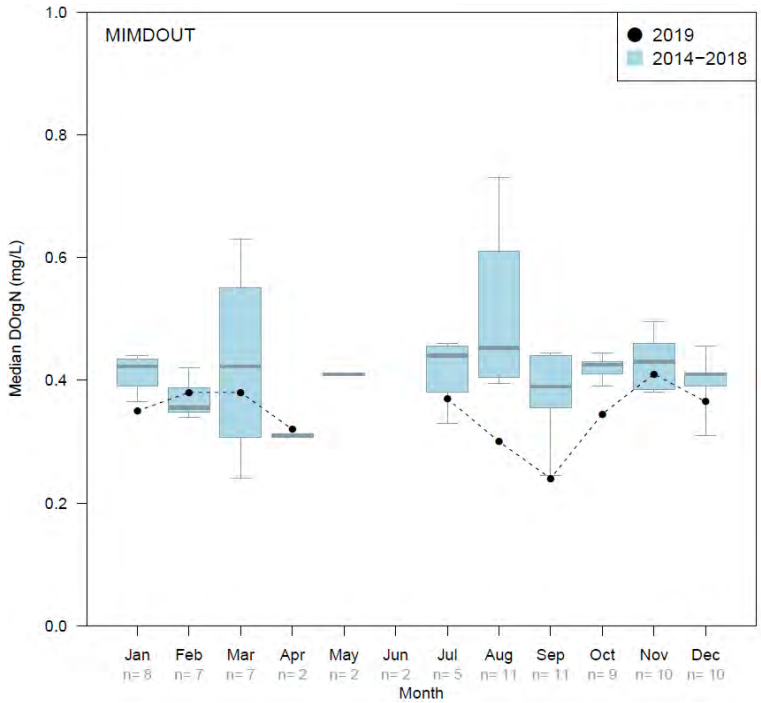

Figure 190. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site MIMDOUT. Number of samples (n) is provided for the historical data.

MIMDOUT total phosphorus (TP)

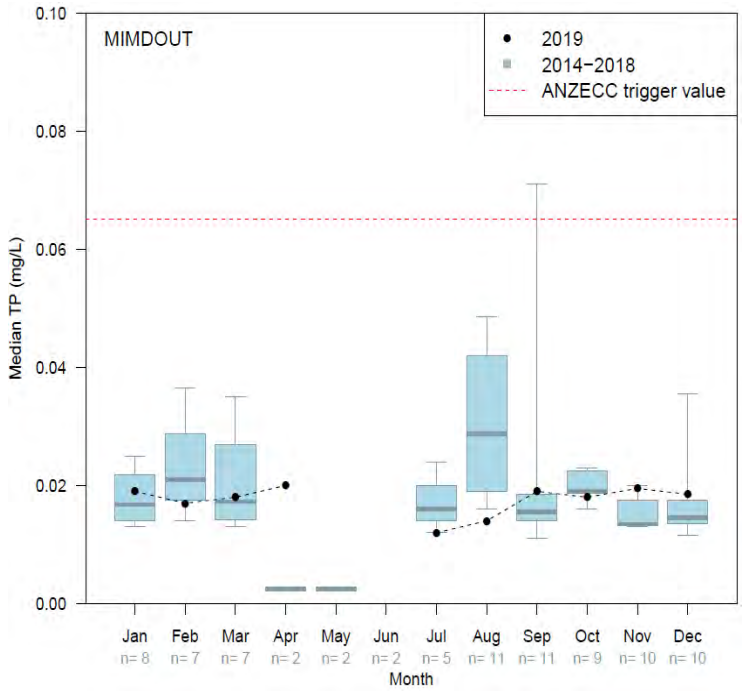

Figure 191. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site MIMDOUT. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

MIMDOUT filterable reactive phosphorus (FRP)

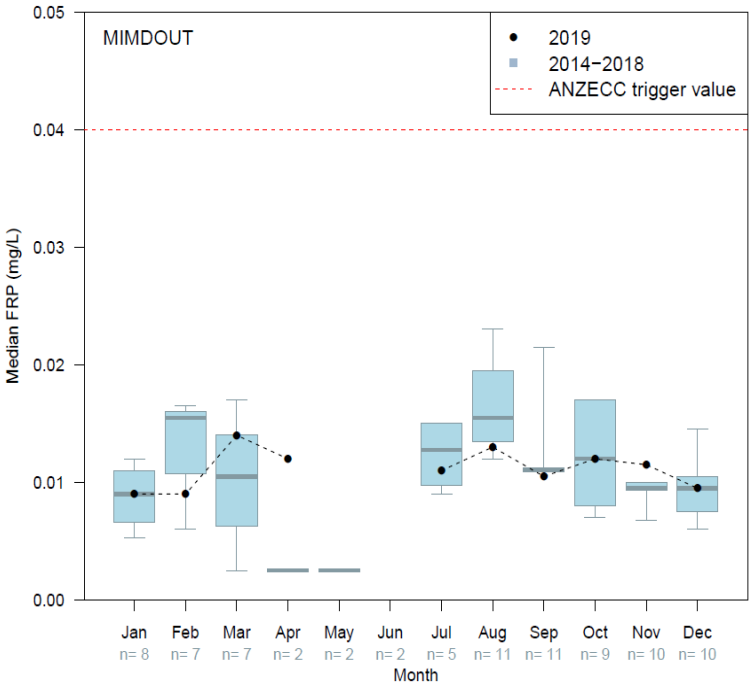

Figure 192. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site MIMDOUT. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

MIMDOUT dissolved organic carbon (DOC)

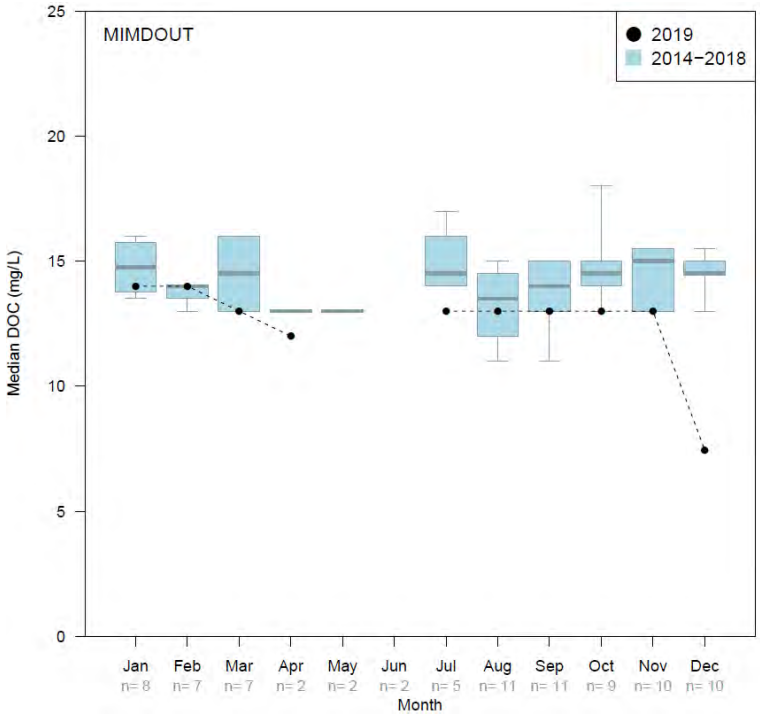

Figure 193. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site MIMDOUT. Number of samples (n) is provided for the historical data.

MIMDOUT total suspended solids (TSS)

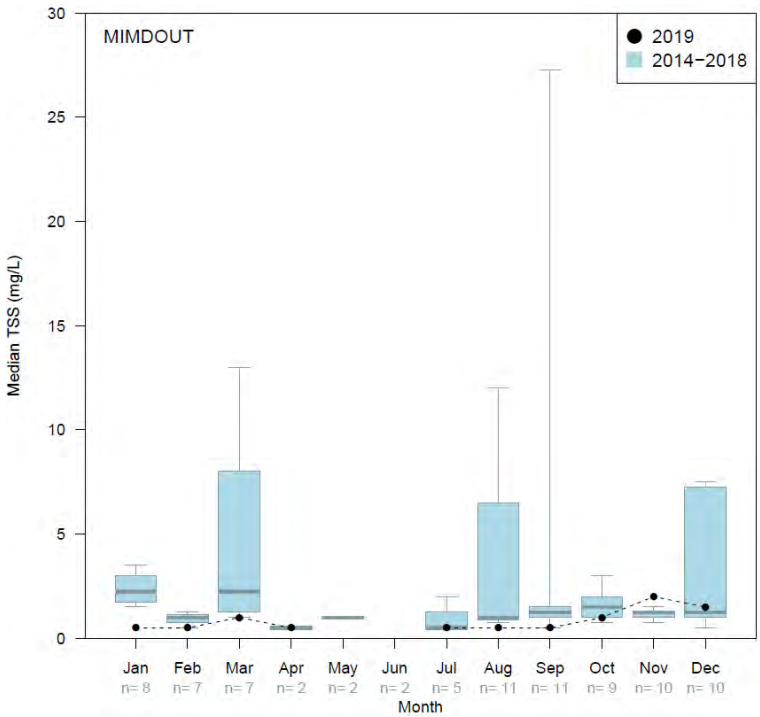

Figure 194. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site MIMDOUT. Number of samples (n) is provided for the historical data.

MIMDOUT dissolved oxygen (DO)

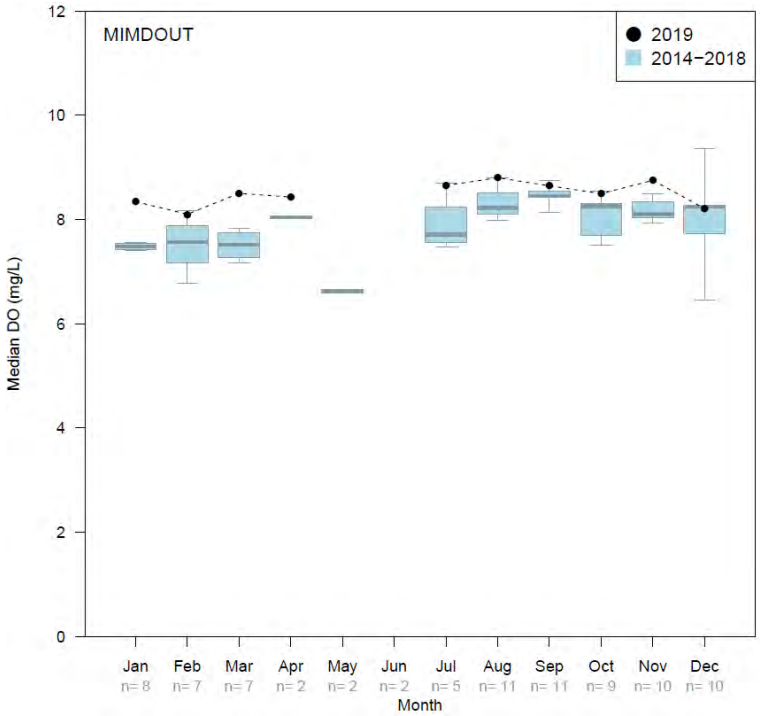

Figure 195. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site MIMDOUT. Number of samples (n) is provided for the historical data.

MIMDOUT specific conductivity (Sp. cond)

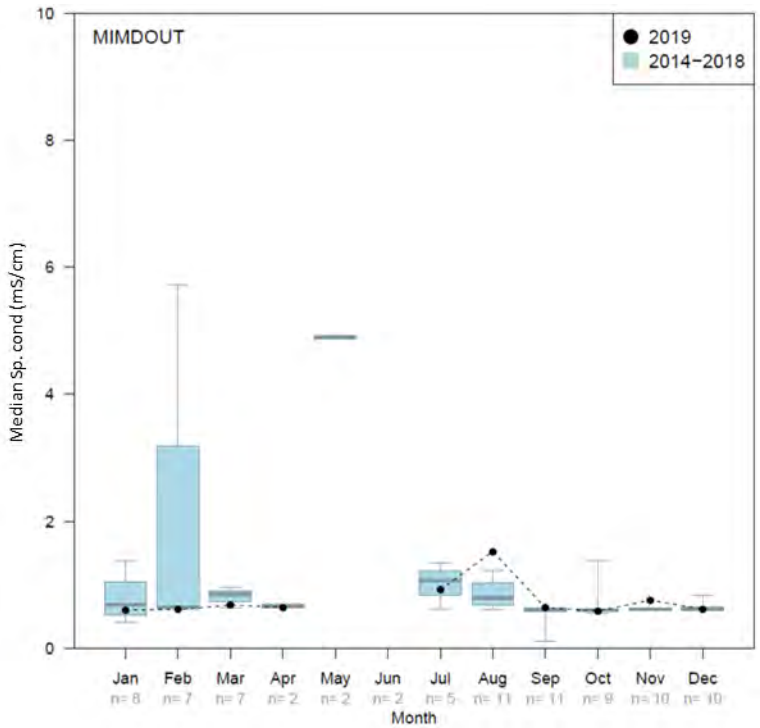

Figure 196. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site MIMDOUT. Number of samples (n) is provided for the historical data.

Table 21. 2019 monthly sample numbers, minimum and maximum values at MIMDOUT.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	1	1	1	0	0	1	1	3	3	2	2
min	0.840	0.730	0.690	0.610			0.970	0.980	0.870	0.860	0.810	0.750
max	0.950	0.730	0.690	0.610			0.970	0.980	0.900	0.930	0.870	0.830
med	**0.890**	**0.730**	**0.690**	**0.610**			**0.970**	**0.980**	**0.885**	**0.895**	**0.840**	**0.790**
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	1	1	1	0	0	1	1	3	3	2	2
min	0.050	0.049	0.039	0.081			0.058	0.065	0.062	0.058	0.010	0.016
max	0.059	0.049	0.039	0.081			0.058	0.065	0.070	0.060	0.068	0.050
med	0.057	0.049	0.039	0.081			0.058	0.065	0.066	0.059	0.039	0.033
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	1	1	1	0	0	1	1	3	3	2	2
min	0.360	0.300	0.250	0.200			0.530	0.590	0.510	0.430	0.360	0.350
max	0.420	0.300	0.250	0.200			0.530	0.590	0.580	0.530	0.410	0.370
med	**0.410**	**0.300**	**0.250**	**0.200**			**0.530**	**0.590**	**0.545**	**0.480**	**0.385**	**0.360**
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	1	1	1	0	0	1	1	3	3	2	2
min	0.330	0.380	0.380	0.320			0.370	0.300	0.240	0.330	0.390	0.350
max	0.440	0.380	0.380	0.320			0.370	0.300	0.240	0.360	0.430	0.380
med	**0.350**	**0.380**	**0.380**	**0.320**			**0.370**	**0.300**	**0.240**	**0.345**	**0.410**	**0.365**
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	1	1	1	0	0	1	1	3	3	2	2
min	0.016	0.017	0.018	0.020			0.012	0.014	0.018	0.015	0.019	0.018
max	0.022	0.017	0.018	0.020			0.012	0.014	0.020	0.021	0.020	0.019
med	**0.019**	**0.017**	**0.018**	**0.020**			**0.012**	**0.014**	**0.019**	**0.018**	**0.020**	**0.019**
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	1	1	1	0	0	1	1	3	3	2	2
min	0.006	0.009	0.014	0.012			0.011	0.013	0.010	0.010	0.010	0.007
max	0.009	0.009	0.014	0.012			0.011	0.013	0.011	0.014	0.013	0.012
med	**0.009**	**0.009**	**0.014**	**0.012**			**0.011**	**0.013**	**0.011**	**0.012**	**0.012**	**0.010**
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	1	1	1	0	0	1	1	3	3	2	2
min	14.00	14.00	13.00	12.00			13.00	13.00	13.00	13.00	13.00	7.450
max	14.00	14.00	13.00	12.00			13.00	13.00	13.00	13.00	13.00	1.900
med	**14.00**	**14.00**	**13.00**	**12.00**			**13.00**	**13.00**	**13.00**	**13.00**	**13.00**	**13.00**
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	1	1	1	0	0	1	1	3	3	2	2
min	0.500	0.500	1.000	0.500			0.500	0.500	0.500	1.000	2.000	1.000
max	1.000	0.500	1.000	0.500			0.500	0.500	0.500	1.000	2.000	2.000
med	**0.500**	**0.500**	**1.000**	**0.500**			**0.500**	**0.500**	**0.500**	**1.000**	**2.000**	**1.500**
DO (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	1	1	1	0	0	1	1	3	3	2	2
min	8.310	8.100	8.500	8.430			8.650	8.800	8.630	8.490	8.680	8.170
max	8.470	8.100	8.500	8.430			8.650	8.800	8.660	8.500	8.820	8.250
med	**8.340**	**8.100**	**8.500**	**8.430**			**8.650**	**8.800**	**8.645**	**8.495**	**8.750**	**8.210**
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	1	1	1	0	0	1	1	3	3	2	2
min	0.605	0.607	0.680	0.644			0.920	1.525	0.632	0.577	0.612	0.607
max	1.704	0.607	0.680	0.644			0.920	1.525	0.645	0.594	0.901	0.625
med	**0.605**	**0.607**	**0.680**	**0.644**			**0.920**	**1.525**	**0.638**	**0.586**	**0.757**	**0.616**

NB: Daily discharge data is not available for MIMDOUT as this site is not gauged. The MIMDOUT sampling site is located at the point that this main drain discharges to the estuary and, as such, can be influenced by estuarine waters during high tides. Water samples are therefore only collected when the drain is flowing freely and during a low tide, which is determined visually and by the conductivity of site water prior to sampling. Due to the influence of estuarine waters, sample numbers were reduced in autumn and spring and no samples were taken during May and June.

Where available, the data for MIMDOUT in 2019 largely followed the trends of background data and typically fell with the range of historic ranges (Figures 187-193, Table 21). Concentrations of NO_x-N were highest between July and September, likely in response to increase discharge from this catchment related to seasonal rainfall, whereas TP and FRP tended to remain low throughout the reporting period (Figure 191 and 192).

Concentrations of TN, TP and FRP remained below their respective ANZECC trigger values of 1.2 mg/L, 0.065 mg/L and 0.04 mg/L for lowland rivers in all months where data were available in 2019 (Figures 187, 191 and 192). In contrast, NO_x-N always exceeded its trigger value of 0.15 mg/L in those months (Figure 189).

When sampled, concentrations of DOC at MIMDOUT remained relatively consistent, apart from December when concentrations were notably reduced (Figure 193). TSS was very low, dissolved oxygen concentrations were always greater than 8 mg/L and conductivity ranged between 0.5 and 2 mS/cm throughout the reporting period, (Figure 194-196, Table 21).

20. Mills Street Main Drain (SWS1)

SWS1 total nitrogen (TN)

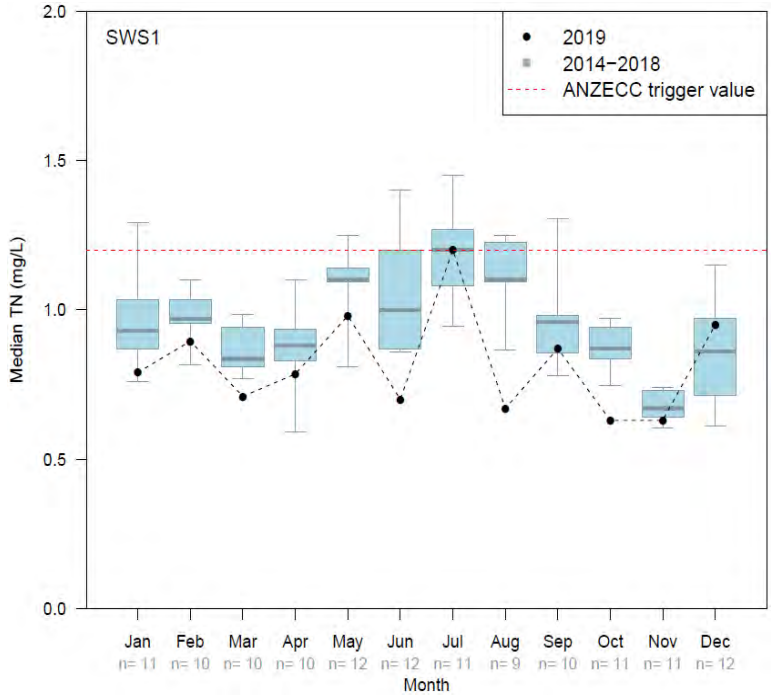

Figure 197. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS1. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

SWS1 ammoniacal nitrogen (NH_3-N)

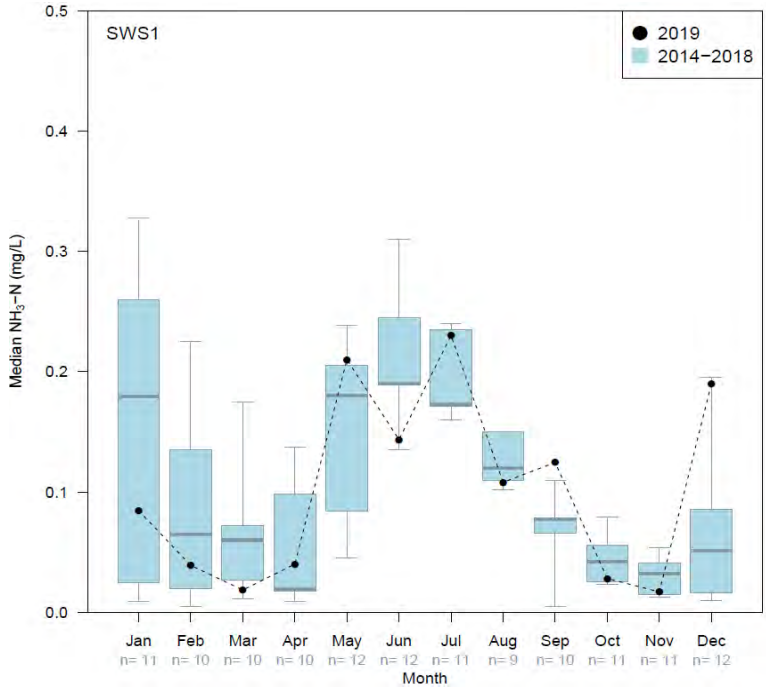

Figure 198. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS1. Number of samples (n) is provided for the historical data.

SWS1 total oxidisable nitrogen (NO_x-N)

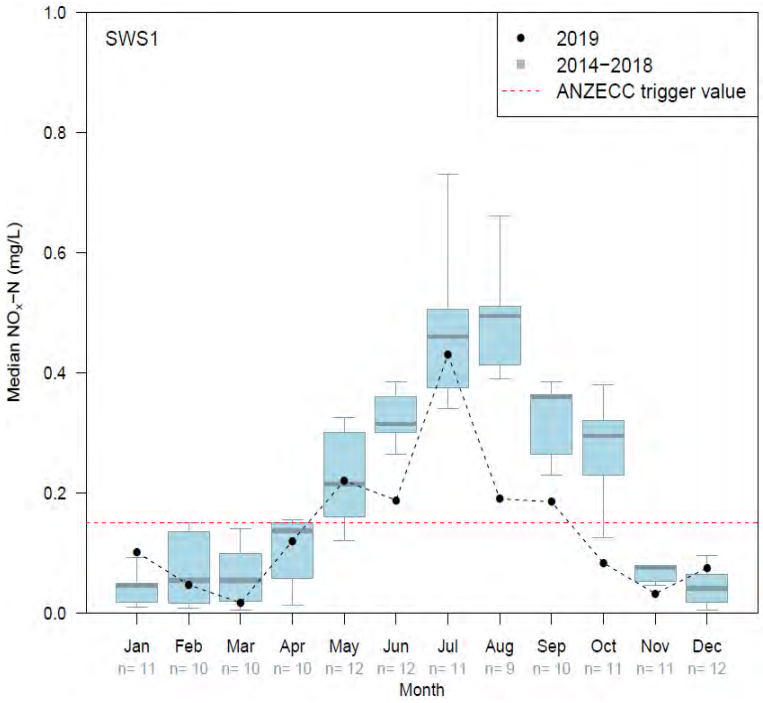

Figure 199. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS1. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

SWS1 dissolved organic nitrogen (DOrgN)

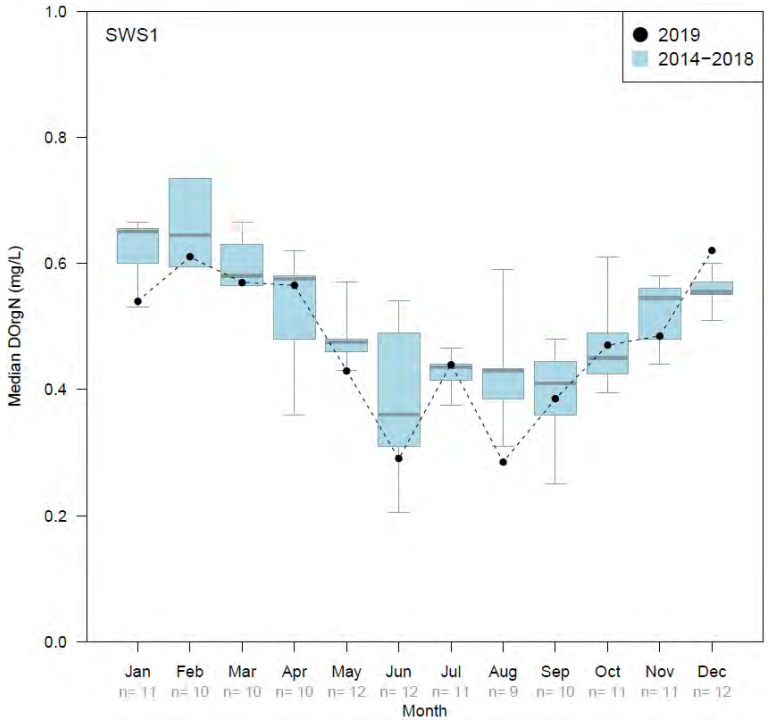

Figure 200. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS1. Number of samples (n) is provided for the historical data.

SWS1 total phosphorus (TP)

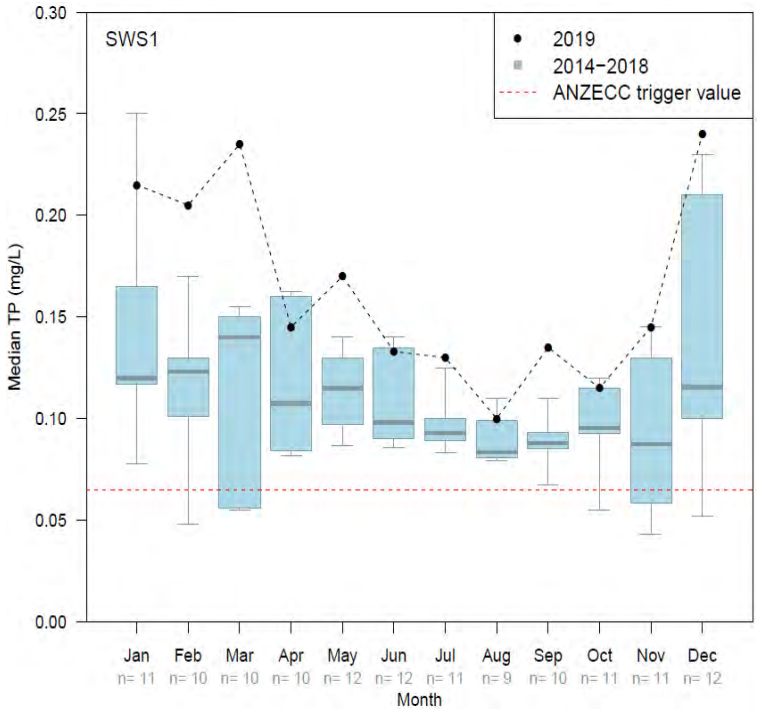

Figure 201. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS1. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

SWS1 filterable reactive phosphorus (FRP)

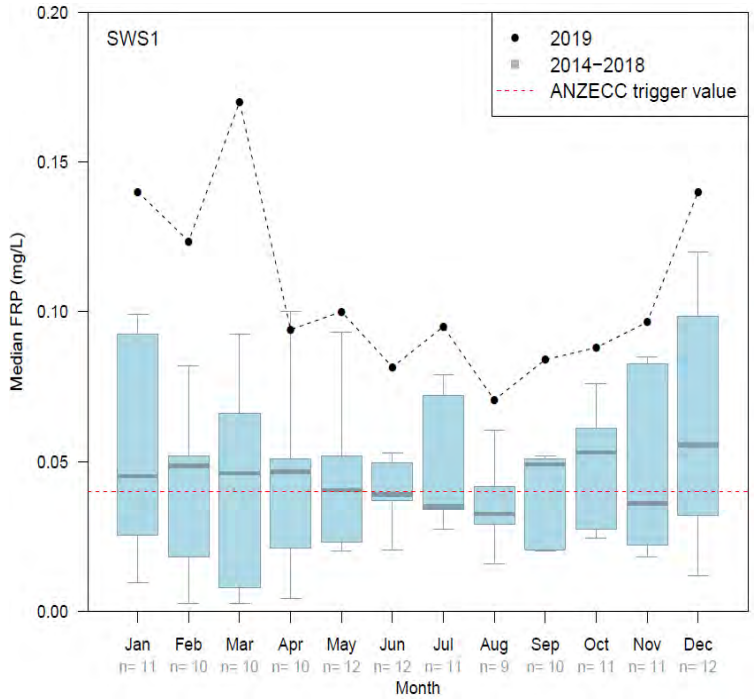

Figure 202. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS1. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

SWS1 dissolved organic carbon (DOC)

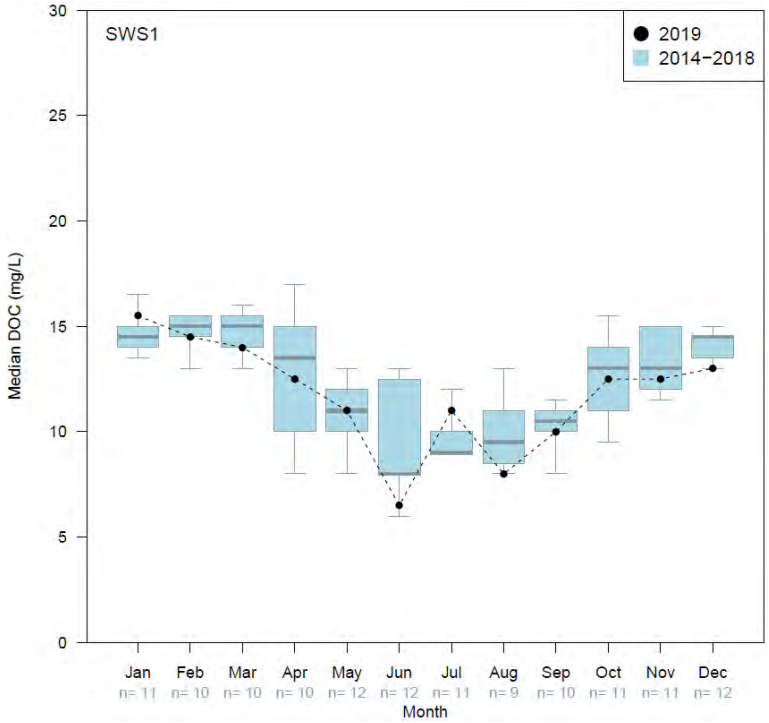

Figure 203. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS1. Number of samples (n) is provided for the historical data.

SWS1 total suspended solids (TSS)

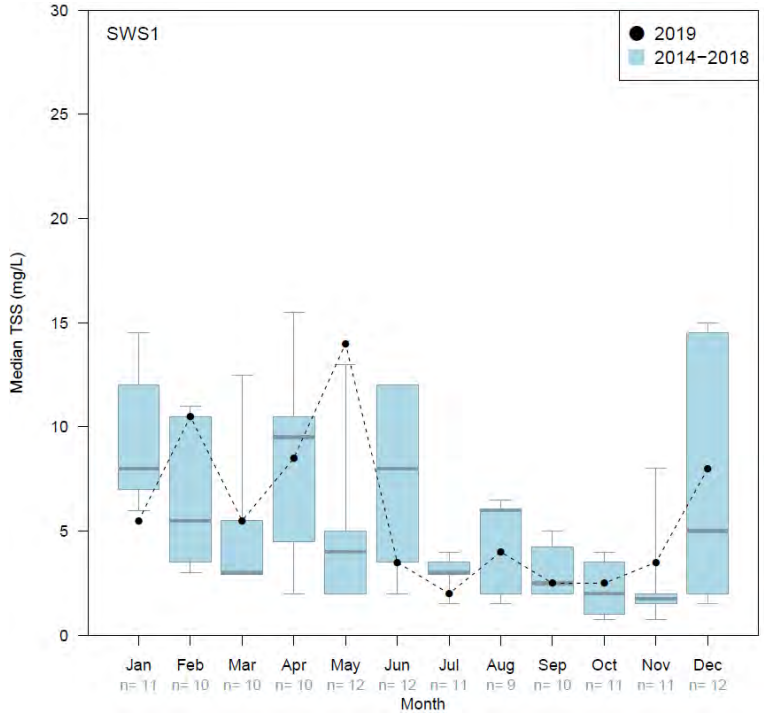

Figure 204. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS1. Number of samples (n) is provided for the historical data.

SWS1 dissolved oxygen (DO)

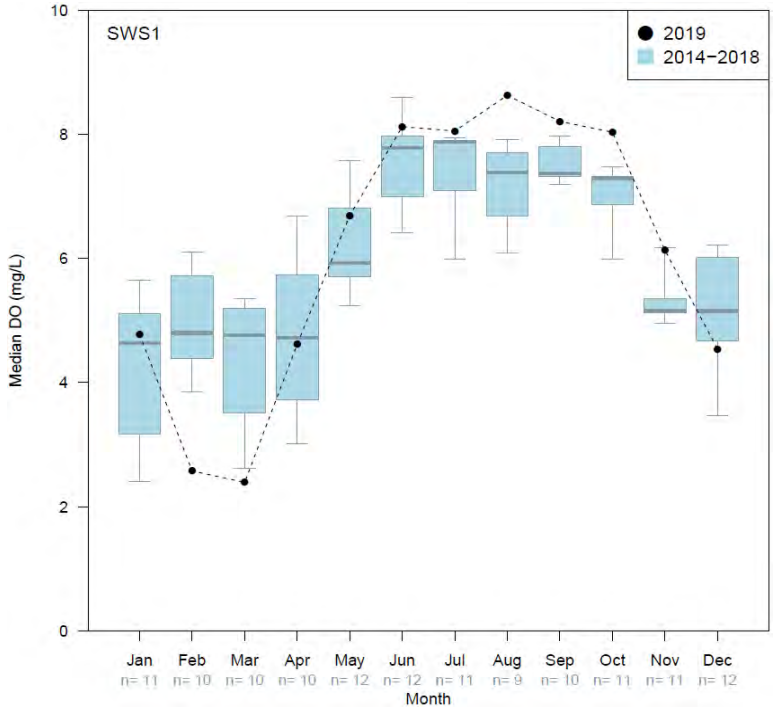

Figure 205. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS1. Number of samples (n) is provided for the historical data.

SWS1 specific conductivity (Sp. cond)

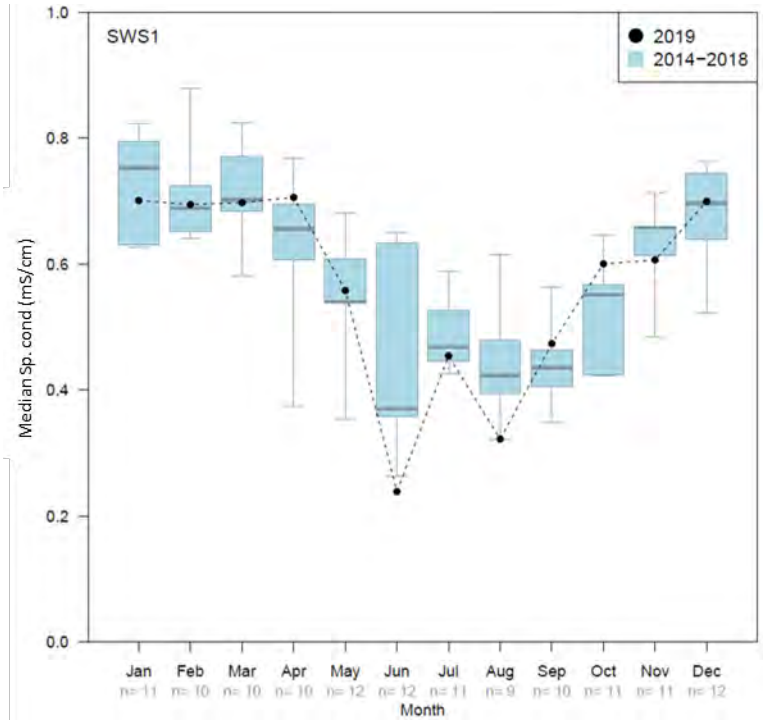

Figure 206. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS1. Number of samples (n) is provided for the historical data.

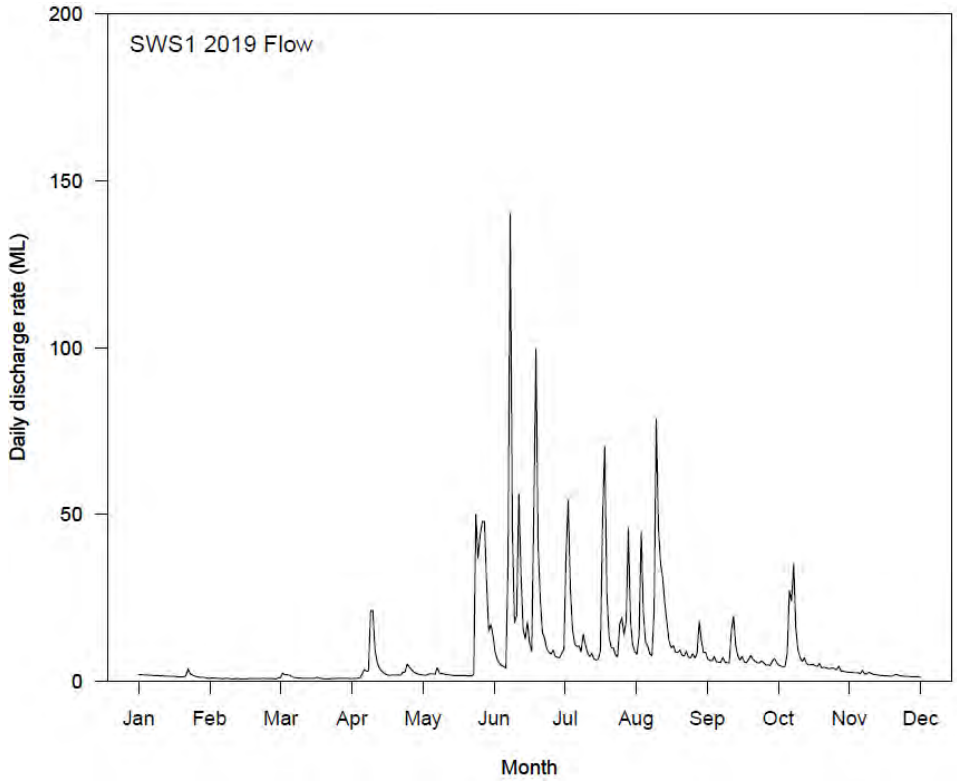

Figure 207. Daily discharge (ML) at Mill Street Main Drain gauging station (616043– at site of SWS1).

The Mills Street main drain 2019 hydrograph illustrates a response to seasonal flow (Figure 207). Prominent rainfall events were recorded over winter before returning to base flow conditions at the beginning of summer.

Table 22. 2019 monthly sample numbers, minimum and maximum values at SWS1.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.610	0.790	0.690	0.750	0.940	0.440	1.200	0.540	0.870	0.590	0.620	0.950
max	0.970	1.000	0.730	0.820	2.100	0.960	1.200	0.800	0.870	0.670	0.640	0.950
med	**0.790**	**0.895**	**0.710**	**0.785**	**0.980**	**0.700**	**1.200**	**0.670**	**0.870**	**0.630**	**0.630**	**0.950**
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.039	0.021	0.016	0.016	0.130	0.067	0.230	0.056	0.089	0.019	0.011	0.190
max	0.130	0.057	0.021	0.064	0.210	0.220	0.230	0.160	0.160	0.037	0.023	0.190
med	**0.085**	**0.039**	**0.019**	**0.040**	**0.210**	**0.144**	**0.230**	**0.108**	**0.125**	**0.028**	**0.017**	**0.190**
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.082	0.005	0.005	0.120	0.170	0.096	0.430	0.160	0.180	0.037	0.016	0.075
max	0.120	0.089	0.029	0.120	0.260	0.280	0.430	0.220	0.190	0.130	0.049	0.075
med	**0.101**	**0.047**	**0.017**	**0.120**	**0.220**	**0.188**	**0.430**	**0.190**	**0.185**	**0.084**	**0.033**	**0.075**
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.490	0.590	0.540	0.530	0.390	0.230	0.440	0.230	0.310	0.450	0.480	0.620
max	0.590	0.630	0.600	0.600	0.660	0.350	0.440	0.340	0.460	0.490	0.490	0.620
med	**0.540**	**0.610**	**0.570**	**0.565**	**0.430**	**0.290**	**0.440**	**0.285**	**0.385**	**0.470**	**0.485**	**0.620**
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.190	0.170	0.180	0.110	0.160	0.096	0.130	0.080	0.130	0.110	0.130	0.240
max	0.240	0.240	0.290	0.180	0.390	0.170	0.130	0.120	0.140	0.120	0.160	0.240
med	**0.215**	**0.205**	**0.235**	**0.145**	**0.170**	**0.133**	**0.130**	**0.100**	**0.135**	**0.115**	**0.145**	**0.240**
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.120	0.097	0.120	0.078	0.098	0.053	0.095	0.051	0.072	0.085	0.083	0.140
max	0.160	0.150	0.220	0.110	0.120	0.110	0.095	0.090	0.096	0.091	0.110	0.140
med	**0.140**	**0.124**	**0.170**	**0.094**	**0.100**	**0.082**	**0.095**	**0.071**	**0.084**	**0.088**	**0.097**	**0.140**
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	15.00	14.00	14.00	12.00	11.00	4.000	11.00	5.000	7.000	12.00	12.00	13.00
max	16.00	15.00	14.00	13.00	11.00	9.000	11.00	11.00	13.00	13.00	13.00	13.00
med	**15.50**	**14.50**	**14.00**	**12.50**	**11.00**	**6.500**	**11.00**	**8.000**	**10.000**	**12.50**	**12.50**	**13.00**
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	4.000	7.000	5.000	7.000	8.000	3.000	2.000	2.000	2.000	2.000	3.000	8.000
max	7.000	14.00	6.000	10.00	36.00	4.000	2.000	6.000	3.000	3.000	4.000	8.000
med	**5.500**	**10.50**	**5.500**	**8.500**	**14.00**	**3.500**	**2.000**	**4.000**	**2.500**	**2.500**	**3.500**	**8.000**
DO (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	4.700	2.370	2.300	3.530	6.590	7.930	8.050	8.470	7.590	7.510	5.780	4.540
max	4.850	2.780	2.480	5.700	6.910	8.310	8.050	8.780	8.820	8.880	6.480	4.540
med	**4.775**	**2.575**	**2.390**	**4.615**	**6.690**	**8.120**	**8.050**	**8.625**	**8.205**	**8.030**	**6.130**	**4.540**
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.690	0.690	0.692	0.685	0.511	0.178	0.454	0.182	0.332	0.541	0.590	0.700
max	0.712	0.699	0.703	0.727	0.612	0.299	0.454	0.462	0.615	0.613	0.623	0.700
med	**0.701**	**0.695**	**0.698**	**0.706**	**0.558**	**0.239**	**0.454**	**0.322**	**0.474**	**0.600**	**0.607**	**0.700**

In 2019, data for SWS1 generally followed the trend of background data, however concentration were not always within the historic range (Figures 197-203, Table 22). Concentration of TN in 2019 were typically at the lower end of the range of background data and fell below that range in March, June, August, and October (Figure 197). While concentrations of NH_3-N and NO_x-N were elevated between May and September, concentrations of DOrgN were reduced (Figure 198-200).

Concentrations of TP and FRP were notably elevated throughout the 2019 reporting period and were typically greater than or at the upper end of the historic range, with the highest concentrations observed in summer and early autumn (Figures 201 and 202). Although the concentrations of these analytes were highly variable over the past five years, the elevated concentrations in summer and early autumn may suggest that this catchment is influenced by groundwater.

Concentrations of TN were at or below the ANZECC trigger value of 1.2 mg/L for lowland rivers for the 2019 reporting period, whereas concentrations of NO_x-N exceeded the trigger value of 0.15 mg/L between May and September (Figure 197 and 199). Concentrations of TP and FRP greatly exceeded their respective trigger values of 0.065 mg/L and 0.04 mg/L for the entire reporting period.

Median DOC concentrations were consistent with background data, TSS ranged between 2 and 14 mg/L and conductivity between 0.24 and 0.7 mS/cm (Figures 203-206, Table 22). Mills Street Main Drain was generally well oxygenated but fell below 3 mg/L in February and March (Figure 205).

21. Perth Airport North (SCCIS12)

SCCIS12 total nitrogen (TN)

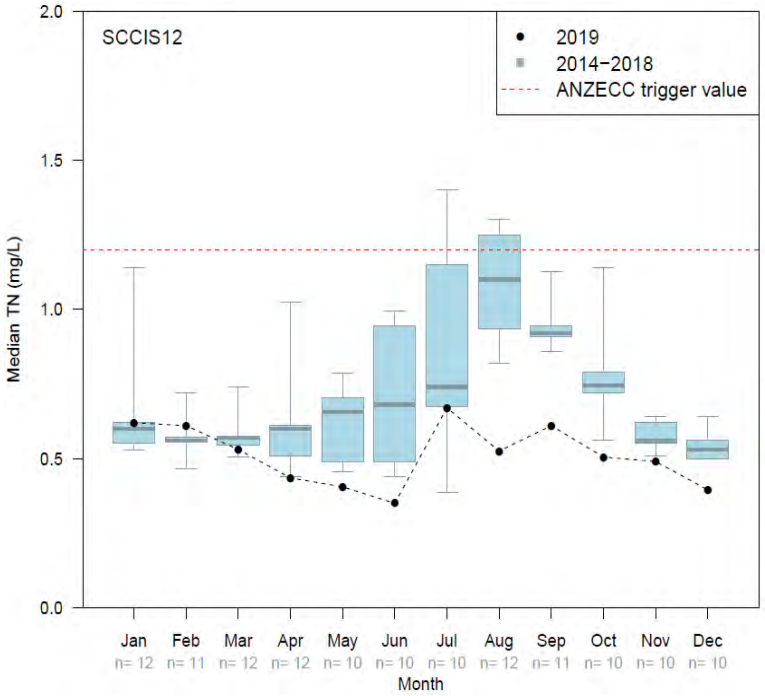

Figure 208. Monthly median Total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS12. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

SCCIS12 ammoniacal nitrogen (NH_3-N)

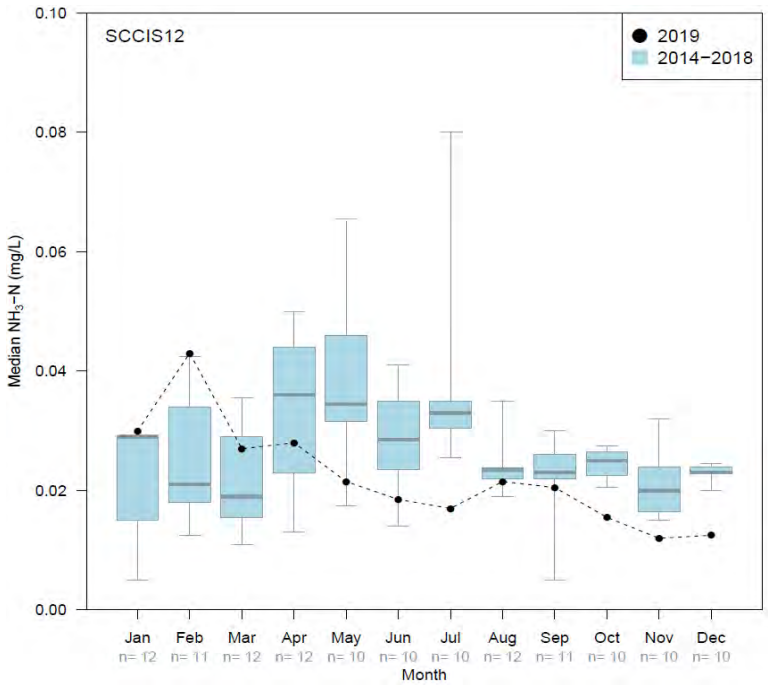

Figure 209. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS12. Number of samples (n) is provided for the historical data.

SCCIS12 total oxidised nitrogen (NO_x-N)

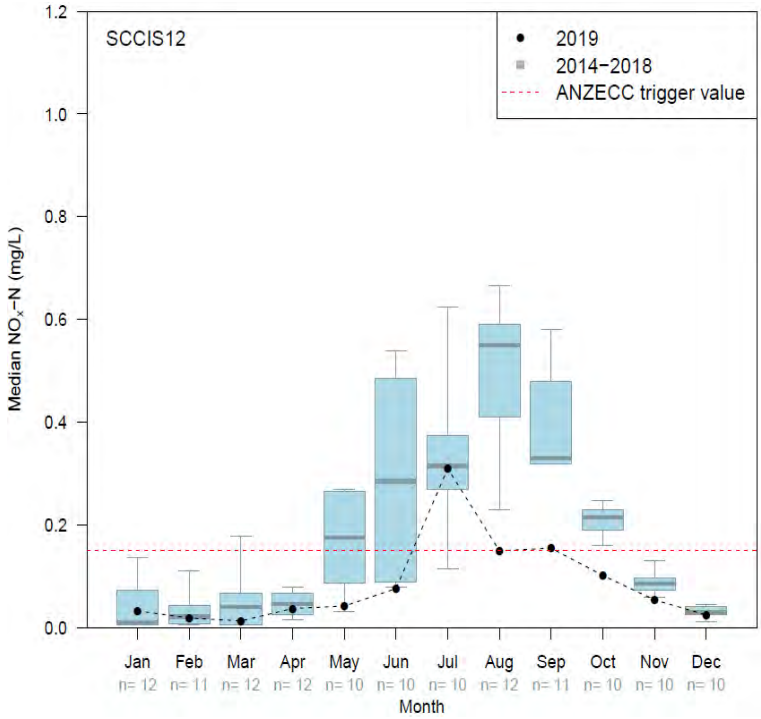

Figure 210. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS12. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

SCCIS12 dissolved organic nitrogen (DOrgN)

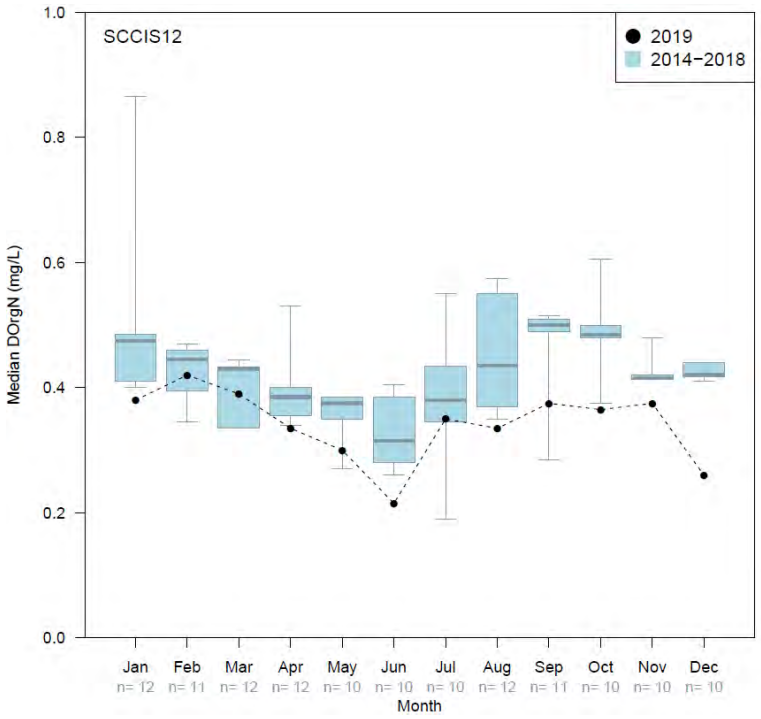

Figure 211. Monthly dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS12. Number of samples (n) is provided for the historical data.

SCCIS12 total phosphorus (TP)

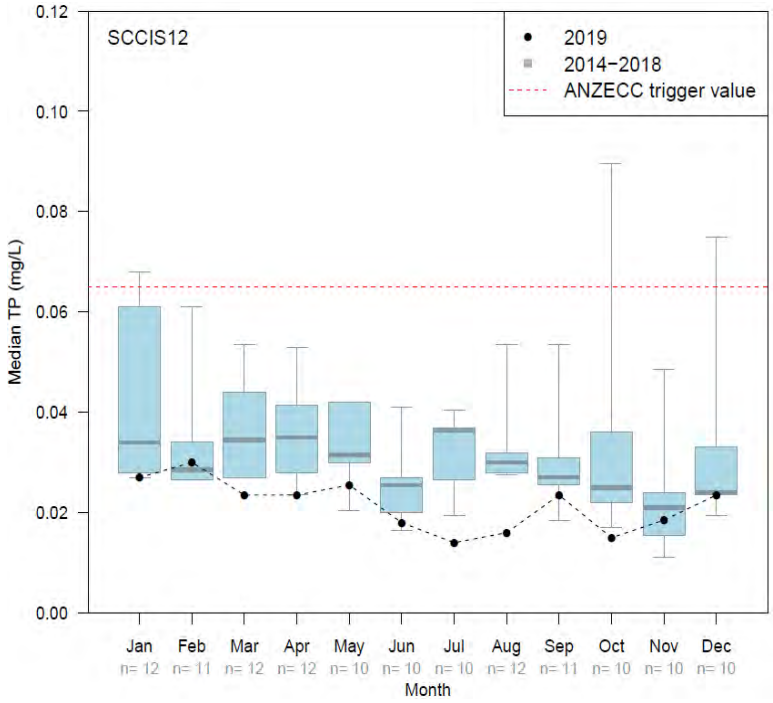

Figure 212. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS12. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

SCCIS12 filterable reactive phosphorus (FRP)

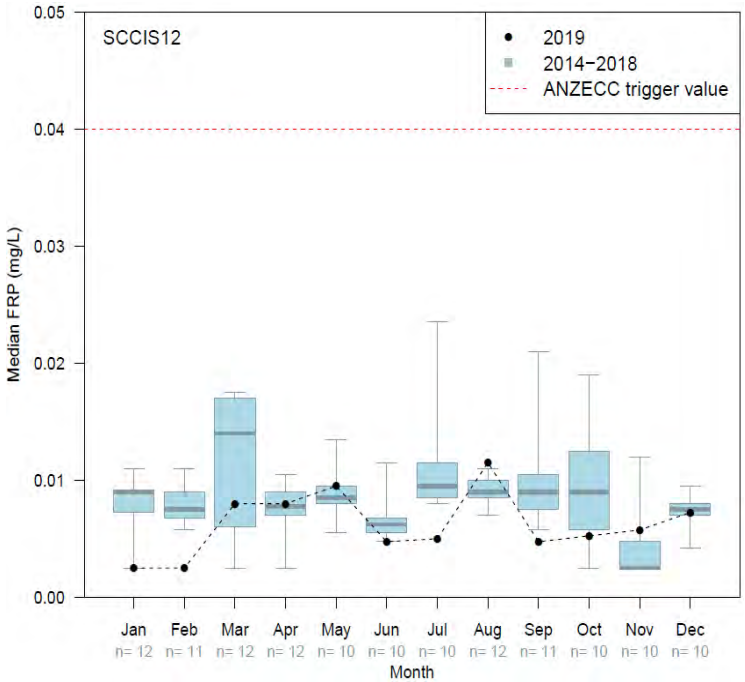

Figure 213. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS12. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

SCCIS12 dissolved organic carbon (DOC)

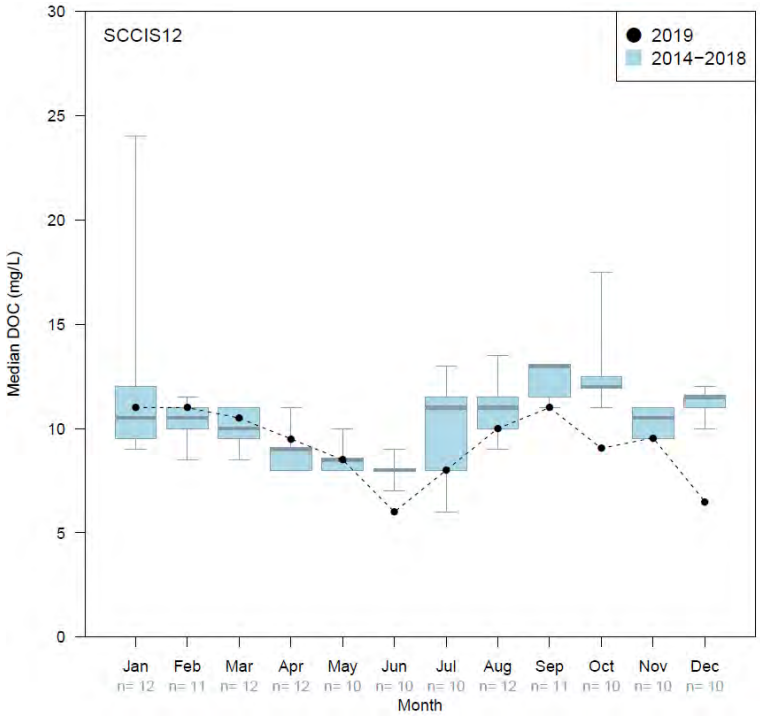

Figure 214. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS12. Number of samples (n) is provided for the historical data.

SCCIS12 total suspended sediment (TSS)

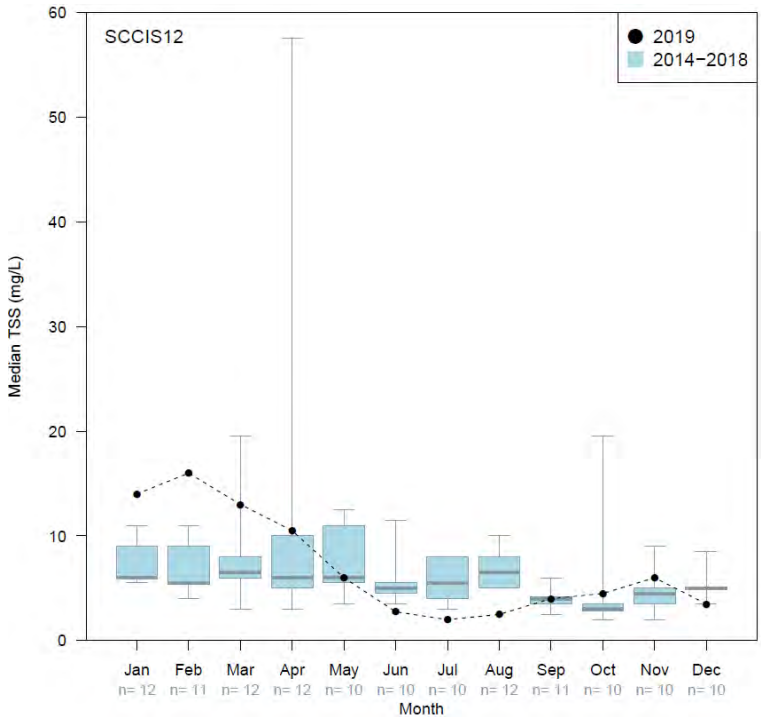

Figure 215. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS12. Number of samples (n) is provided for the historical data.

SCCIS12 dissolved oxygen (DO)

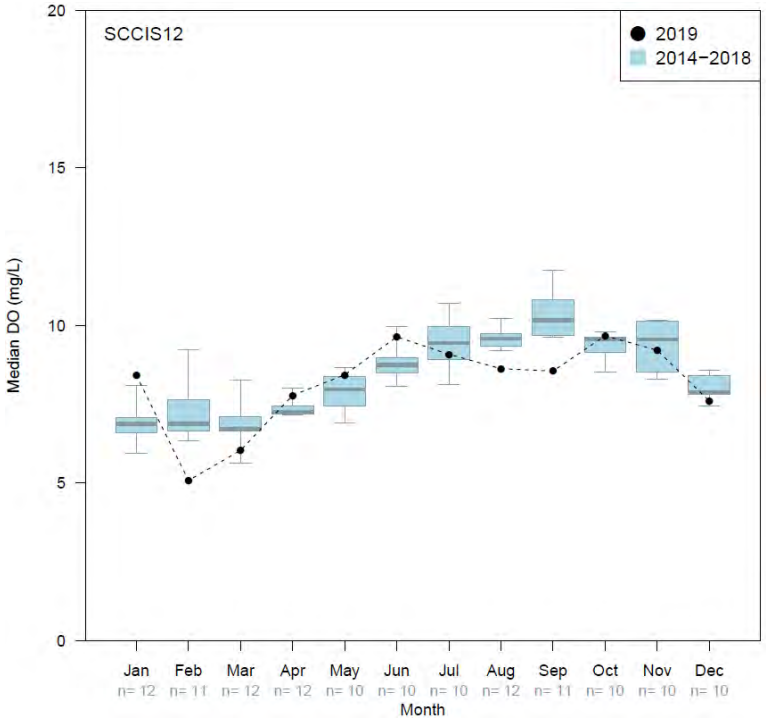

Figure 216. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS12. Number of samples (n) is provided for the historical data.

SCCIS12 specific conductivity (Sp. cond)

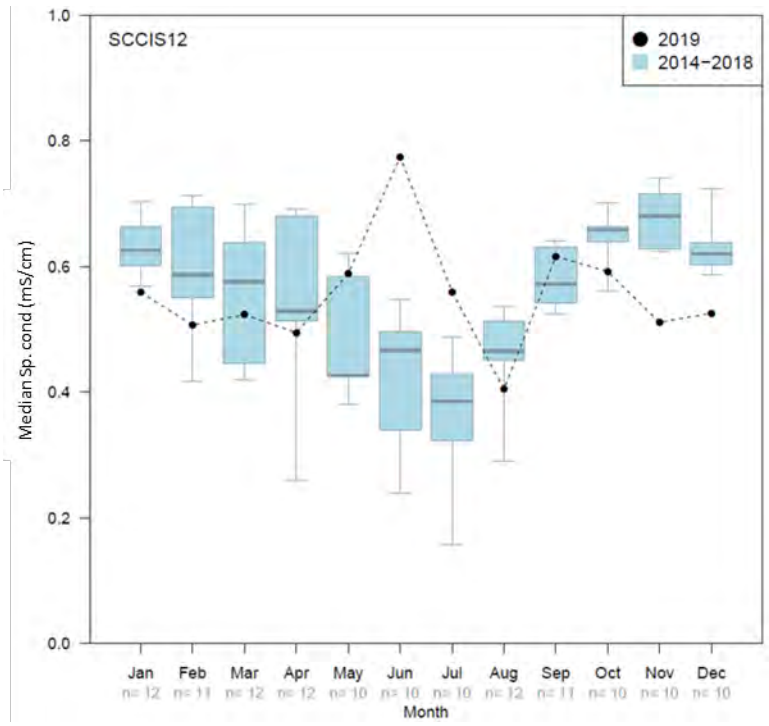

Figure 217. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS12. Number of samples (n) is provided for the historical data.

Table 23. 2019 monthly sample numbers, minimum and maximum values at SCCIS12.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.610	0.610	0.480	0.410	0.310	0.220	0.660	0.460	0.570	0.480	0.460	0.250
max	0.700	0.610	0.580	0.460	0.500	0.480	0.690	0.590	0.650	0.530	0.520	0.540
med	**0.620**	**0.610**	**0.530**	**0.435**	**0.405**	**0.350**	**0.670**	**0.525**	**0.610**	**0.505**	**0.490**	**0.395**
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.024	0.043	0.024	0.025	0.005	0.014	0.005	0.018	0.018	0.014	0.005	0.005
max	0.030	0.043	0.030	0.031	0.038	0.023	0.039	0.025	0.023	0.017	0.019	0.020
med	**0.030**	**0.043**	**0.027**	**0.028**	**0.022**	**0.019**	**0.017**	**0.022**	**0.021**	**0.016**	**0.012**	**0.013**
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.017	0.019	0.011	0.015	0.029	0.013	0.300	0.120	0.140	0.094	0.052	0.019
max	0.047	0.019	0.016	0.060	0.056	0.140	0.350	0.180	0.170	0.110	0.057	0.031
med	**0.033**	**0.019**	**0.014**	**0.038**	**0.043**	**0.077**	**0.310**	**0.150**	**0.155**	**0.102**	**0.055**	**0.025**
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.370	0.420	0.360	0.300	0.260	0.150	0.250	0.290	0.370	0.340	0.360	0.110
max	0.510	0.420	0.420	0.370	0.340	0.280	0.370	0.380	0.380	0.390	0.390	0.410
med	**0.380**	**0.420**	**0.390**	**0.335**	**0.300**	**0.215**	**0.350**	**0.335**	**0.375**	**0.365**	**0.375**	**0.260**
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.024	0.030	0.016	0.020	0.023	0.012	0.012	0.016	0.023	0.012	0.015	0.023
max	0.035	0.030	0.031	0.027	0.028	0.024	0.016	0.016	0.024	0.018	0.022	0.024
med	**0.027**	**0.030**	**0.024**	**0.024**	**0.026**	**0.018**	**0.014**	**0.016**	**0.024**	**0.015**	**0.019**	**0.024**
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.003	0.003	0.007	0.008	0.009	0.003	0.003	0.010	0.003	0.003	0.003	0.003
max	0.011	0.003	0.009	0.008	0.010	0.007	0.007	0.013	0.007	0.008	0.009	0.012
med	**0.003**	**0.003**	**0.008**	**0.008**	**0.010**	**0.005**	**0.005**	**0.012**	**0.005**	**0.005**	**0.006**	**0.007**
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	11.00	11.00	10.00	9.000	7.000	4.000	7.000	9.000	11.00	9.000	9.500	3.800
max	15.00	11.00	11.00	10.00	10.00	8.000	9.000	11.00	11.00	9.100	9.600	9.200
med	**11.00**	**11.00**	**10.50**	**9.500**	**8.500**	**6.000**	**8.000**	**10.00**	**11.00**	**9.050**	**9.550**	**6.500**
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	12.00	16.00	9.000	10.00	4.000	0.500	2.000	2.000	4.000	4.000	4.000	3.000
max	15.00	16.00	17.00	11.00	8.000	5.000	2.000	3.000	4.000	5.000	8.000	4.000
med	**14.00**	**16.00**	**13.00**	**10.50**	**6.000**	**2.750**	**2.000**	**2.500**	**4.000**	**4.500**	**6.000**	**3.500**
DO (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	7.720	2.140	4.320	7.720	8.400	9.360	8.980	8.440	8.170	9.380	9.070	7.360
max	9.090	8.020	7.750	7.840	8.460	9.910	9.540	8.810	8.930	9.960	9.350	7.840
med	**8.410**	**5.080**	**6.035**	**7.780**	**8.430**	**9.635**	**9.080**	**8.625**	**8.550**	**9.670**	**9.210**	**7.600**
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.520	0.502	0.513	0.456	0.427	0.430	0.422	0.270	0.596	0.585	0.479	0.513
max	0.574	0.512	0.534	0.534	0.751	1.120	0.603	0.540	0.637	0.599	0.544	0.538
med	**0.559**	**0.507**	**0.524**	**0.495**	**0.589**	**0.775**	**0.560**	**0.405**	**0.616**	**0.592**	**0.511**	**0.526**

NB: Daily discharge data is not available for SCCIS12 as this site is not gauged.

Concentrations of TN, NH_3-N, NO_x-N and DOrgN tended to be towards the lower limit or below the range of background data from April or May to December 2019, except for NO_x-N in July (the highest concentration for this analyte during the reporting period) which was consistent with the background median for that month (Figure 208-211, Table 23). Similarly, concentrations of TP and FRP were very low and often lower than the historical range (Figure 212-213). These lower concentrations may reflect the below average rainfall in 2019 and reduced surface runoff from this catchment (Figure 341).

The concentrations of TN, TP and FRP remained well below their respective ANZECC trigger values of 1.2 mg/L, 0.065 mg/L and 0.04 mg/L for the entire 2019 reporting period (Figures 208, 212 and 213). The concentration of NO_x-N also remained below the ANZECC trigger level of 0.15 mg/L, except for July, when the trigger was exceeded, despite concentrations remaining well within the background range (Figure 210).

As with nitrogen, median DOC and TSS were toward the lower limit or below the background range from June and May, respectively (Figure 214 and 215). The site was well oxygenation (> 5 mg/L) throughout the year (Figure 216). Specific conductivity was also typically toward the lower limit or below the background range, except from May to July when conductivity was notably elevated (Figure 217).

22. Perth Airport South (KANAV)

KANAV total nitrogen (TN)

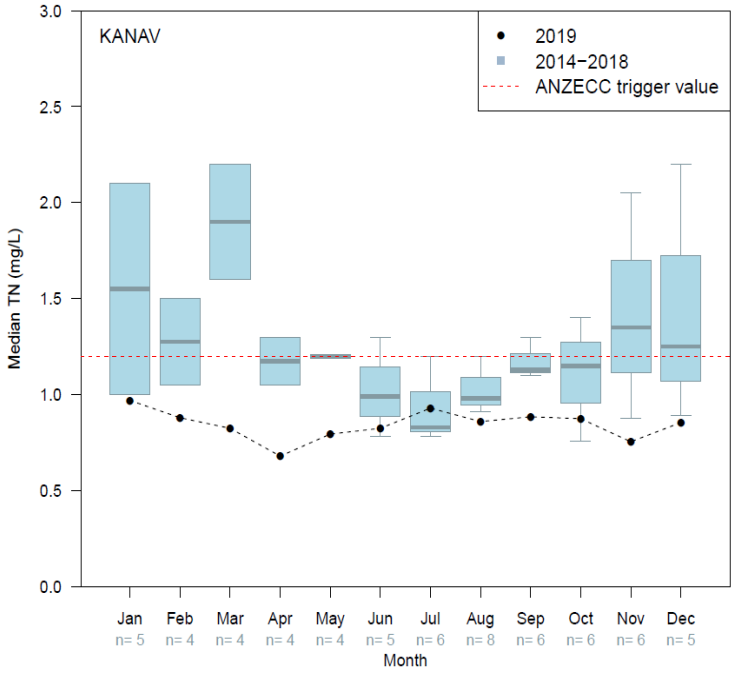

Figure 218. Monthly median Total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site KANAV. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

KANAV ammoniacal nitrogen (NH_3-N)

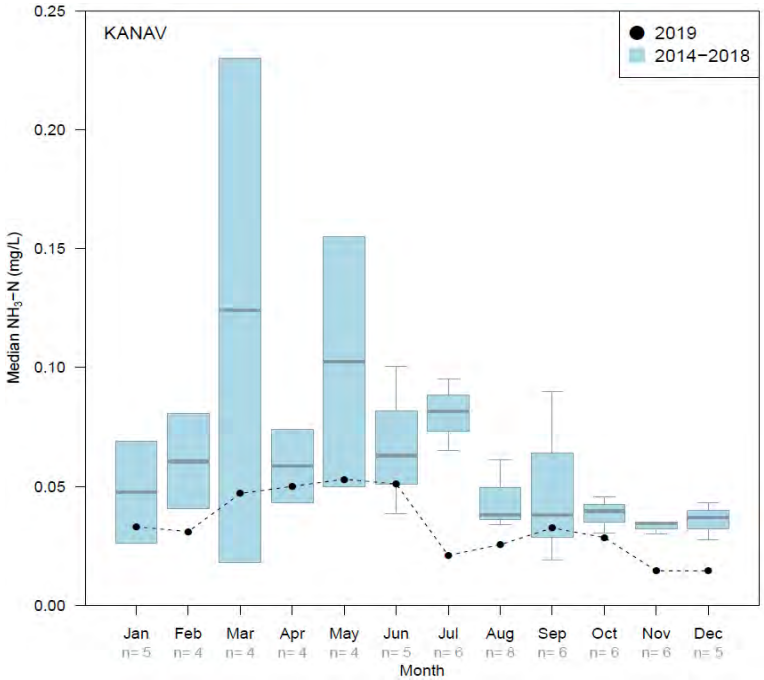

Figure 219. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site KANAV. Number of samples (n) is provided for the historical data.

KANAV total oxidisable nitrogen (NO_x-N)

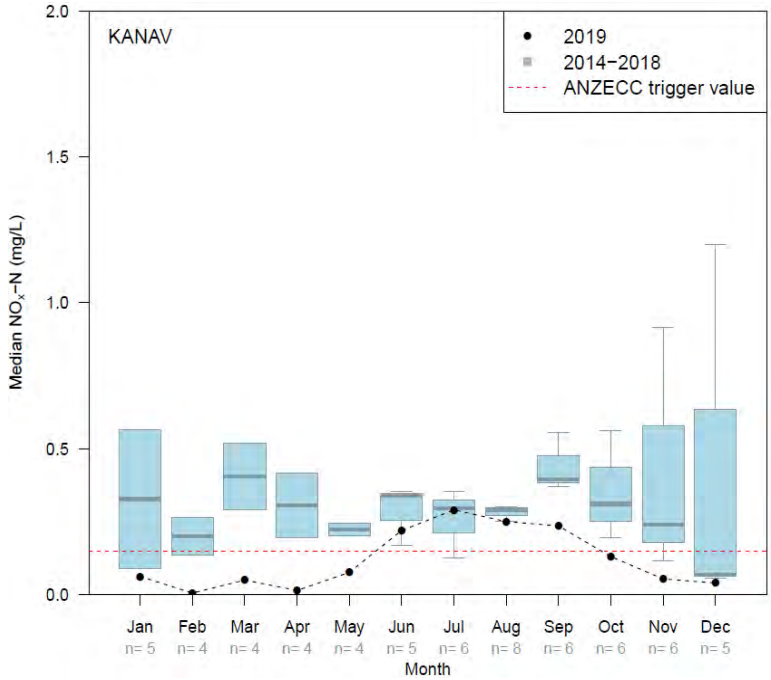

Figure 220. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site KANAV. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

KANAV dissolved organic nitrogen (DOrgN)

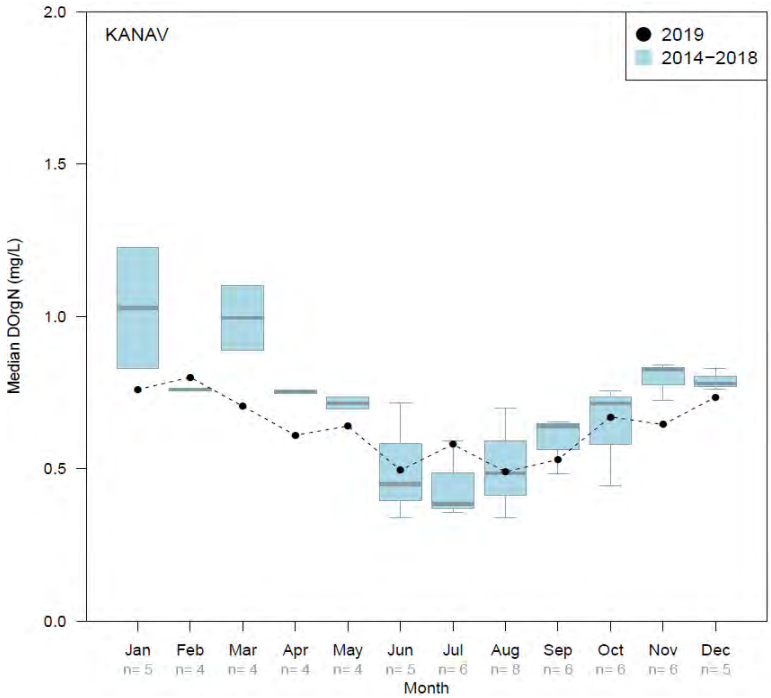

Figure 221. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site KANAV. Number of samples (n) is provided for the historical data.

KANAV total phosphorus (TP)

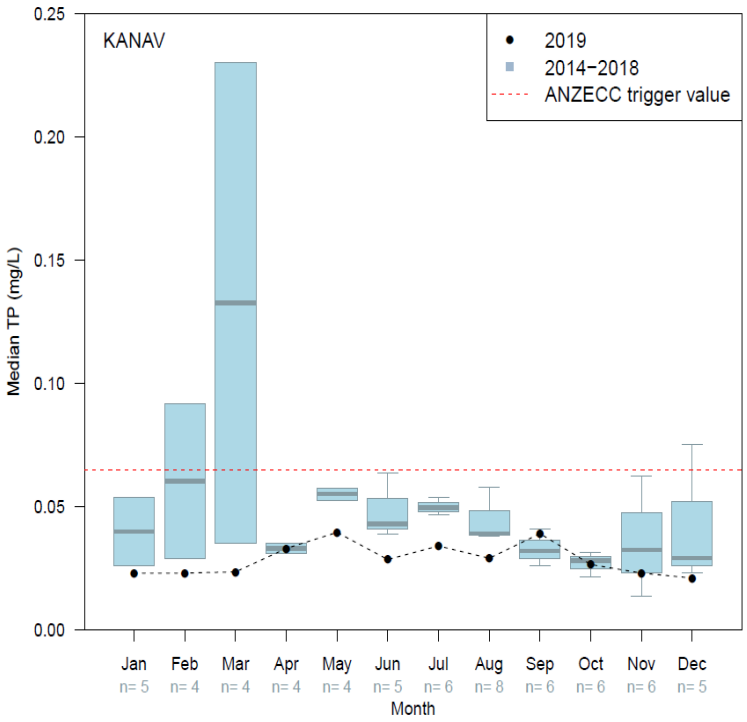

Figure 222. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site KANAV. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

KANAV filterable reactive phosphorus (FRP)

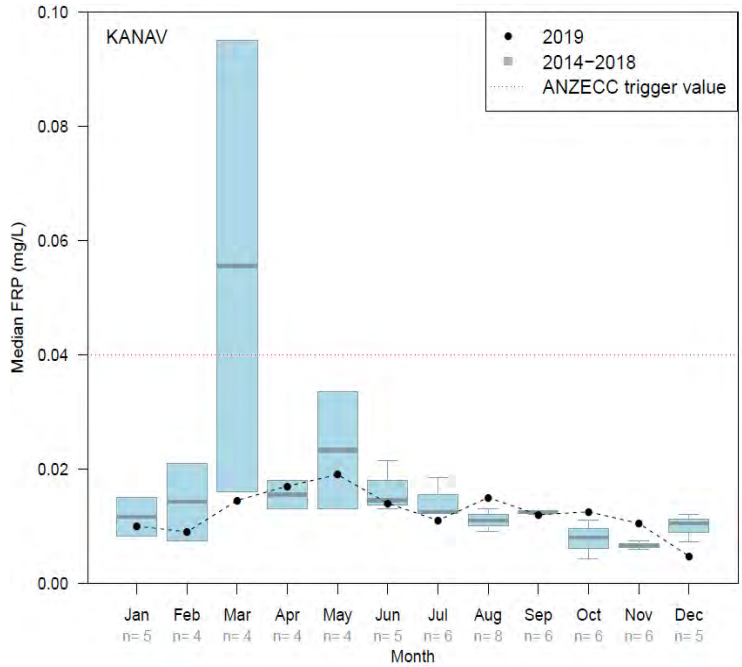

Figure 223. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site KANAV. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

KANAV dissolved organic carbon (DOC)

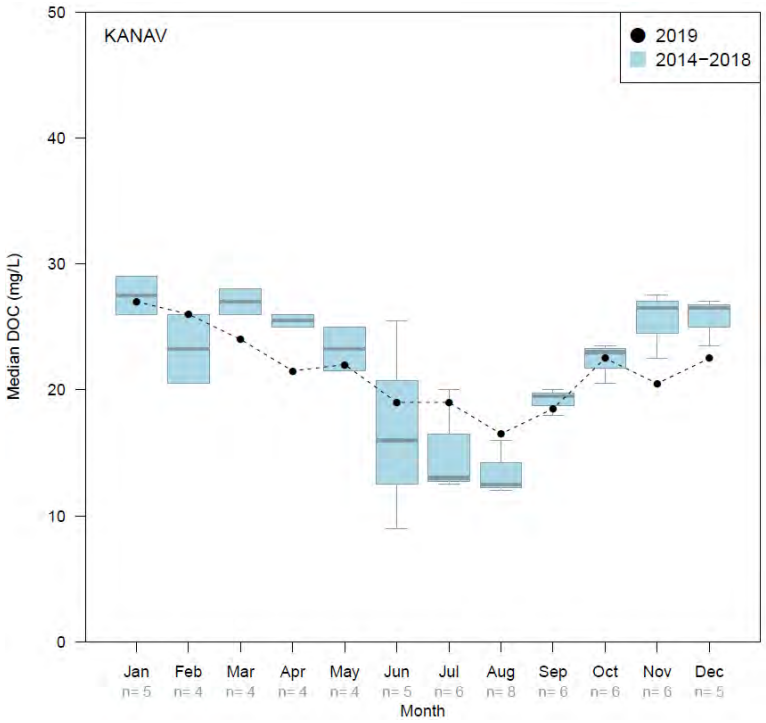

Figure 224. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site KANAV. Number of samples (n) is provided for the historical data.

KANAV total suspended solids (TSS)

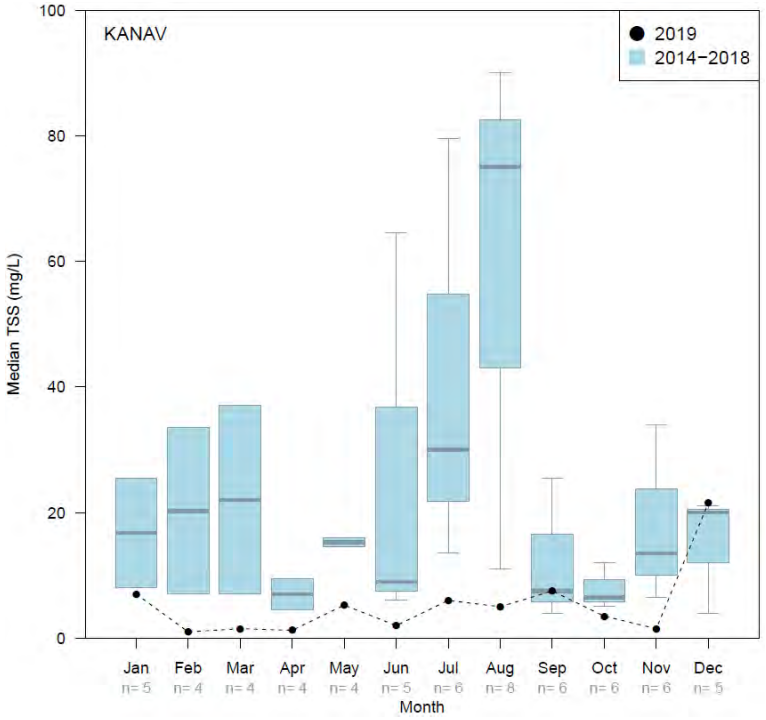

Figure 225. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site KANAV. Number of samples (n) is provided for the historical data.

KANAV dissolved oxygen (DO)

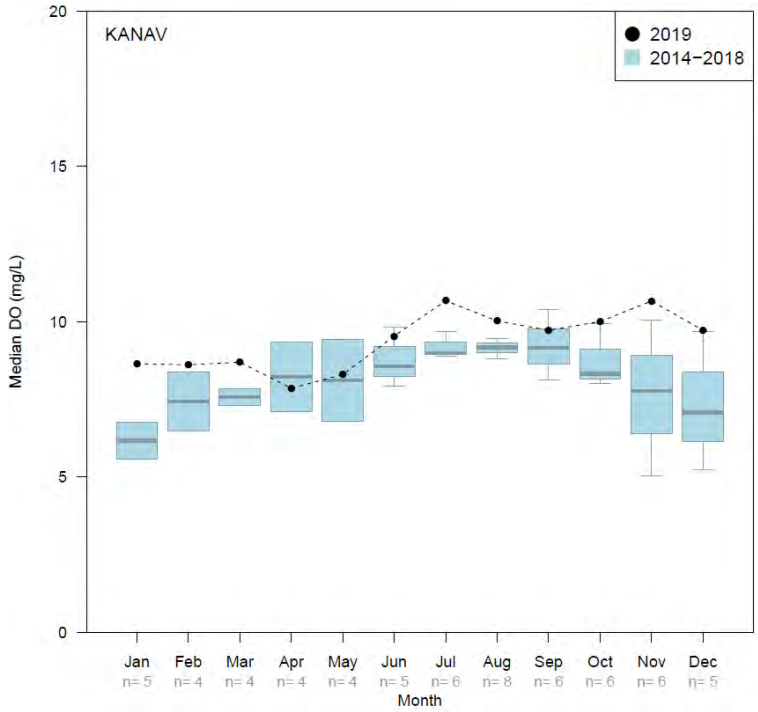

Figure 226. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site KANAV. Number of samples (n) is provided for the historical data.

KANAV specific conductivity (Sp. cond)

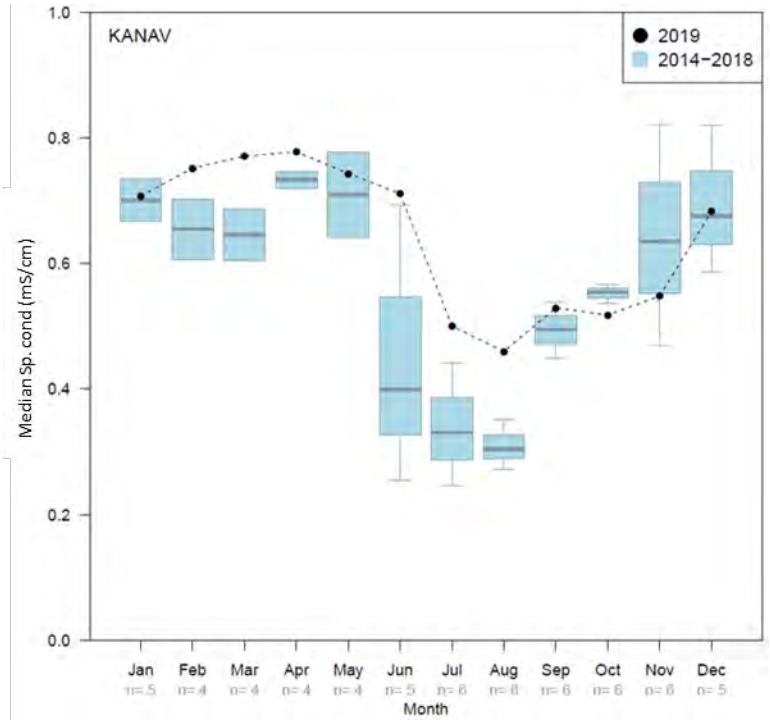

Figure 227. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site KANAV. Number of samples (n) is provided for the historical data.

Table 24. 2019 monthly sample numbers, minimum and maximum values at KANAV.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.960	0.880	0.790	0.630	0.770	0.670	0.910	0.830	0.880	0.840	0.710	0.840
max	1.100	0.880	0.860	0.730	0.820	0.980	0.980	0.890	0.890	0.910	0.800	0.870
med	**0.970**	**0.880**	**0.825**	**0.680**	**0.795**	**0.825**	**0.930**	**0.860**	**0.885**	**0.875**	**0.755**	**0.855**
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.031	0.031	0.030	0.041	0.040	0.048	0.010	0.021	0.025	0.028	0.005	0.005
max	0.034	0.031	0.064	0.059	0.066	0.054	0.039	0.030	0.040	0.029	0.024	0.024
med	**0.033**	**0.031**	**0.047**	**0.050**	**0.053**	**0.051**	**0.021**	**0.026**	**0.033**	**0.029**	**0.015**	**0.015**
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.058	0.005	0.028	0.012	0.022	0.019	0.280	0.240	0.230	0.100	0.053	0.033
max	0.074	0.005	0.071	0.016	0.130	0.420	0.300	0.260	0.240	0.160	0.054	0.046
med	**0.062**	**0.005**	**0.050**	**0.014**	**0.076**	**0.220**	**0.290**	**0.250**	**0.235**	**0.130**	**0.054**	**0.040**
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.700	0.800	0.660	0.560	0.610	0.480	0.540	0.480	0.510	0.670	0.570	0.690
max	0.800	0.800	0.750	0.660	0.670	0.510	0.620	0.500	0.550	0.670	0.720	0.780
med	**0.760**	**0.800**	**0.705**	**0.610**	**0.640**	**0.495**	**0.580**	**0.490**	**0.530**	**0.670**	**0.645**	**0.735**
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.021	0.023	0.021	0.031	0.037	0.028	0.027	0.028	0.039	0.026	0.023	0.020
max	0.034	0.023	0.026	0.035	0.042	0.029	0.036	0.030	0.039	0.027	0.023	0.022
med	**0.023**	**0.023**	**0.024**	**0.033**	**0.040**	**0.029**	**0.034**	**0.029**	**0.039**	**0.027**	**0.023**	**0.021**
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.003	0.009	0.014	0.013	0.018	0.012	0.003	0.014	0.011	0.009	0.008	0.003
max	0.017	0.009	0.015	0.021	0.020	0.016	0.013	0.016	0.013	0.016	0.013	0.007
med	**0.010**	**0.009**	**0.015**	**0.017**	**0.019**	**0.014**	**0.011**	**0.015**	**0.012**	**0.013**	**0.011**	**0.005**
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	26.00	26.00	23.00	21.00	21.00	17.00	16.00	15.00	18.00	22.00	18.00	22.00
max	27.00	26.00	25.00	22.00	23.00	21.00	19.00	18.00	19.00	23.00	23.00	23.00
med	**27.00**	**26.00**	**24.00**	**21.50**	**22.00**	**19.00**	**19.00**	**16.50**	**18.50**	**22.50**	**20.50**	**22.50**
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	4.000	1.000	1.000	0.500	0.500	2.000	5.000	5.000	4.000	3.000	1.000	2.000
max	10.00	1.000	2.000	2.000	10.00	2.000	8.000	5.000	11.00	4.000	2.000	41.00
med	**7.000**	**1.000**	**1.500**	**1.250**	**5.250**	**2.000**	**6.000**	**5.000**	**7.500**	**3.500**	**1.500**	**21.50**
DO (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	8.580	8.310	8.420	7.430	7.460	8.660	10.52	9.610	9.380	9.570	10.26	9.350
max	9.420	8.910	8.960	8.280	9.130	10.41	11.03	10.43	10.06	10.43	11.06	10.09
med	**8.640**	**8.610**	**8.690**	**7.855**	**8.295**	**9.535**	**10.67**	**10.02**	**9.720**	**10.00**	**10.66**	**9.720**
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.696	0.748	0.765	0.753	0.730	0.657	0.466	0.432	0.523	0.427	0.467	0.665
max	0.727	0.755	0.776	0.802	0.756	0.765	0.569	0.488	0.535	0.608	0.629	0.699
med	**0.707**	**0.752**	**0.771**	**0.778**	**0.743**	**0.711**	**0.500**	**0.460**	**0.529**	**0.518**	**0.548**	**0.682**

NB: Daily discharge data is not available for KANAV as this site is not gauged.

Concentrations of TN, NH_3-N, NO_x-N and DOrgN in 2019 tended to be towards the lower limit or below the range of background data, with the exceptions of TN and NO_x-N in July and DOrgN from June to August, which were slightly greater than the background medians in those months (Figures 218-221). Concentrations of TP and FRP were low throughout the 2019 reporting period and tended to be within or below the range of historical data (Figures 222-223).

Concentrations of TN, TP and FRP remained well below their respective ANZECC trigger values for lowland rivers of 1.2 mg/L, 0.065 mg/L and 0.04 mg/L throughout the 2019 reporting period (Figures 218, 222 and 223). Concentrations of NO_x-N were generally low but exceeded the trigger value of 0.15 mg/L from June to September, likely in response to seasonal rainfall and surface runoff from this catchment (Figure 220).

DOC concentrations were high (frequently >20 mg/L) but were largely consistent with the trends of background data (Figure 224, Table 24). Concentrations of TSS were low throughout the reporting period and typically lower than background data, except for December when concentrations were slightly higher than the historical range (Figure 225). TSS concentrations were elevated and highly variable between 2014-2018 due to earthworks to realign the drain during that period. DO and specific conductivity followed similar trends to the background data but were often higher than the historic medians (Figure 226-227).

23. St Leonard's Creek (SCCIN3)

SCCIN3 total nitrogen (TN)

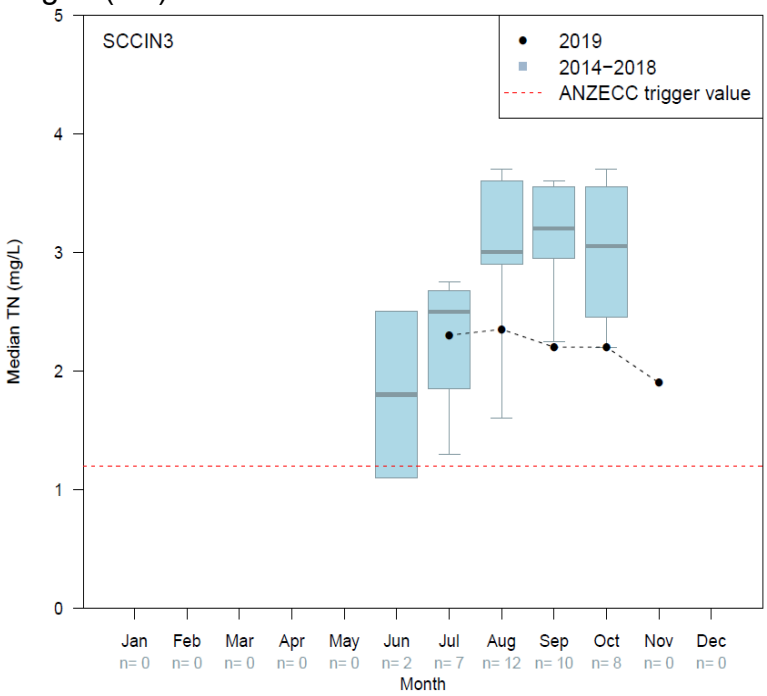

Figure 228. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIN3. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

SCCIN3 ammoniacal nitrogen (NH_3-N)

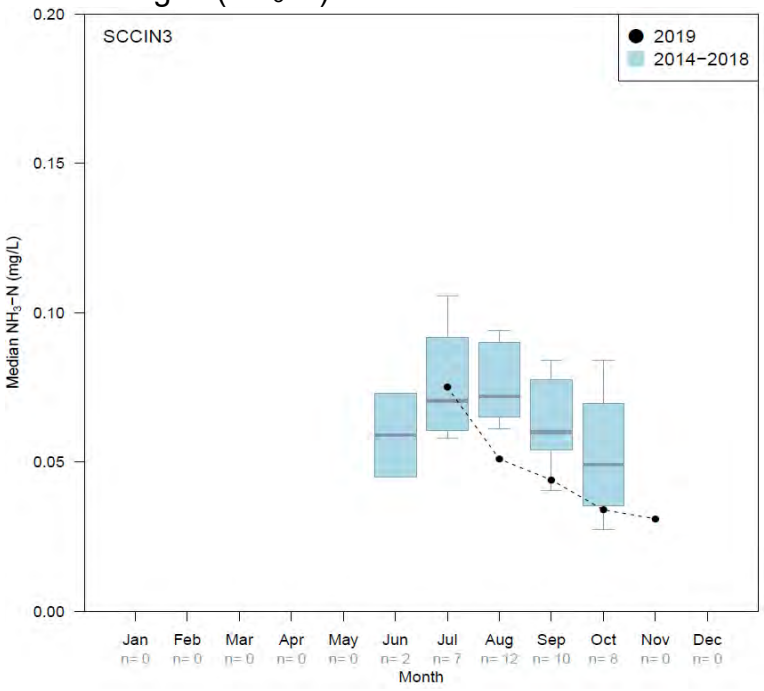

Figure 229. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIN3. Number of samples (n) is provided for the historical data.

SCCIN3 total oxidised nitrogen (NO_x-N)

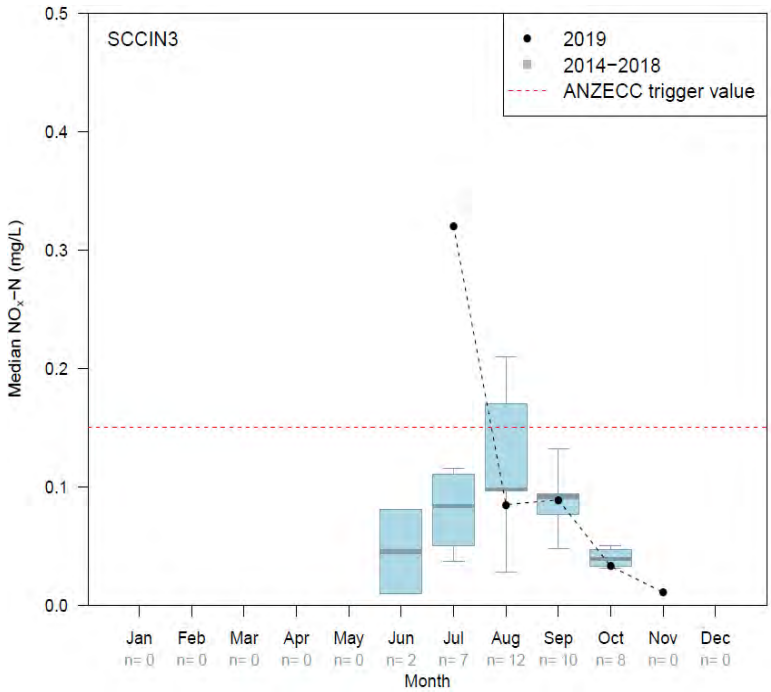

Figure 230. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIN3. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

SCCIN3 dissolved organic nitrogen (DOrgN)

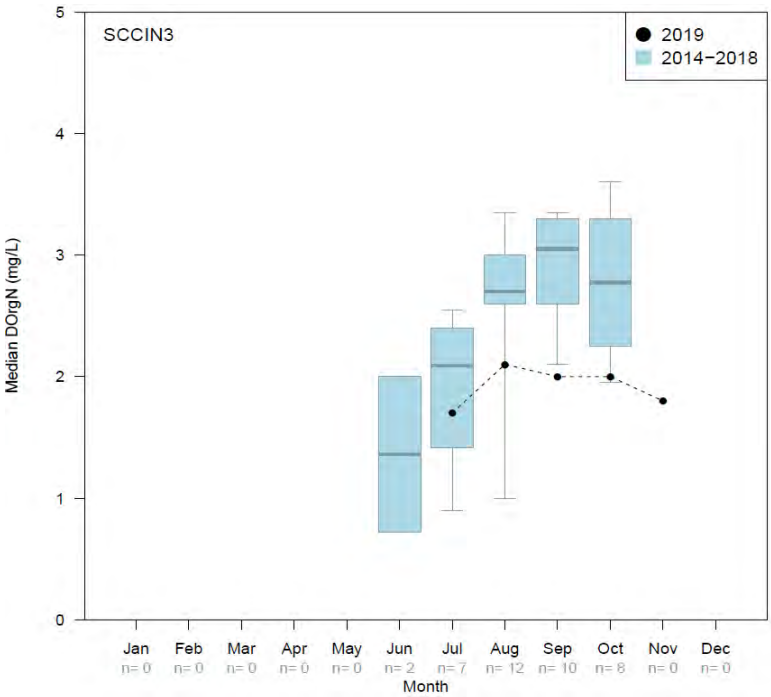

Figure 231. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIN3. Number of samples (n) is provided for the historical data.

SCCIN3 total phosphorus (TP)

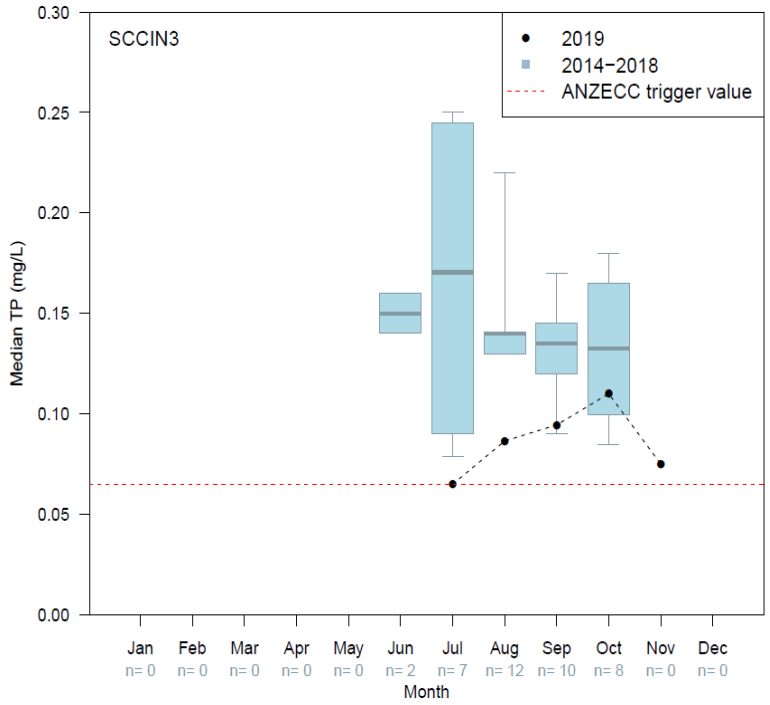

Figure 232. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIN3. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

SCCIN3 filterable reactive phosphorus (FRP)

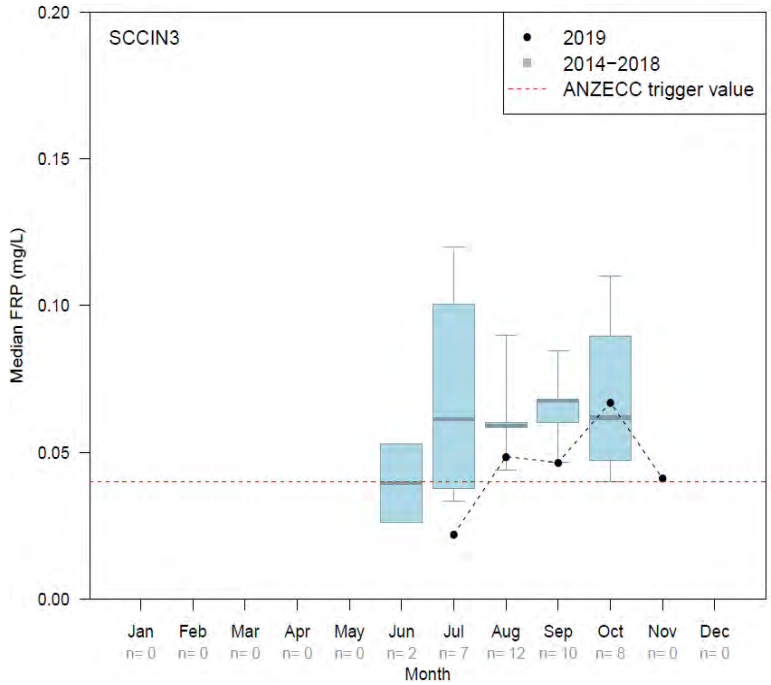

Figure 233. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIN3. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

SCCIN3 dissolved organic carbon (DOC)

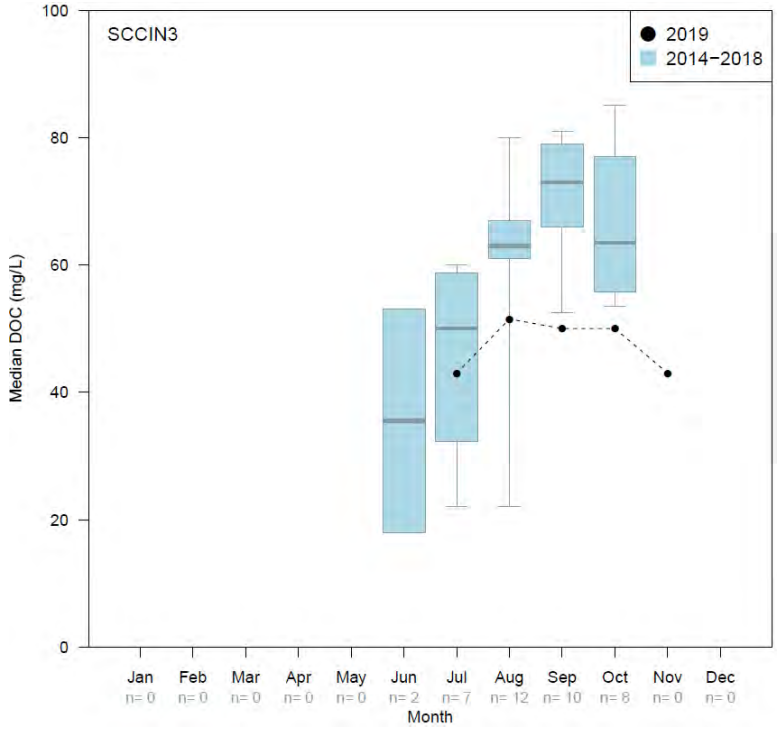

Figure 234. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIN3. Number of samples (n) is provided for the historical data.

SCCIN3 total suspended solids (TSS)

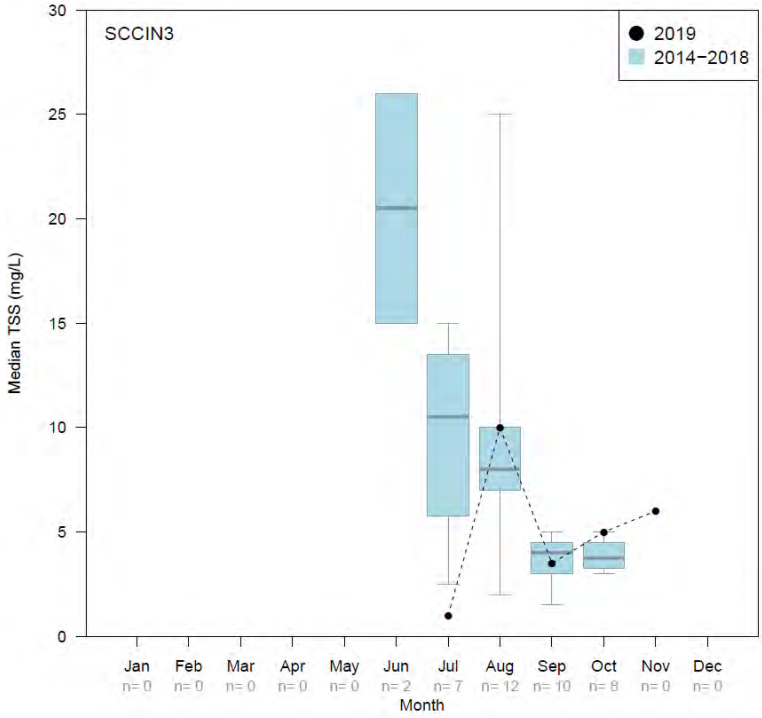

Figure 235. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIN3. Number of samples (n) is provided for the historical data.

SCCIN3 dissolved oxygen (DO)

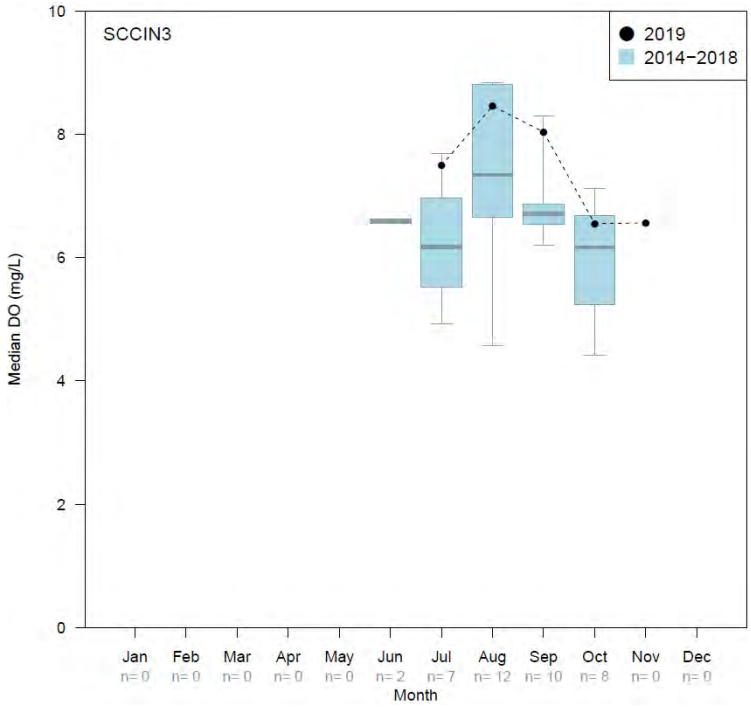

Figure 236. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIN3. Number of samples (n) is provided for the historical data.

SCCIN3 specific conductivity (Sp. cond)

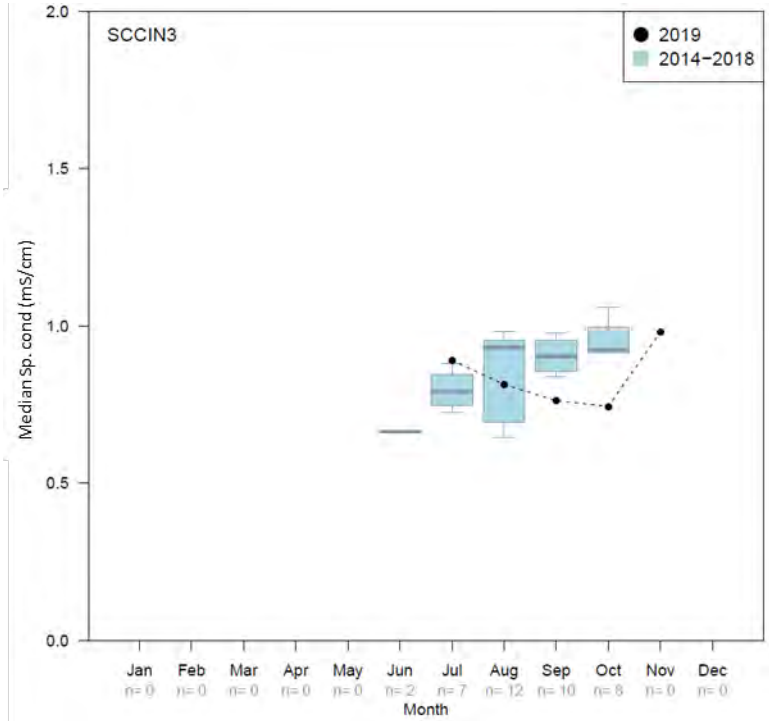

Figure 237. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIN3. Number of samples (n) is provided for the historical data.

Table 25. 2019 monthly sample numbers, minimum and maximum values at SCCIN3.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	0	3	2	2	1	1	0
min							2.100	2.300	2.200	2.200	1.900	
max							2.400	2.400	2.200	2.200	1.900	
med							**2.300**	**2.350**	**2.200**	**2.200**	**1.900**	
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	3	2	2	1	1	0
min							0.072	0.039	0.042	0.034	0.031	
max							0.078	0.063	0.046	0.034	0.031	
med							**0.075**	**0.051**	**0.044**	**0.034**	**0.031**	
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	3	2	2	1	1	0
min							0.170	0.083	0.058	0.033	0.011	
max							0.520	0.087	0.120	0.033	0.011	
med							**0.320**	**0.085**	**0.089**	**0.033**	**0.011**	
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	3	2	2	1	1	0
min							1.600	2.100	2.000	2.000	1.800	
max							2.100	2.100	2.000	2.000	1.800	
med							**1.700**	**2.100**	**2.000**	**2.000**	**1.800**	
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	3	2	2	1	1	0
min							0.044	0.075	0.089	0.110	0.075	
max							0.071	0.098	0.100	0.110	0.075	
med							**0.065**	**0.087**	**0.095**	**0.110**	**0.075**	
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	3	2	2	1	1	0
min							0.016	0.040	0.042	0.067	0.041	
max							0.037	0.057	0.051	0.067	0.041	
med							**0.022**	**0.049**	**0.047**	**0.067**	**0.041**	
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	3	2	2	1	1	0
min							33.00	51.00	49.00	50.00	43.00	
max							50.00	52.00	51.00	50.00	43.00	
med							**43.00**	**51.50**	**50.00**	**50.00**	**43.00**	
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	3	2	2	1	1	0
min							0.500	4.000	3.000	5.000	6.000	
max							1.000	16.000	4.000	5.000	6.000	
med							**1.000**	**10.000**	**3.500**	**5.000**	**6.000**	
DO (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	3	2	2	1	1	0
min							7.100	8.040	7.760	6.550	6.560	
max							7.740	8.870	8.310	6.550	6.560	
med							**7.490**	**8.455**	**8.035**	**6.550**	**6.560**	
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	3	2	2	1	1	0
min							0.790	0.766	0.756	0.744	0.980	
max							0.928	0.861	0.767	0.744	0.980	
med							**0.890**	**0.814**	**0.761**	**0.744**	**0.980**	

NB: Daily discharge data is not available for SCCIN3 as this site is not gauged. Due to the ephemeral nature of flow in St Leonard's Creek and the below average rainfall in 2019, samples were only collected between July and November 2019.

While concentrations of TN and DOrgN remained relatively constant between July and November 2019, concentrations of NH_3-N and NO_x-N were highest in July and declined to their lowest values in November (Figures 228-231, Table 25). Concentrations of TP and FRP however were least in July and increased to maixma in October before declining in November (Figure 232 and 233). Due to the highly ephemeral and unpredictable nature of flow in St Leonard's Creek, the background data for nutrients tended to be highly variable (Figures 228-223).

In those months where data were available, concentrations of TN always greatly exceed the ANZECC trigger value of 1.2 mg/L, whereas concentrations of NO_x-N only exceeded the trigger value of 0.15 mg/L in July (Figures 228 and 230). Concentrations of TP and FRP were at or above their respective trigger values of 0.065 mg/L and 0.04 mg/L, except for FRP in July (Figure 232-233).

Concentrations of DOC tended to be toward the lower limit or below the highly variable range of background data (Figure 234). TSS were least in July and greatest in August, with both months exhibiting highly variable historic ranges (Figure 235). The site was well oxygenated (>6 mg/L) and specific conductivity ranged from 0.74 and 0.98 mS/cm (Figures 236 and 237, Table 25).

24. South Belmont Main Drain (SWS13)

SWS13 total nitrogen (TN)

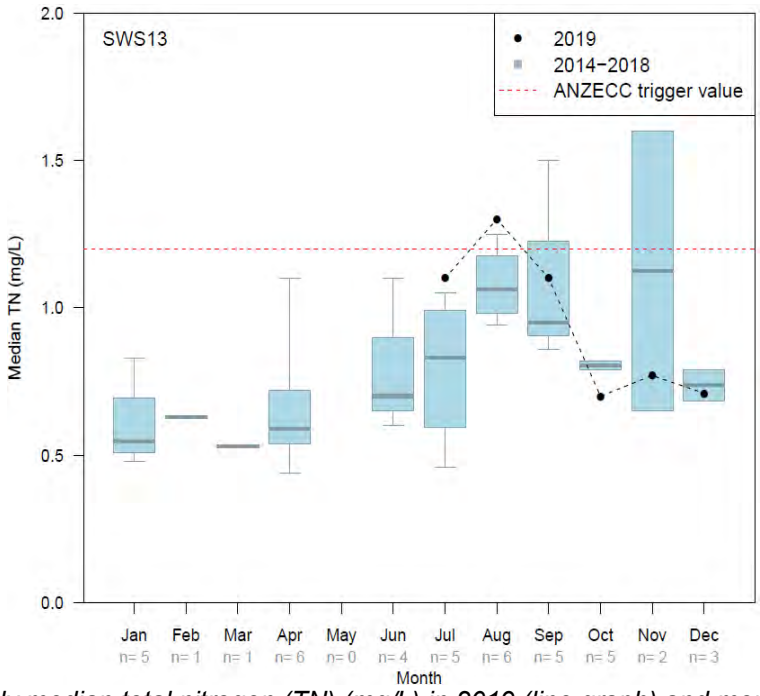

Figure 238. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS13. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

SWS13 ammoniacal nitrogen (NH_3-N)

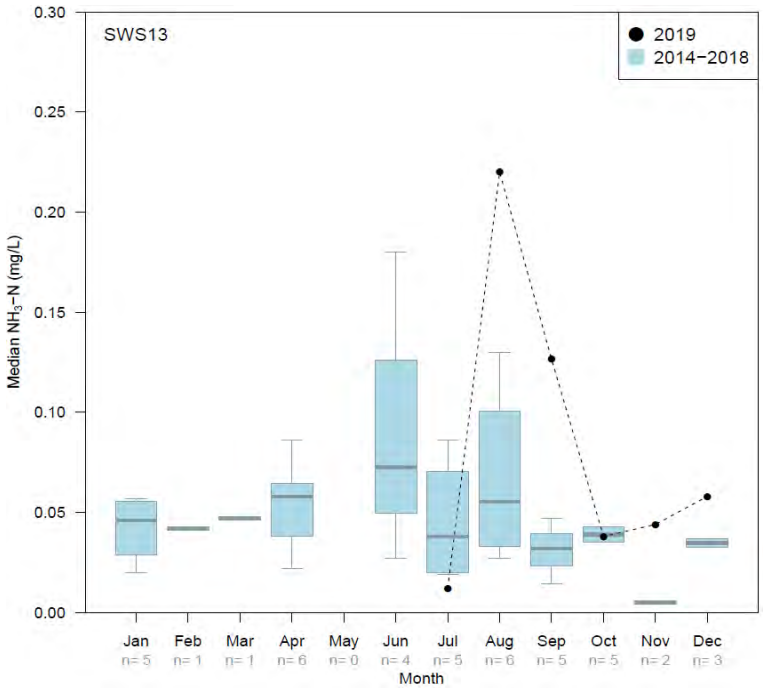

Figure 239. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS13. Number of samples (n) is provided for the historical data.

SWS13 total oxidised nitrogen (NO_x-N)

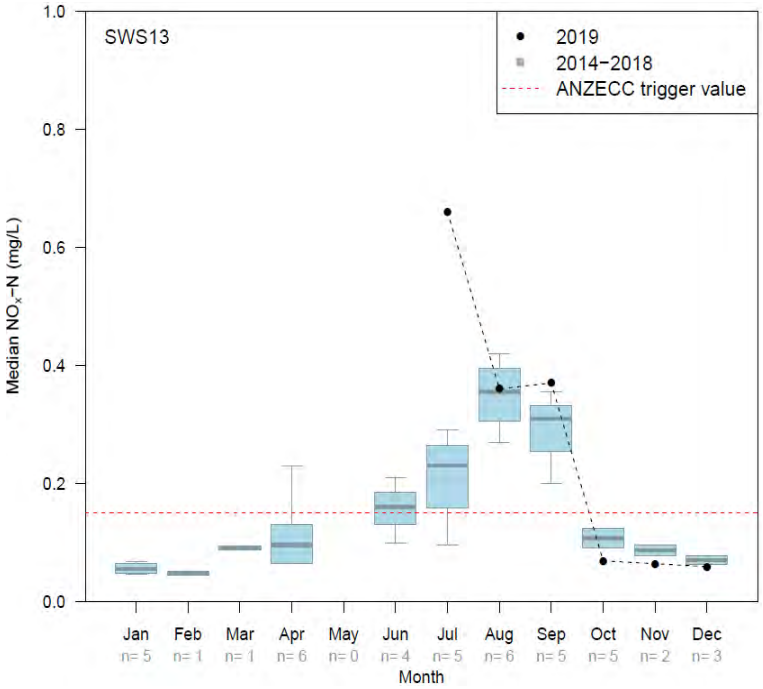

Figure 240. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS13. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

SWS13 dissolved organic nitrogen (DOrgN)

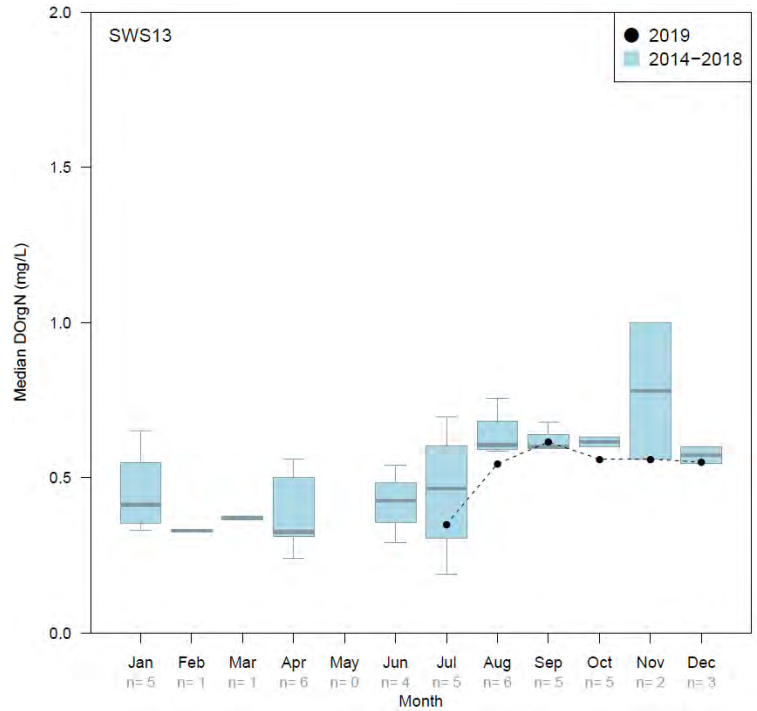

Figure 241. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS13. Number of samples (n) is provided for the historical data.

SWS13 total phosphorus (TP)

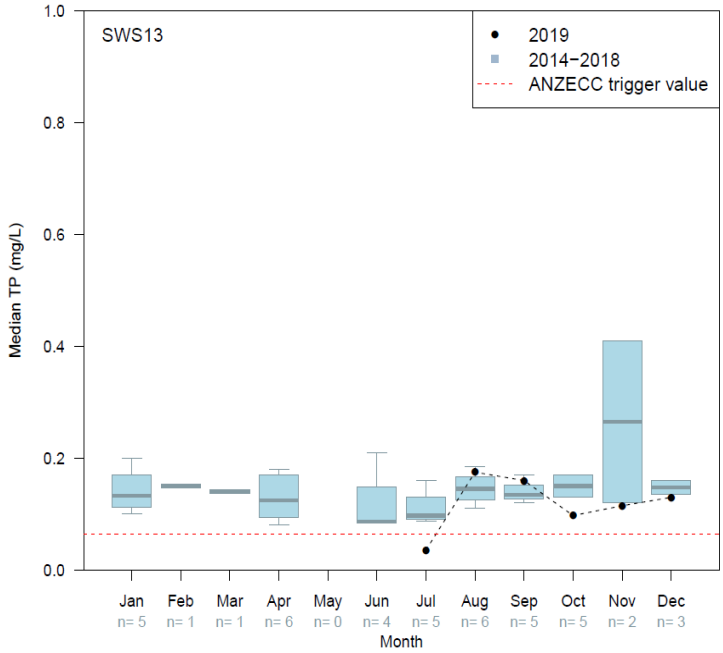

Figure 242. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS13. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

SWS13 filterable reactive phosphorus (FRP)

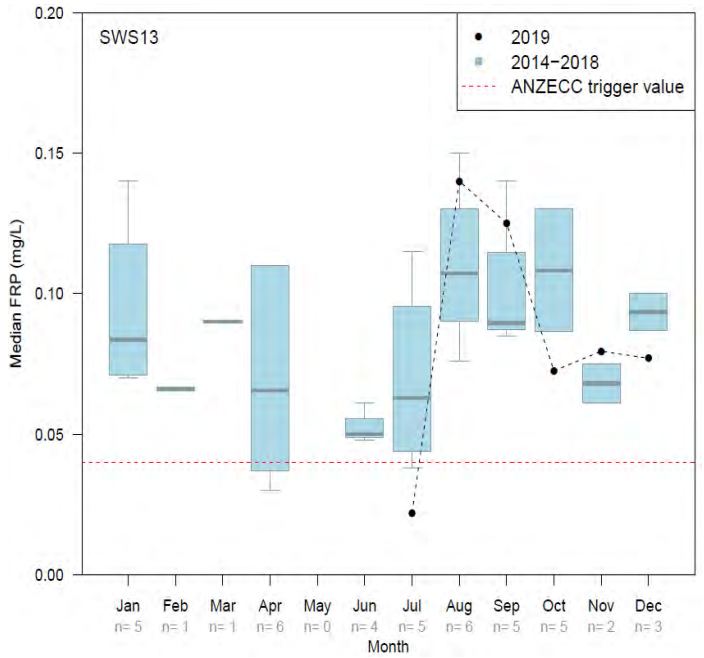

Figure 243. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS13. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

SWS13 dissolved organic carbon (DOC)

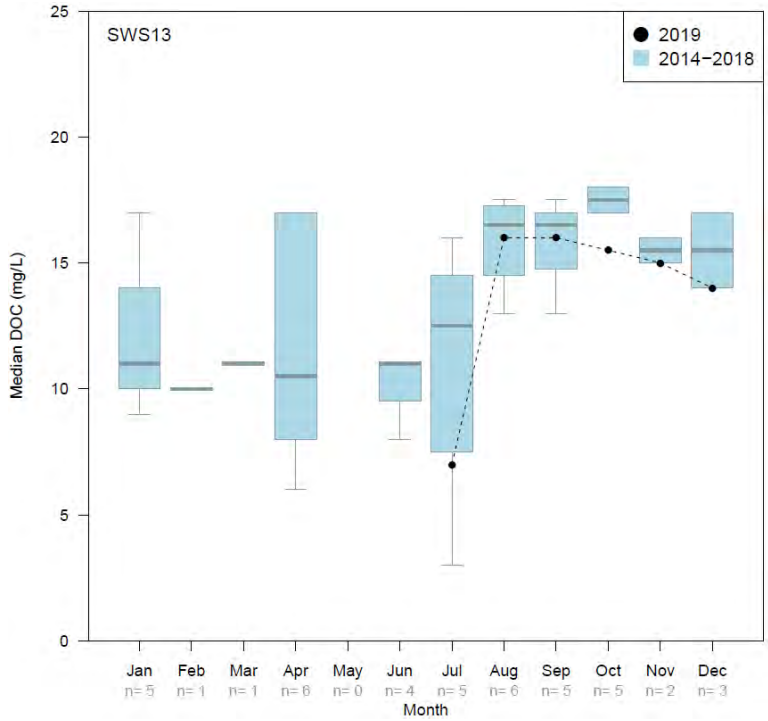

Figure 244. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS13. Number of samples (n) is provided for the historical data.

SWS13 total suspended solids (TSS)

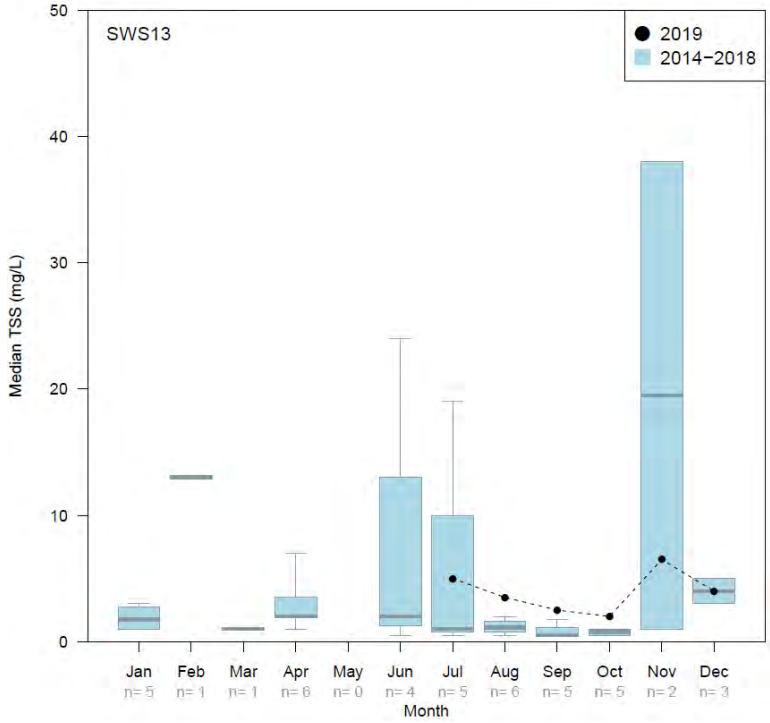

Figure 245. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS13. Number of samples (n) is provided for the historical data.

SWS13 dissolved oxygen (DO)

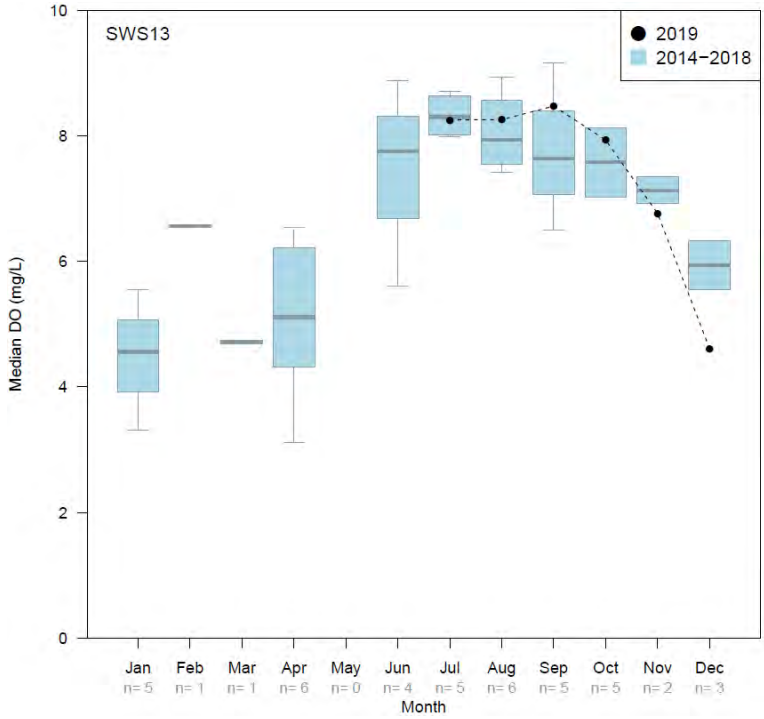

Figure 246. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS13. Number of samples (n) is provided for the historical data.

SWS13 specific conductivity (Sp. cond)

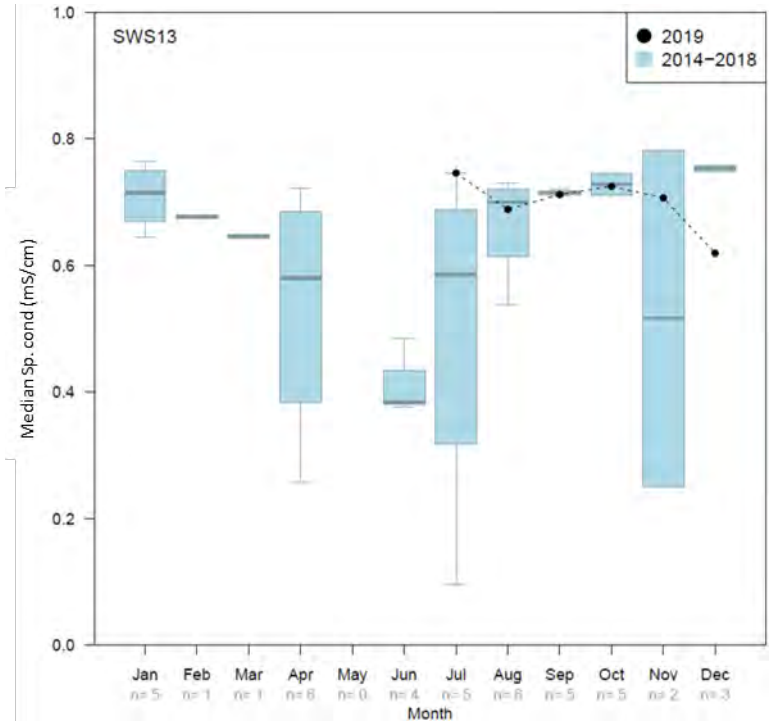

Figure 247. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS13. Number of samples (n) is provided for the historical data.

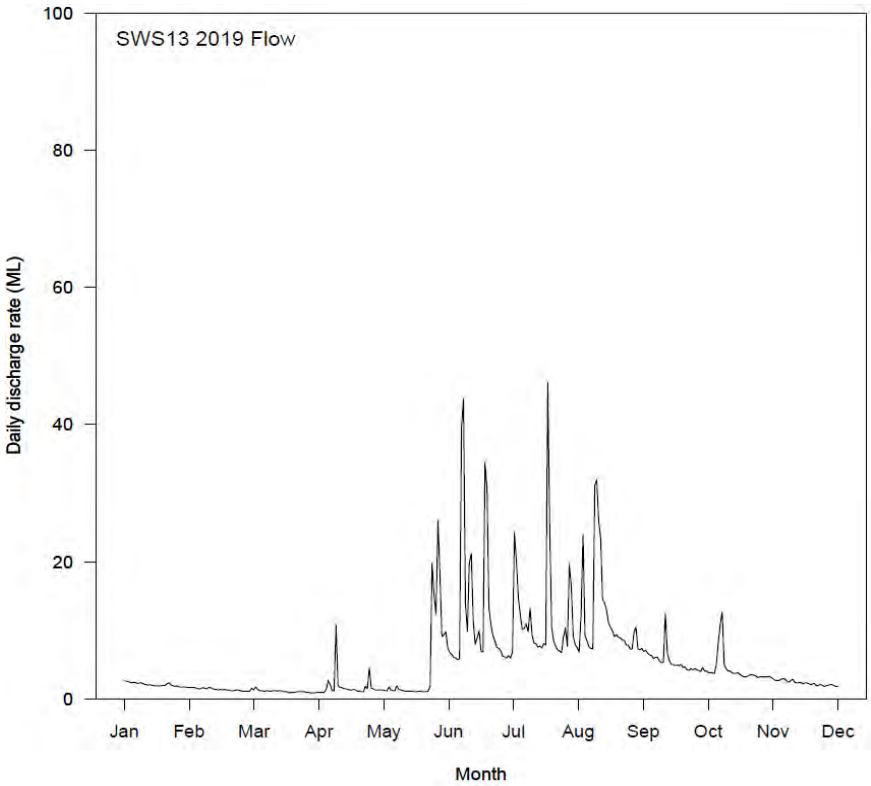

Figure 248. Daily discharge (ML) at Cleaver Terrace gauging station (6160133– approximately 0.5 km upstream of SWS13).

Table 26. 2019 monthly sample numbers, minimum and maximum values at SWS13.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	0	1	2	2	3	2	1
min							1.100	1.200	1.000	0.690	0.730	0.710
max							1.100	1.400	1.200	0.710	0.810	0.710
med							**1.100**	**1.300**	**1.100**	**0.700**	**0.770**	**0.710**
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	1	2	2	3	2	1
min							0.012	0.190	0.083	0.037	0.043	0.058
max							0.012	0.250	0.170	0.039	0.045	0.058
med							**0.012**	**0.220**	**0.127**	**0.038**	**0.044**	**0.058**
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	1	2	2	3	2	1
min							0.660	0.340	0.340	0.052	0.062	0.059
max							0.660	0.380	0.400	0.086	0.066	0.059
med							**0.660**	**0.360**	**0.370**	**0.069**	**0.064**	**0.059**
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	1	2	2	3	2	1
min							0.350	0.500	0.580	0.540	0.540	0.550
max							0.350	0.590	0.650	0.580	0.580	0.550
med							**0.350**	**0.545**	**0.615**	**0.560**	**0.560**	**0.550**
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	1	2	2	3	2	1
min							0.036	0.160	0.150	0.096	0.100	0.130
max							0.036	0.190	0.170	0.099	0.130	0.130
med							**0.036**	**0.175**	**0.160**	**0.098**	**0.115**	**0.130**
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	1	2	2	3	2	1
min							0.022	0.130	0.120	0.070	0.074	0.077
max							0.022	0.150	0.130	0.075	0.085	0.077
med							**0.022**	**0.140**	**0.125**	**0.073**	**0.080**	**0.077**
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	1	2	2	3	2	1
min							7.000	15.00	16.00	15.00	15.00	14.00
max							7.000	17.00	16.00	16.00	15.00	14.00
med							**7.000**	**16.00**	**16.00**	**15.50**	**15.00**	**14.00**
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	1	2	2	3	2	1
min							5.000	3.000	2.000	1.000	3.000	4.000
max							5.000	4.000	3.000	3.000	10.000	4.000
med							**5.000**	**3.500**	**2.500**	**2.000**	**6.500**	**4.000**
DO (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	1	2	2	3	2	1
min							8.250	7.960	8.320	7.510	6.450	4.610
max							8.250	8.550	8.620	8.000	7.070	4.610
med							**8.250**	**8.255**	**8.470**	**7.930**	**6.760**	**4.610**
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	1	2	2	3	2	1
min							0.746	0.639	0.660	0.689	0.707	0.619
max							0.746	0.738	0.764	0.743	0.707	0.619
med							**0.746**	**0.689**	**0.712**	**0.725**	**0.707**	**0.619**

In 2019, data was only available for SWS13 from July to December. Samples were not collected from mid-summer to early-winter as field notes indicated waters in the drain were stagnant.

Concentrations of TN and NO_x-N were elevated from July to September, before declining to low levels between October and December (Figures 238 and 240). Concentrations of NH_3-N and DOrgN were at their lowest in July 2019 and while DOrgN concentrations increased slightly and remained relatively constant for the remainder of the reporting period, those of NH_3-N were highly elevated in August and September, before returning to lower levels between October and December (Figures 239 and 241). Concentrations of both TP and FRP were least in July, increased to maxima in August and remained high in September, before declining to lower levels between October and December. This trend was far more pronounced for FRP than TP (Figures 242-243).

The concentration of TN remained below the ANZECC trigger value of 1.2 mg/L for lowland rivers in all months sampled except August, whereas NO_x-N greatly exceeded its trigger value of 0.15 mg/L from July to September (Figure 238 and 240). Concentrations of TP and particularly FRP exceeded their respective trigger values of 0.065 mg/L and 0.04 mg/L from July to September (Figure 242-243).

Median concentrations of DOC were equal to or greater than 14 mg/L in all months in which data were available, except July in which concentrations were greatly reduced, i.e. 7 mg/L (Figure 244, Table 26). TSS was relatively consistent and within or slightly above the range of background data, noting however that the historic data for July and November were highly variable (Figure 245). DO concentrations generally followed historic trends with concentrations typically over 6 mg/L, except in December when concentrations decreased to 4.6 mg/L (Figure 246, Table 26). Median specific conductivity remained relatively stable over the sampling period, only ranging from 0.61 and 0.74 mS/cm (Figure 247, Table 26).

25. South Perth (SCCIS1)

SCCIS1 total nitrogen (TN)

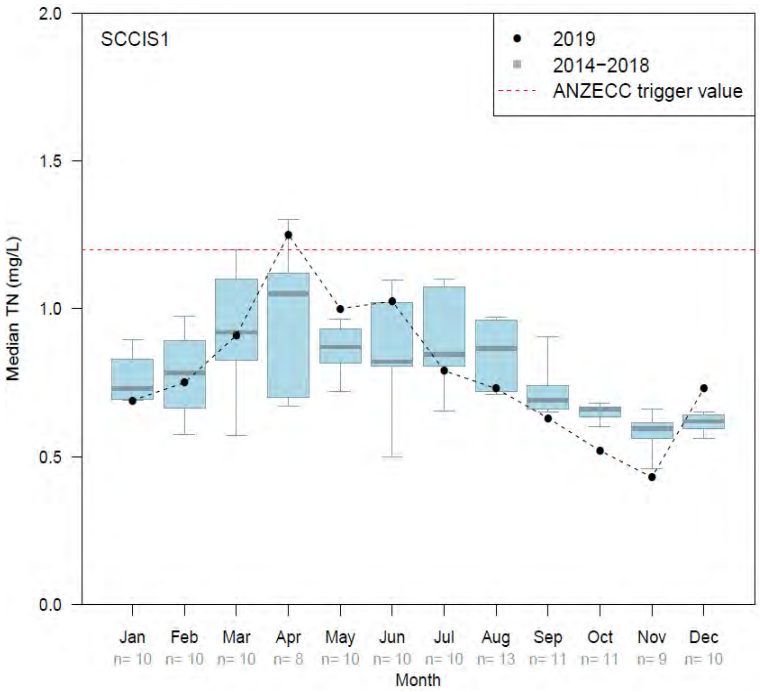

Figure 249. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS1. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

SCCIS1 ammoniacal nitrogen (NH_3-N)

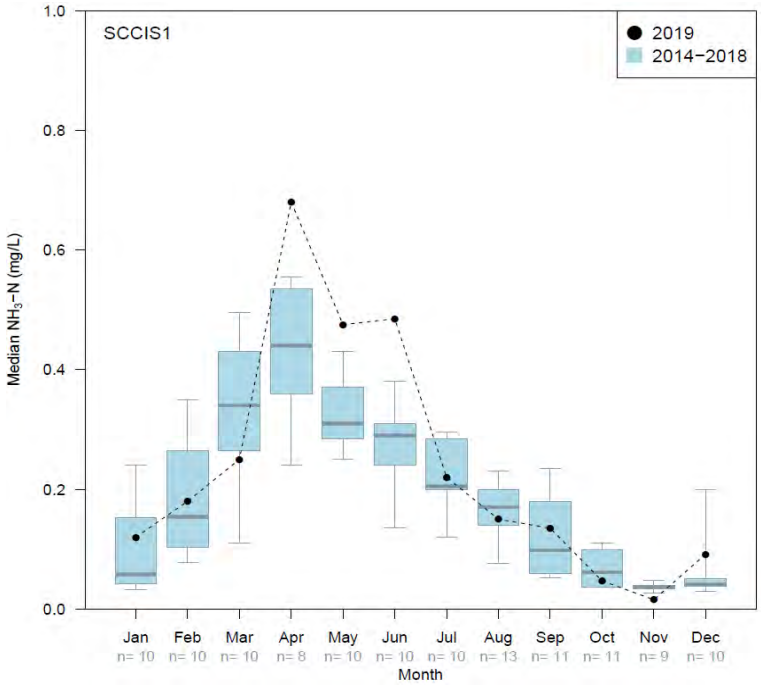

Figure 250. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS1. Number of samples (n) is provided for the historical data.

SCCIS1 total oxidised nitrogen (NO_x-N)

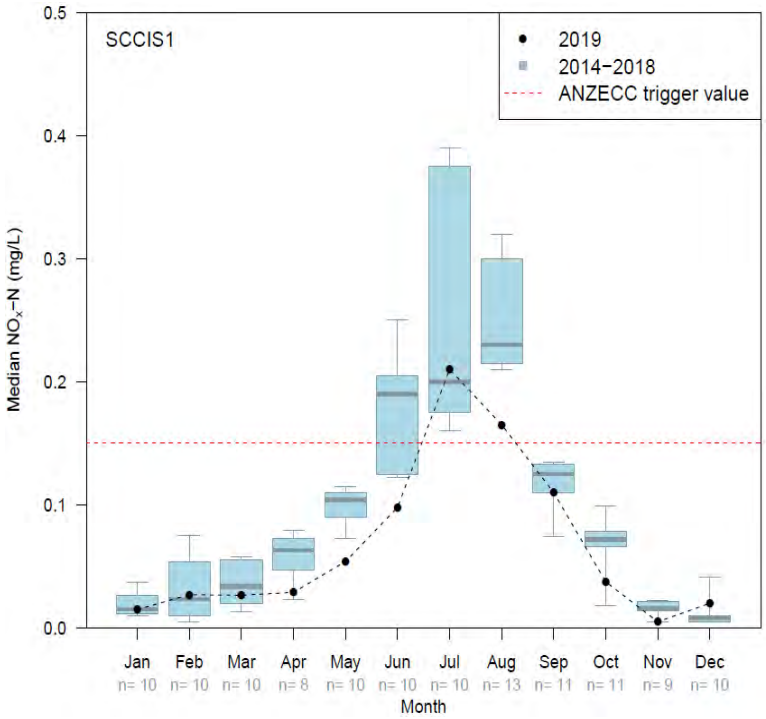

Figure 251. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS1. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

SCCIS1 dissolved organic nitrogen (DOrgN)

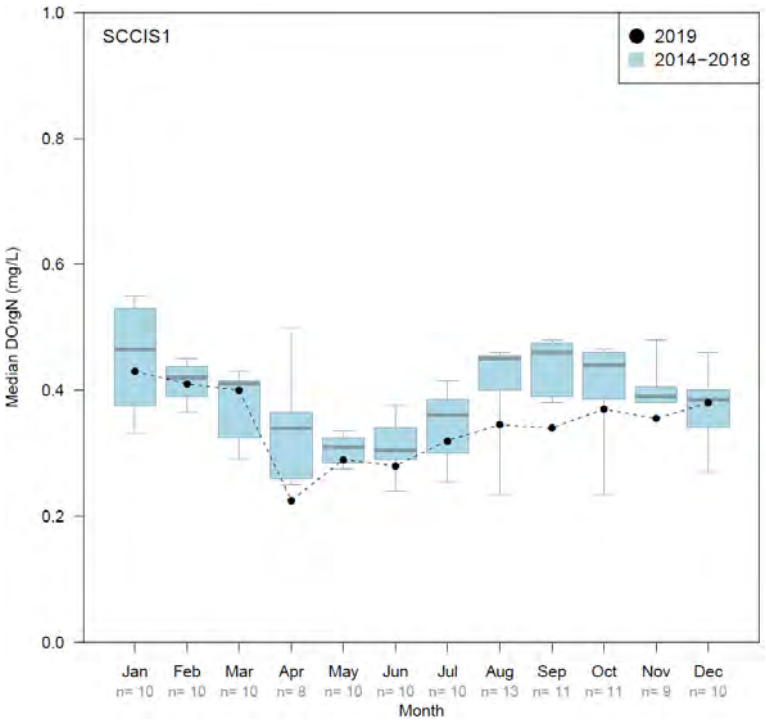

Figure 252. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS1. Number of samples (n) is provided for the historical data.

SCCIS1 total phosphorus (TP)

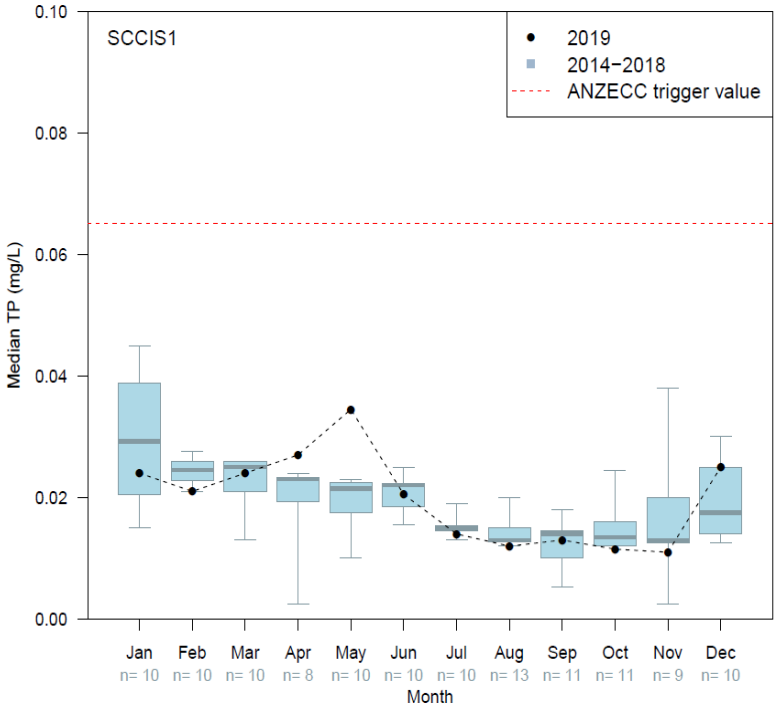

Figure 253. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS1. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

SCCIS1 filterable reactive phosphorus (FRP)

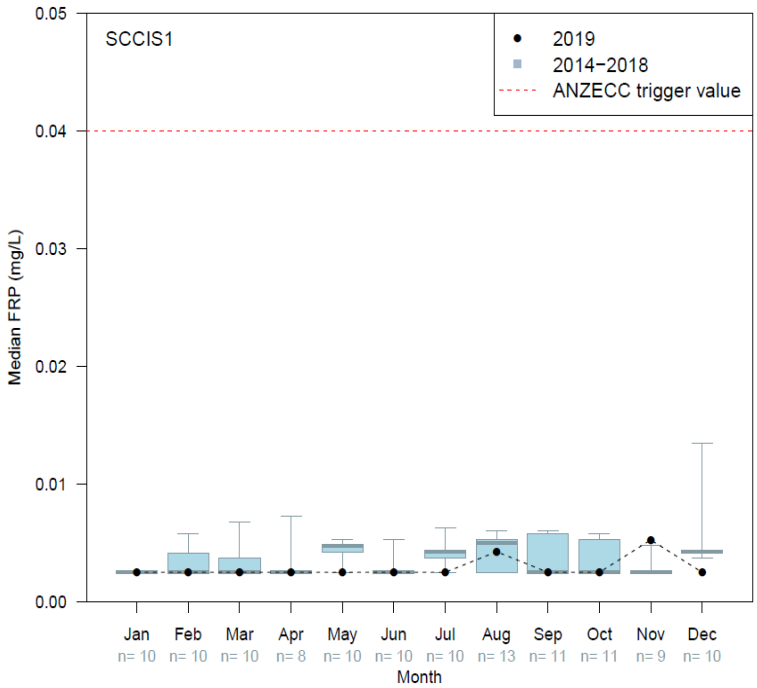

Figure 254. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS1. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

SCCIS1 dissolved organic carbon (DOC)

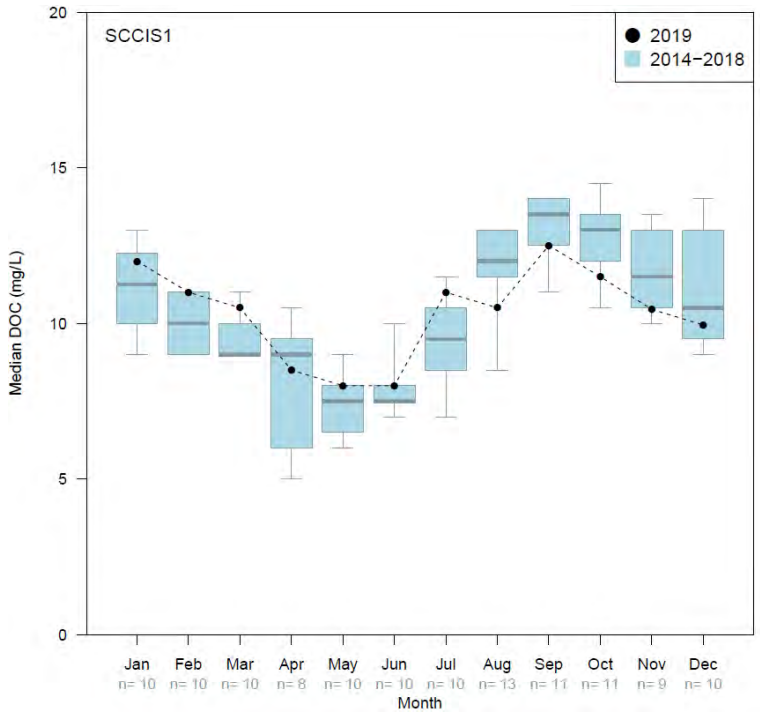

Figure 255. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS1. Number of samples (n) is provided for the historical data.

SCCIS1 total suspended solids (TSS)

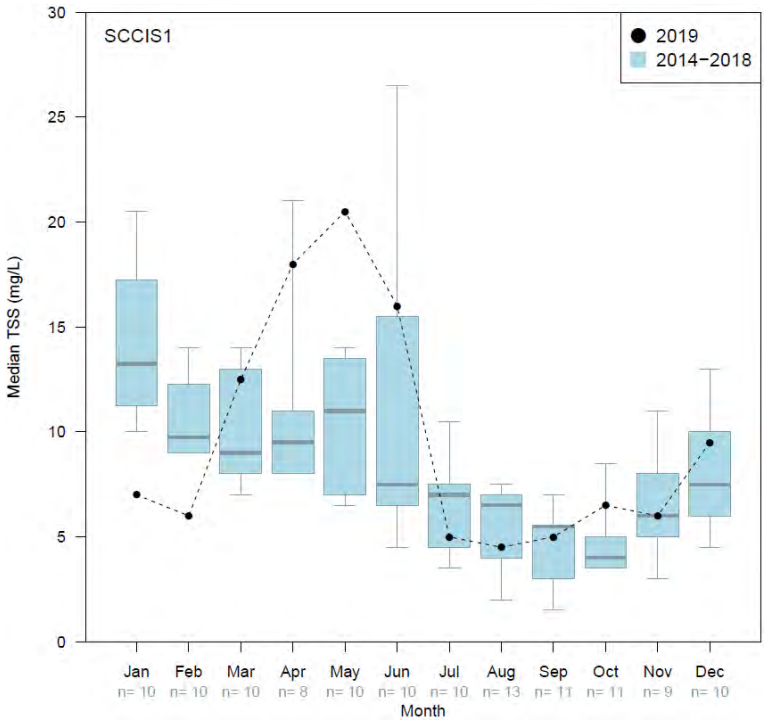

Figure 256. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS1. Number of samples (n) is provided for the historical data.

SCCIS1 dissolved oxygen (DO)

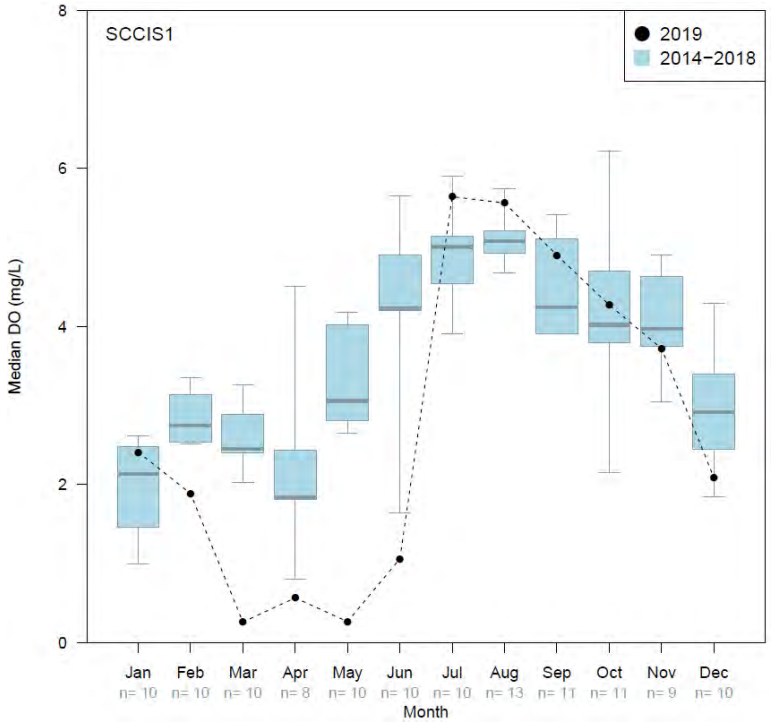

Figure 257. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS1. Number of samples (n) is provided for the historical data.

SCCIS1 specific conductivity (Sp. cond)

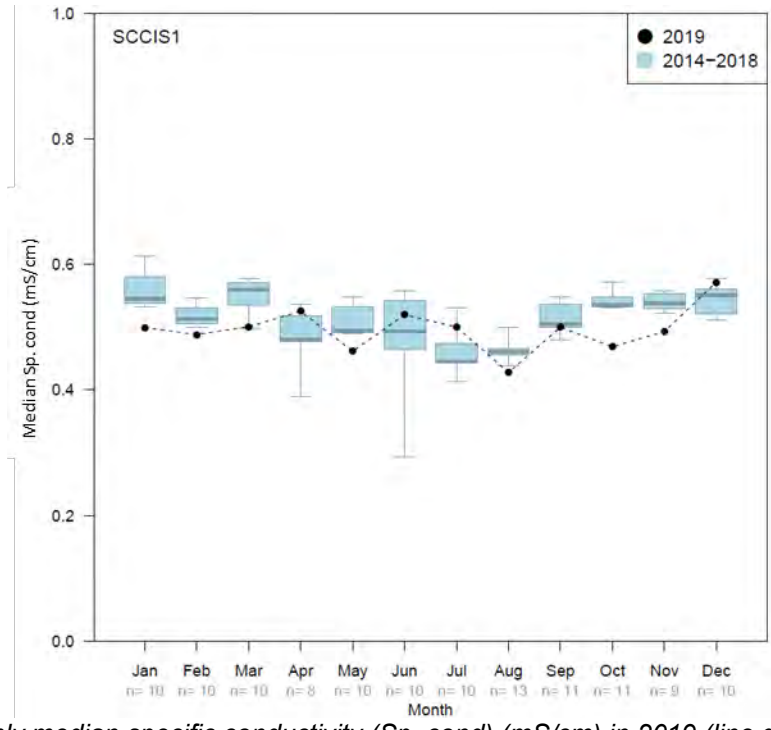

Figure 258. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SCCIS1. Number of samples (n) is provided for the historical data.

Table 27. 2019 monthly sample numbers, minimum and maximum values at SCCIS1.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.600	0.750	0.820	1.100	1.000	0.950	0.780	0.700	0.620	0.490	0.430	0.490
max	0.990	0.750	1.000	1.400	1.000	1.100	1.200	0.760	0.640	0.550	0.430	0.970
med	**0.690**	**0.750**	**0.910**	**1.250**	**1.000**	**1.025**	**0.790**	**0.730**	**0.630**	**0.520**	**0.430**	**0.730**
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.086	0.180	0.110	0.640	0.340	0.470	0.210	0.140	0.130	0.035	0.005	0.043
max	0.290	0.180	0.390	0.720	0.610	0.500	0.300	0.160	0.140	0.059	0.026	0.140
med	**0.120**	**0.180**	**0.250**	**0.680**	**0.475**	**0.485**	**0.220**	**0.150**	**0.135**	**0.047**	**0.016**	**0.092**
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.005	0.027	0.016	0.022	0.044	0.056	0.190	0.160	0.110	0.018	0.005	0.019
max	0.058	0.027	0.037	0.036	0.064	0.140	0.270	0.170	0.110	0.057	0.005	0.021
med	**0.015**	**0.027**	**0.027**	**0.029**	**0.054**	**0.098**	**0.210**	**0.165**	**0.110**	**0.038**	**0.005**	**0.020**
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.370	0.410	0.400	0.130	0.260	0.280	0.280	0.340	0.320	0.370	0.350	0.340
max	0.460	0.410	0.400	0.320	0.320	0.280	0.510	0.350	0.360	0.370	0.360	0.420
med	**0.430**	**0.410**	**0.400**	**0.225**	**0.290**	**0.280**	**0.320**	**0.345**	**0.340**	**0.370**	**0.355**	**0.380**
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.021	0.021	0.021	0.021	0.022	0.014	0.010	0.010	0.013	0.006	0.008	0.017
max	0.026	0.021	0.027	0.033	0.047	0.027	0.015	0.014	0.013	0.017	0.014	0.033
med	**0.024**	**0.021**	**0.024**	**0.027**	**0.035**	**0.021**	**0.014**	**0.012**	**0.013**	**0.012**	**0.011**	**0.025**
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
max	0.006	0.003	0.003	0.003	0.003	0.003	0.003	0.006	0.003	0.003	0.008	0.003
med	**0.003**	**0.003**	**0.003**	**0.003**	**0.003**	**0.003**	**0.003**	**0.004**	**0.003**	**0.003**	**0.005**	**0.003**
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	11.00	11.00	10.00	8.000	8.000	8.000	11.00	10.00	12.00	11.00	9.900	9.900
max	13.00	11.00	11.00	9.000	8.000	8.000	11.00	11.00	13.00	12.00	11.00	10.00
med	**12.00**	**11.00**	**10.50**	**8.500**	**8.000**	**8.000**	**11.00**	**10.50**	**12.50**	**11.50**	**10.45**	**9.950**
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	6.000	6.000	12.00	15.00	12.00	9.000	5.000	4.000	4.000	6.000	6.000	5.000
max	10.00	6.000	13.00	21.00	29.00	23.00	10.00	5.000	6.000	7.000	6.000	14.00
med	**7.000**	**6.000**	**12.50**	**18.00**	**20.50**	**16.00**	**5.000**	**4.500**	**5.000**	**6.500**	**6.000**	**9.500**
DO (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	2.080	0.870	0.180	0.410	0.220	0.920	3.540	5.220	4.900	4.100	3.630	0.720
max	3.150	2.900	0.340	0.720	0.310	1.200	5.770	5.900	4.900	4.440	3.810	3.450
med	**2.410**	**1.885**	**0.260**	**0.565**	**0.265**	**1.060**	**5.640**	**5.560**	**4.900**	**4.270**	**3.720**	**2.085**
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	2	2	2	2
min	0.498	0.484	0.492	0.520	0.442	0.501	0.497	0.374	0.491	0.442	0.470	0.496
max	0.532	0.492	0.509	0.530	0.481	0.538	0.500	0.481	0.508	0.495	0.516	0.648
med	**0.499**	**0.488**	**0.501**	**0.525**	**0.462**	**0.520**	**0.500**	**0.428**	**0.500**	**0.469**	**0.493**	**0.572**

NB: Daily discharge data is not available for SCCIS1 as this site is not gauged.

The trend in TN concentrations largely followed that of the background data, with the highest median concentration observed in April and the lowest in November (Figure 249). Concentrations of NH_3-N followed a similar, but far more pronounced trend, which likely had a strong influence on the overall trend observed for TN (Figure 250). Concentrations of NO_x-N increased in late-autumn to a maximum in winter before declining to a minimum in late-spring, which is likely attributed to seasonal rainfall and surface runoff from this catchment (Figure 251). DOrgN concentrations remained relatively constant throughout the 2019 reporting period and tended to be toward the lower limit or below the range of background data (Figure 252). Concentrations of TP and FRP were very low throughout 2019 and were consistent with background data, except for TP in April and May in which concentrations were slightly elevated (Figure 253 and 254). Concentrations of FRP were particularly low, typically being below the limit of reporting (Figure 254).

The concentrations of TN and NO_x-N remained below the respective ANZECC trigger value for lowland rivers of 1.2 mg/L and 0.15 mg/L in 2019, except in April for TN and July and August for NO_x-N when concentrations marginally exceeded the triggers (Figure 249). Concentrations of TP and FRP remained well below their respective trigger values of 0.065 mg/L and 0.04 mg/L.

Concentrations of DOC in 2019 tended to follow the trend in background data and fell within the range of data for 2014-2018 (Figure 255). Concentrations of TSS increased markedly to a maximum in May 2019, which corresponded with very low dissolved oxygen concentrations between May and June and elevated concentrations of TN and particularly NH_3-N in April (Figures 249, 256 and 257). In 2019, the median specific conductivity generally followed the trend of background data and only ranged from 0.462 to 0.572 mS/cm (Figure 258, Table 27).

26. South Perth (WIFRD)

WIFRD total nitrogen (TN)

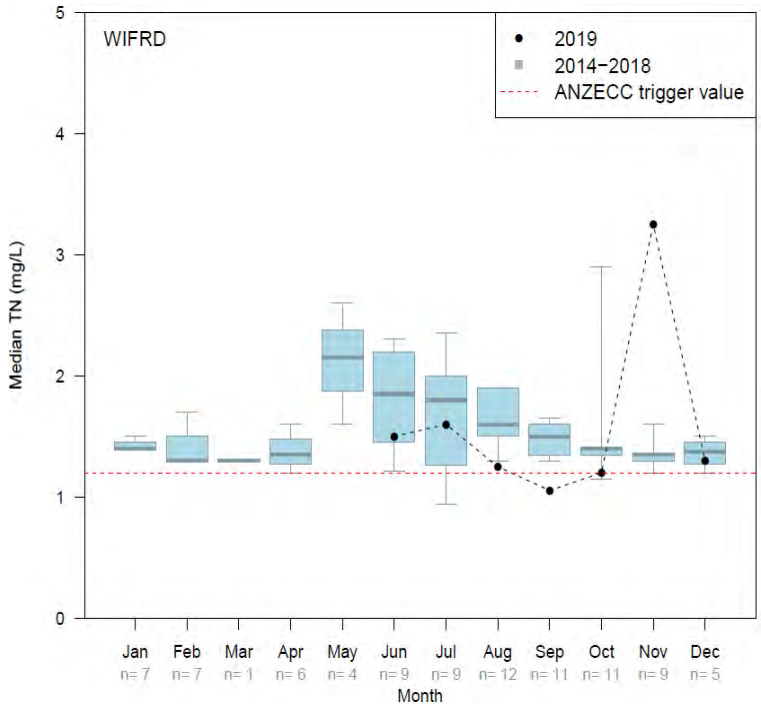

Figure 259. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site WIFRD. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

WIFRD ammoniacal nitrogen (NH_3-N)

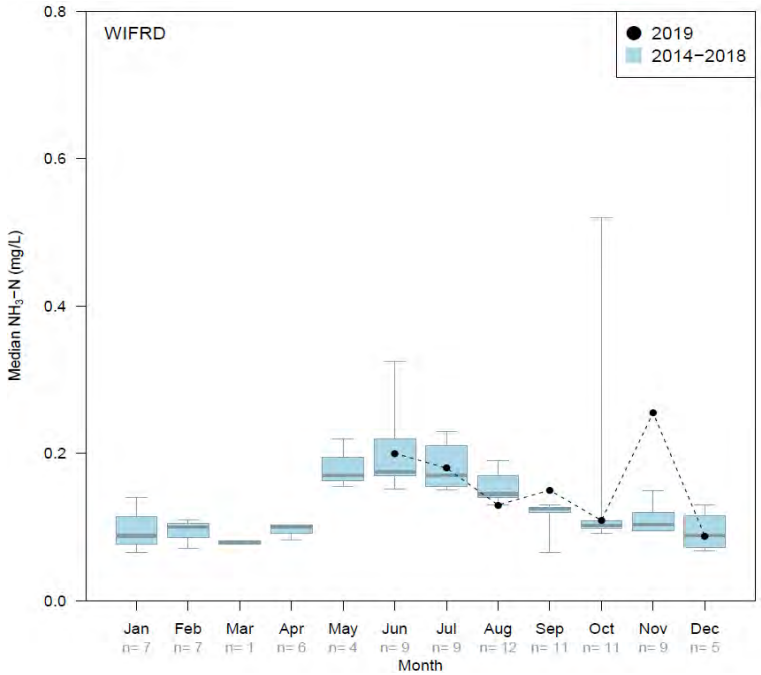

Figure 260. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site WIFRD. Number of samples (n) is provided for the historical data.

WIFRD total oxidised nitrogen (NO_x-N)

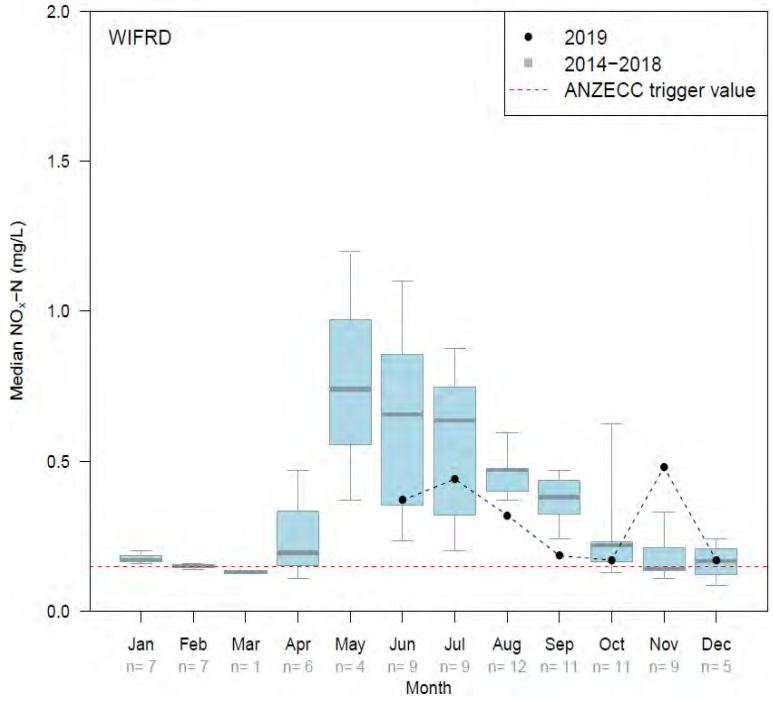

Figure 261. *Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site WIFRD. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).*

WIFRD dissolved organic nitrogen (DOrgN)

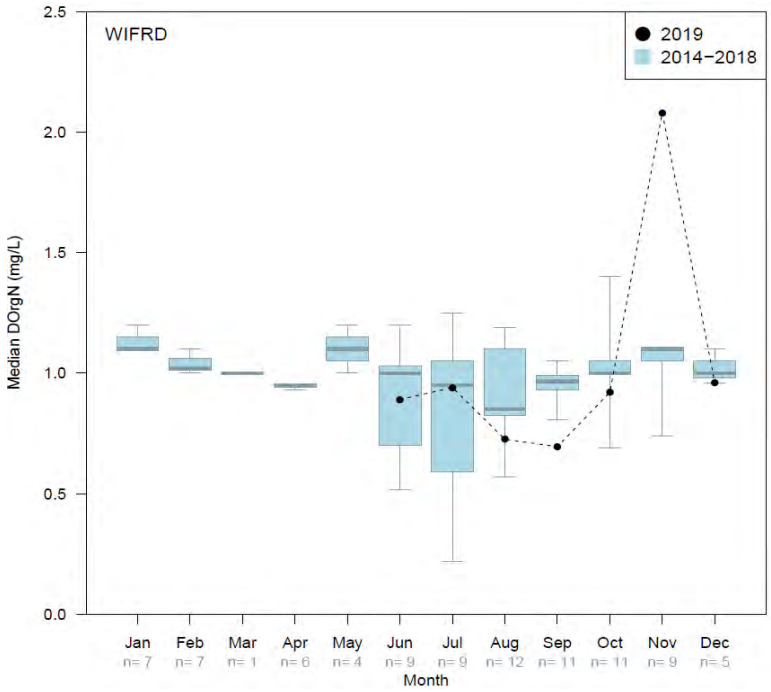

Figure 262. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site WIFRD. Number of samples (n) is provided for the historical data.

WIFRD total phosphorus (TP)

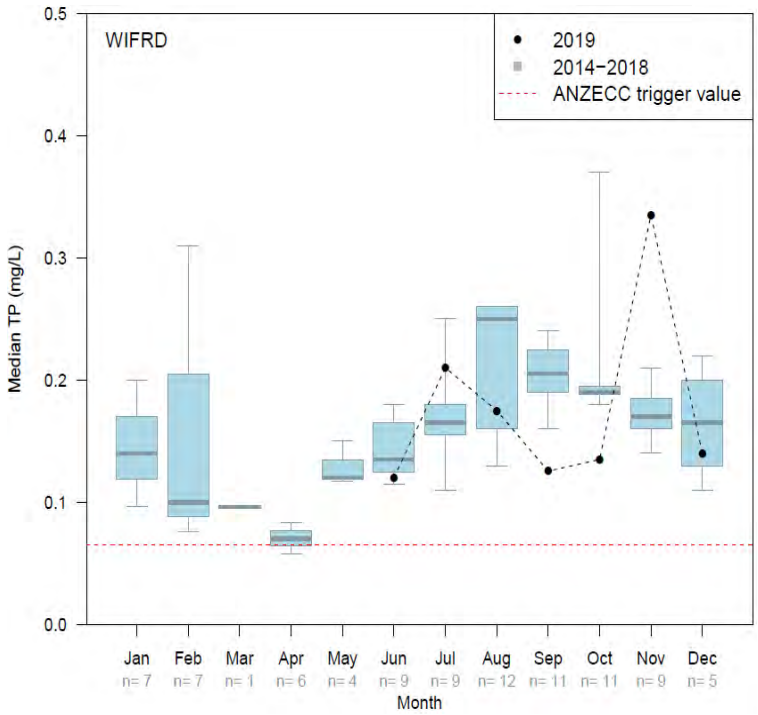

Figure 263. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site WIFRD. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

WIFRD filterable reactive phosphors (FRP)

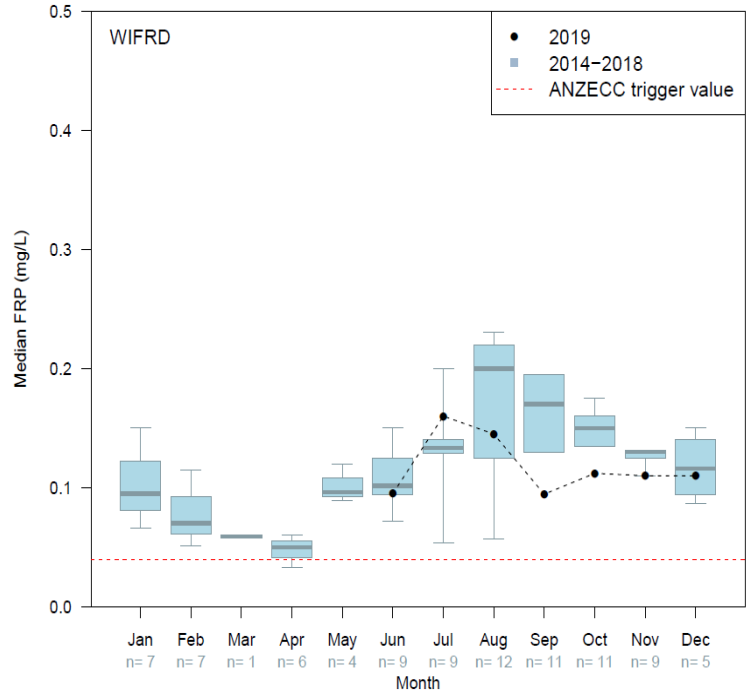

Figure 264. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site WIFRD. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

WIFRD dissolved organic carbon (DOC)

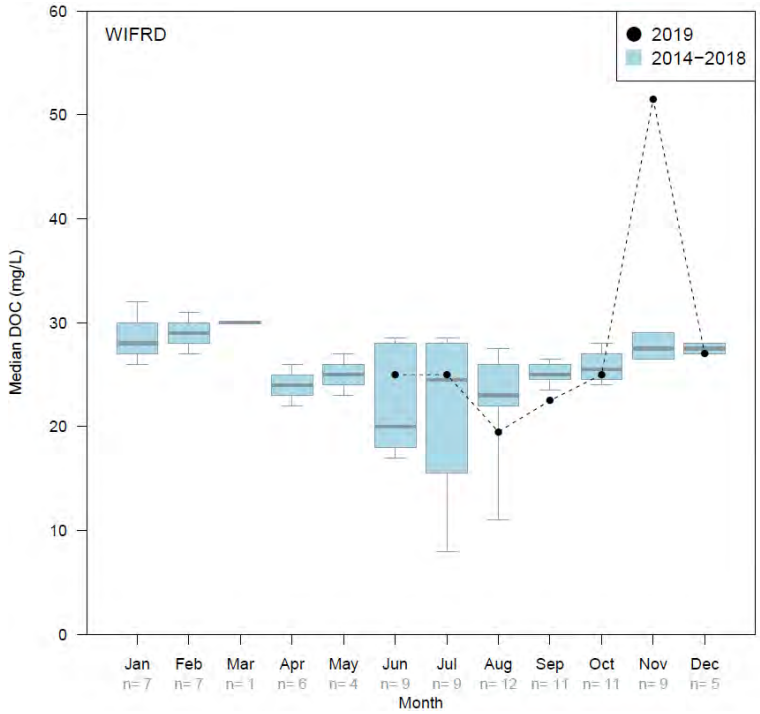

Figure 265. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site WIFRD. Number of samples (n) is provided for the historical data.

WIFRD total suspended solids (TSS)

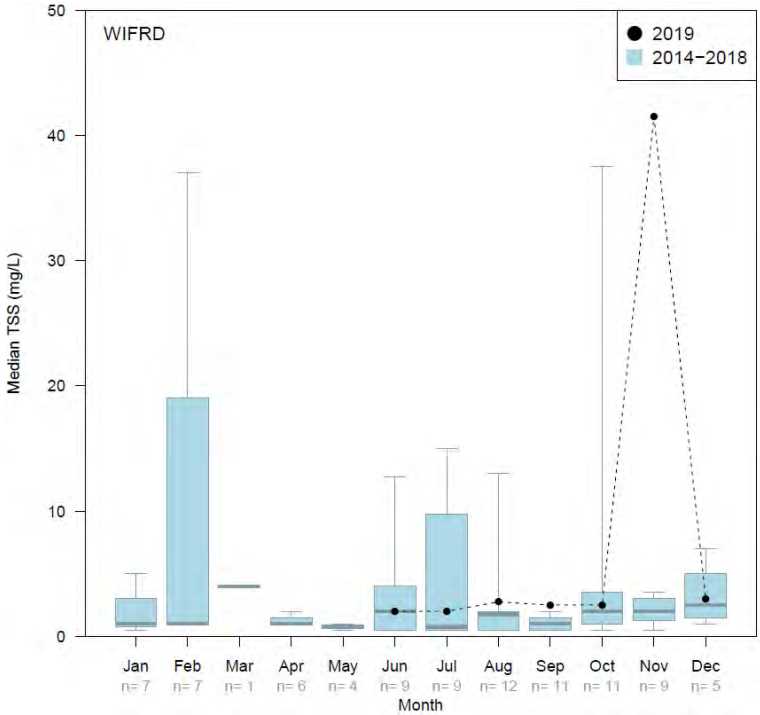

Figure 266. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site WIFRD. Number of samples (n) is provided for the historical data.

WIFRD dissolved oxygen (DO)

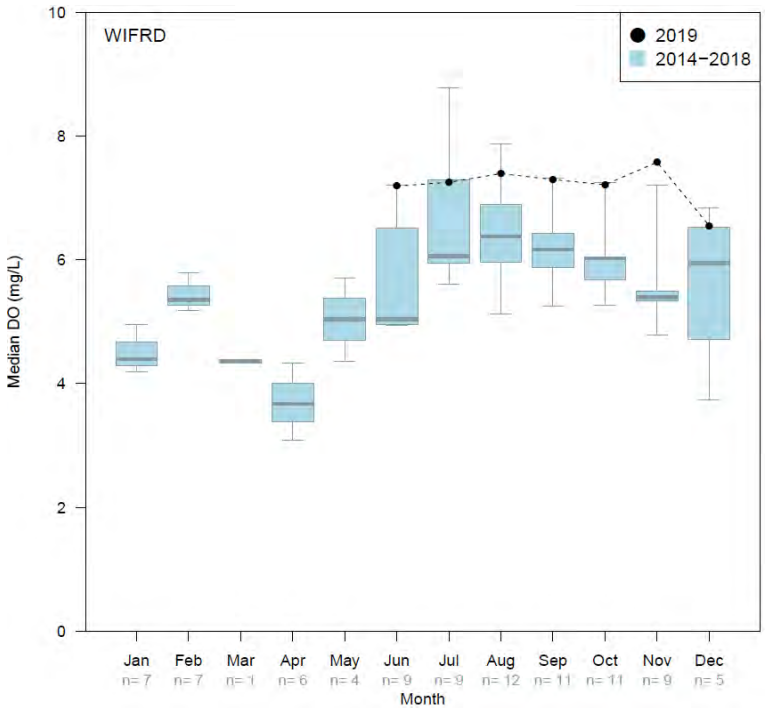

Figure 267. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site WIFRD. Number of samples (n) is provided for the historical data.

WIFRD specific conductivity (Sp. cond)

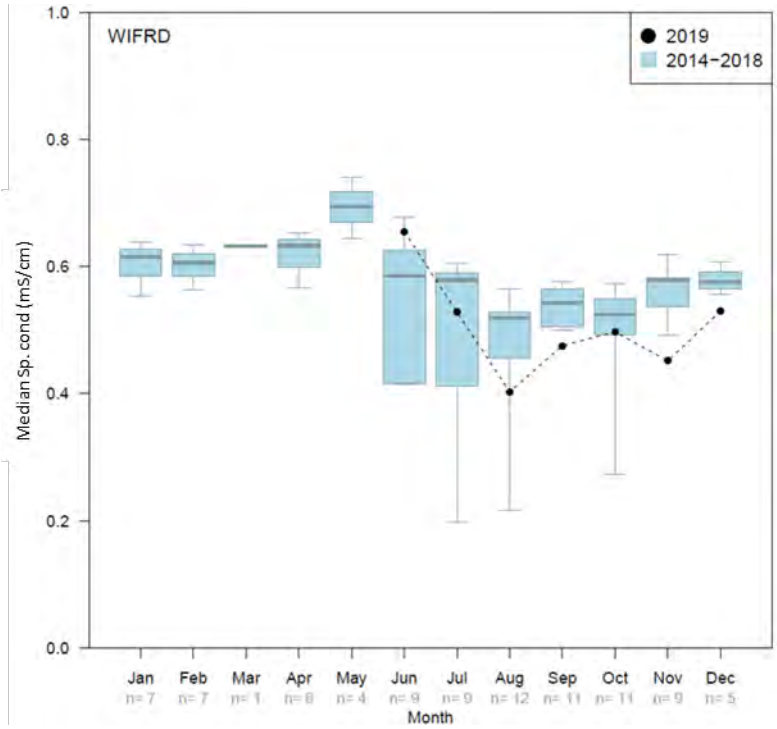

Figure 268. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site WIFRD. Number of samples (n) is provided for the historical data.

Table 28. 2019 monthly sample numbers, minimum and maximum values at WIFRD.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	1	3	2	2	2	2	1
min						1.500	1.400	1.100	0.910	1.200	1.200	1.300
max						1.500	2.300	1.400	1.200	1.200	5.300	1.300
med						**1.500**	**1.600**	**1.250**	**1.055**	**1.200**	**3.250**	**1.300**
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	3	2	2	2	2	1
min						0.200	0.140	0.120	0.110	0.098	0.120	0.088
max						0.200	0.270	0.140	0.190	0.120	0.390	0.088
med						**0.200**	**0.180**	**0.130**	**0.150**	**0.109**	**0.255**	**0.088**
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	3	2	2	2	2	1
min						0.370	0.330	0.280	0.150	0.140	0.150	0.170
max						0.370	0.560	0.360	0.220	0.200	0.810	0.170
med						**0.370**	**0.440**	**0.320**	**0.185**	**0.170**	**0.480**	**0.170**
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	3	2	2	2	2	1
min						0.890	0.940	0.590	0.520	0.900	0.860	0.960
max						0.890	1.400	0.860	0.870	0.940	3.300	0.960
med						**0.890**	**0.940**	**0.725**	**0.695**	**0.920**	**2.080**	**0.960**
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	3	2	2	2	2	1
min						0.120	0.180	0.150	0.071	0.120	0.120	0.140
max						0.120	0.220	0.200	0.180	0.150	0.550	0.140
med						**0.120**	**0.210**	**0.175**	**0.126**	**0.135**	**0.335**	**0.140**
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	3	2	2	2	2	1
min						0.095	0.140	0.120	0.049	0.094	0.110	0.110
max						0.095	0.170	0.170	0.140	0.130	0.110	0.110
med						**0.095**	**0.160**	**0.145**	**0.095**	**0.112**	**0.110**	**0.110**
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	3	2	2	2	2	1
min						25.00	25.00	15.00	20.00	24.00	25.00	27.00
max						25.00	26.00	24.00	25.00	26.00	78.00	27.00
med						**25.00**	**25.00**	**19.50**	**22.50**	**25.00**	**51.50**	**27.00**
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	3	2	2	2	2	1
min						2.000	0.500	0.500	2.000	2.000	3.000	3.000
max						2.000	5.000	5.000	3.000	3.000	80.00	3.000
med						**2.000**	**2.000**	**2.750**	**2.500**	**2.500**	**41.50**	**3.000**
DO (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	3	2	2	2	2	1
min						7.190	6.780	7.390	7.280	7.110	7.180	6.550
max						7.190	7.290	7.390	7.310	7.310	7.970	6.550
med						**7.190**	**7.250**	**7.390**	**7.295**	**7.210**	**7.575**	**6.550**
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	3	2	2	2	2	1
min						0.655	0.510	0.308	0.475	0.457	0.383	0.530
max						0.655	0.575	0.498	0.476	0.537	0.520	0.530
med						**0.655**	**0.528**	**0.403**	**0.475**	**0.497**	**0.452**	**0.530**

NB: Daily discharge data is not available for WIFRD as this site is not gauged. Due to the ephemeral nature of flow in WIFRD and the below average rainfall in 2019, samples were only collected between June and December 2019.

In those months sampled in 2019, nutrient concentrations generally followed the trend of background data, except for November when concentrations were exceptionally high for all analytes other than FRP (Figure 259-264). These elevated concentrations in nutrients corresponded with very high concentrations in DOC and TSS (Figure 265 and 266) and likely represent a rapid response of this catchment to a rainfall event (18 mm) at the beginning of the month following a relatively dry October (Figure 341).

In 2019, TN, NO_x-N, TP and FRP exceeded their ANZECC trigger values for lowland rivers (1.2 mg/L, 0.15 mg/L, 0.065 mg/L, and 0.04 mg/L, respectively) where data was available, except for TN in September and October when concentrations were slightly lower than the trigger (Figure 259, 261, 263 and 264).

In 2019, median DO ranged from 6.5 to 7.5 mg/L and median specific conductivity between 0.41 and 0.65 mS/cm and were largely consistent with the range of background data for June to December (Figures 267 and 268, Table 28).

27. Southern River (SWS7)

SWS7 total nitrogen (TN)

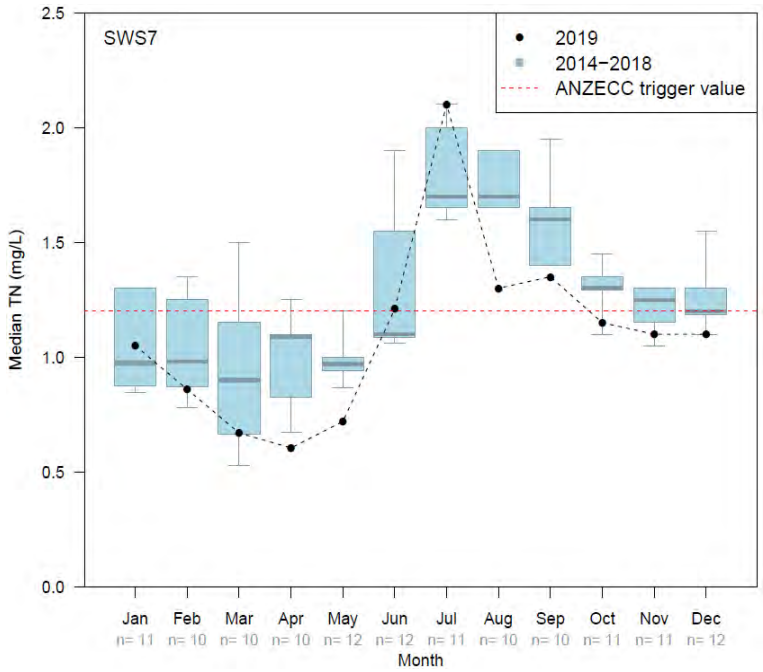

Figure 269. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS7.Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

SWS7 ammoniacal nitrogen (NH_3-N)

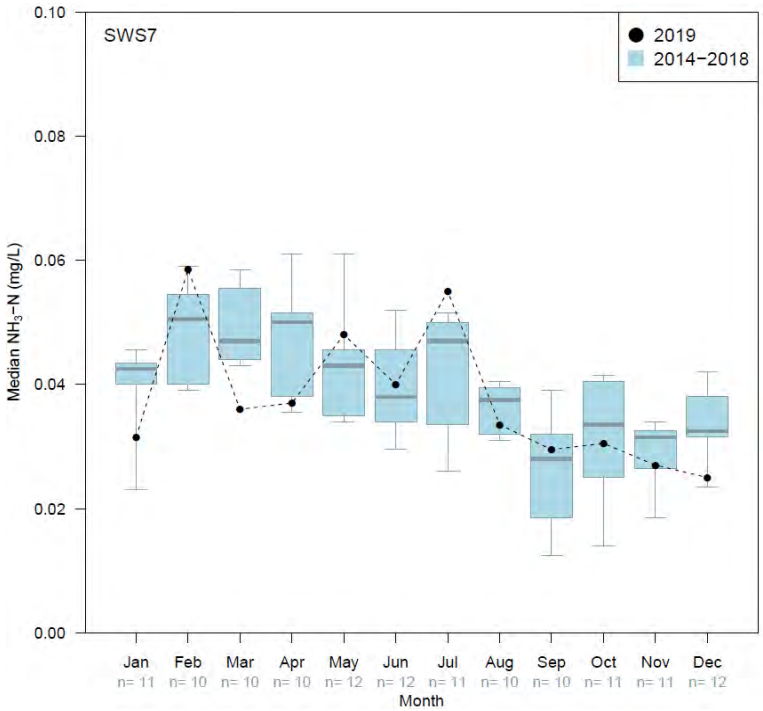

Figure 270. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS7. Number of samples (n) is provided for the historical data.

SWS7 total oxidised nitrogen (NO_x-N)

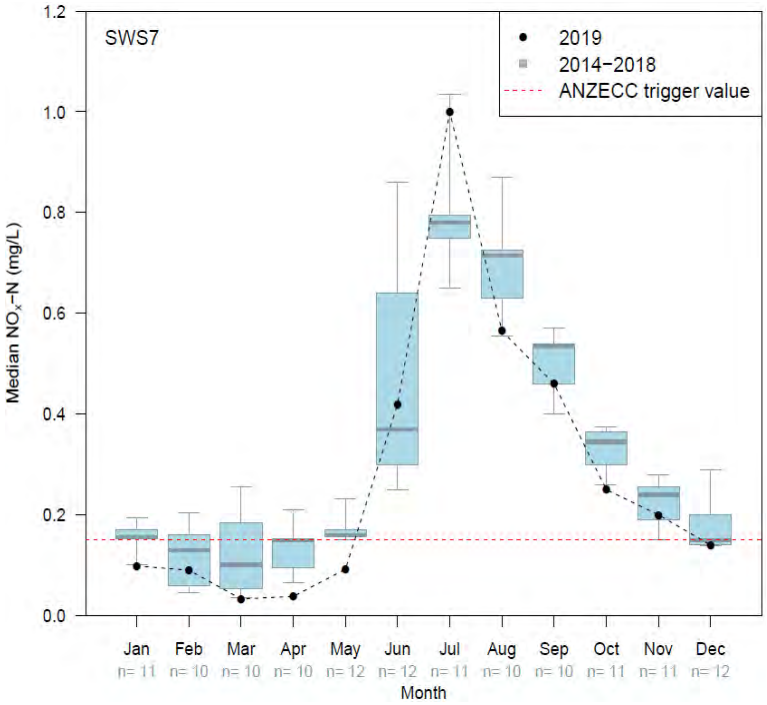

Figure 271. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS7. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

SWS7 dissolved organic nitrogen (DOrgN)

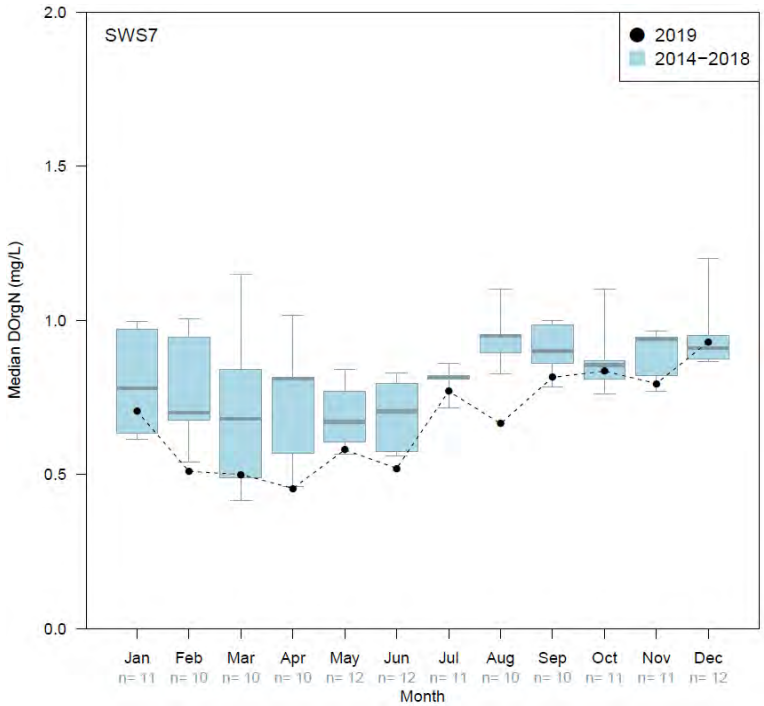

Figure 272. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS7. Number of samples (n) is provided for the historical data.

SWS7 total phosphorus (TP)

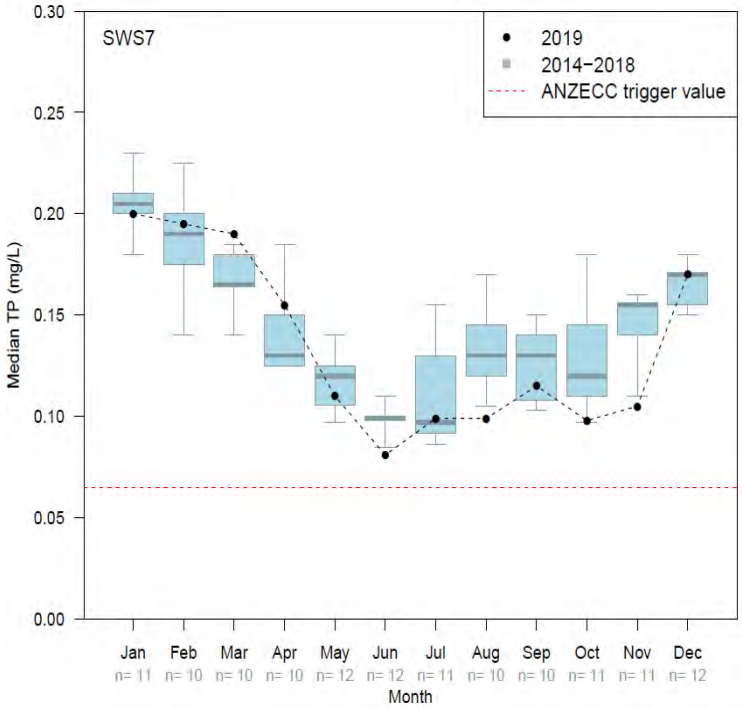

Figure 273. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS7. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

SWS7 filterable reactive phosphorus (FRP)

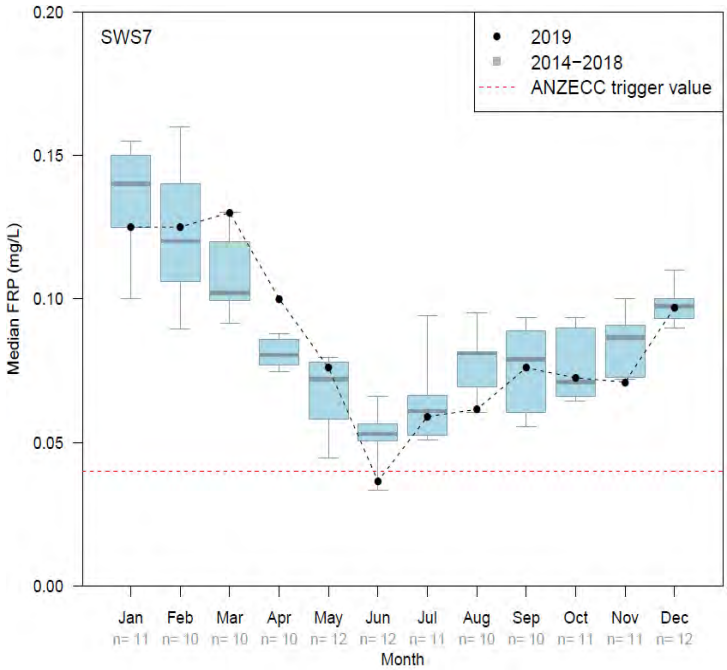

Figure 274. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS7. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

SWS7 dissolved organic carbon (DOC)

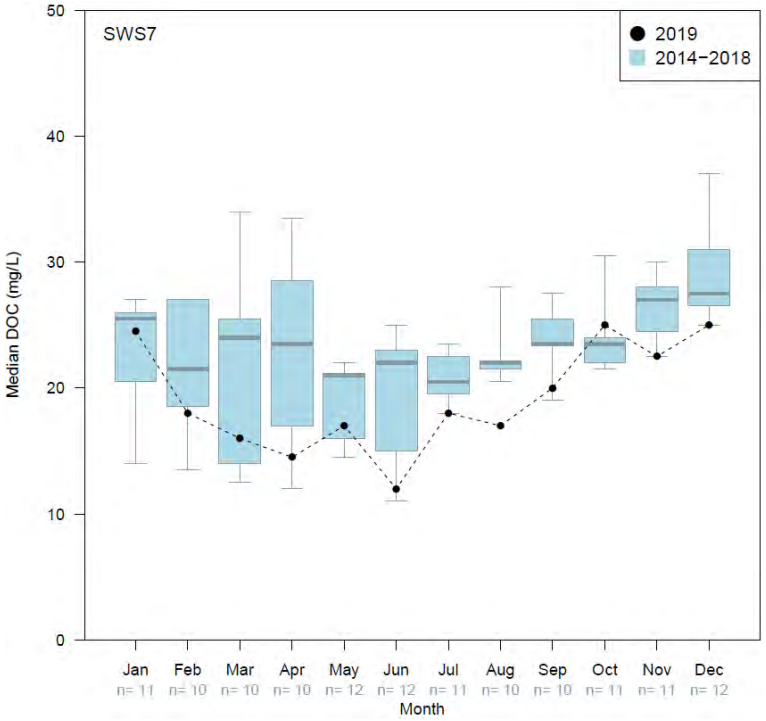

Figure 275. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS7. Number of samples (n) is provided for the historical data.

SWS7 total suspended solids (TSS)

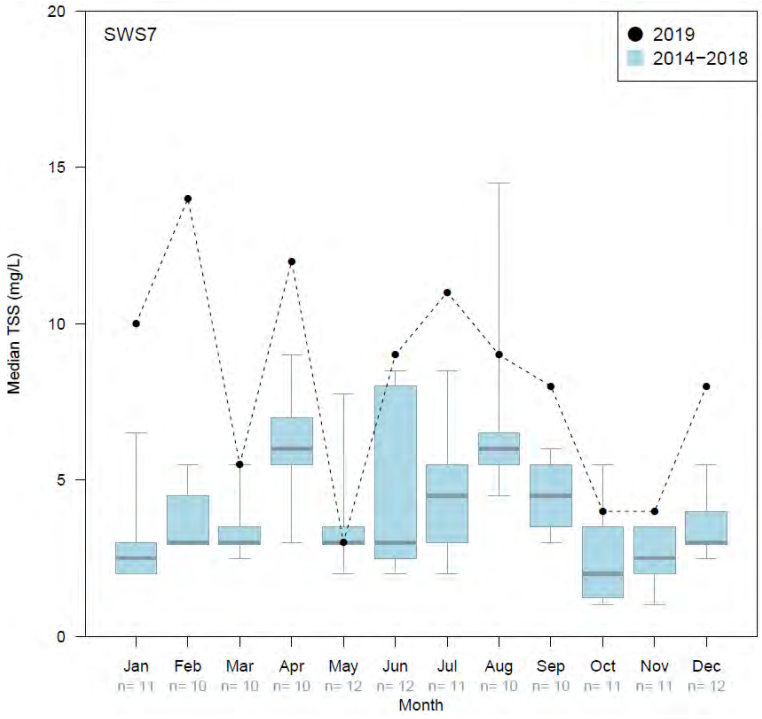

Figure 276. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS7. Number of samples (n) is provided for the historical data.

SWS7 dissolved oxygen (DO)

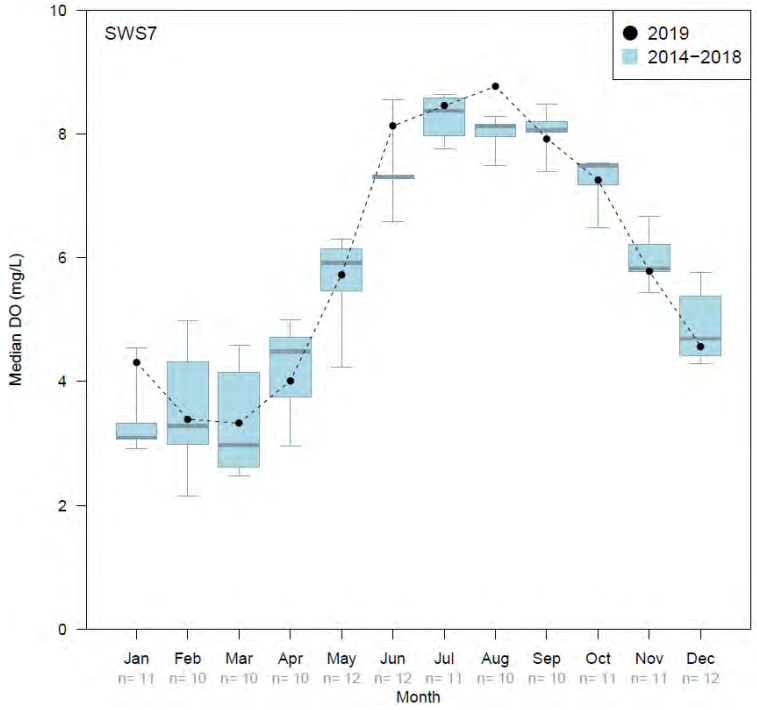

Figure 277. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS7. Number of samples (n) is provided for the historical data.

SWS7 specific conductivity (Sp. cond)

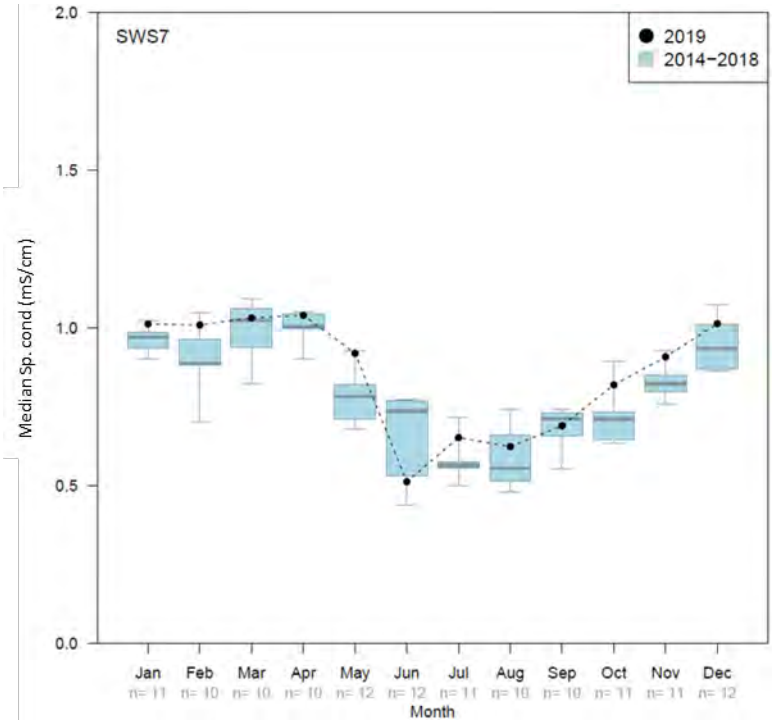

Figure 278. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS7. Number of samples (n) is provided for the historical data.

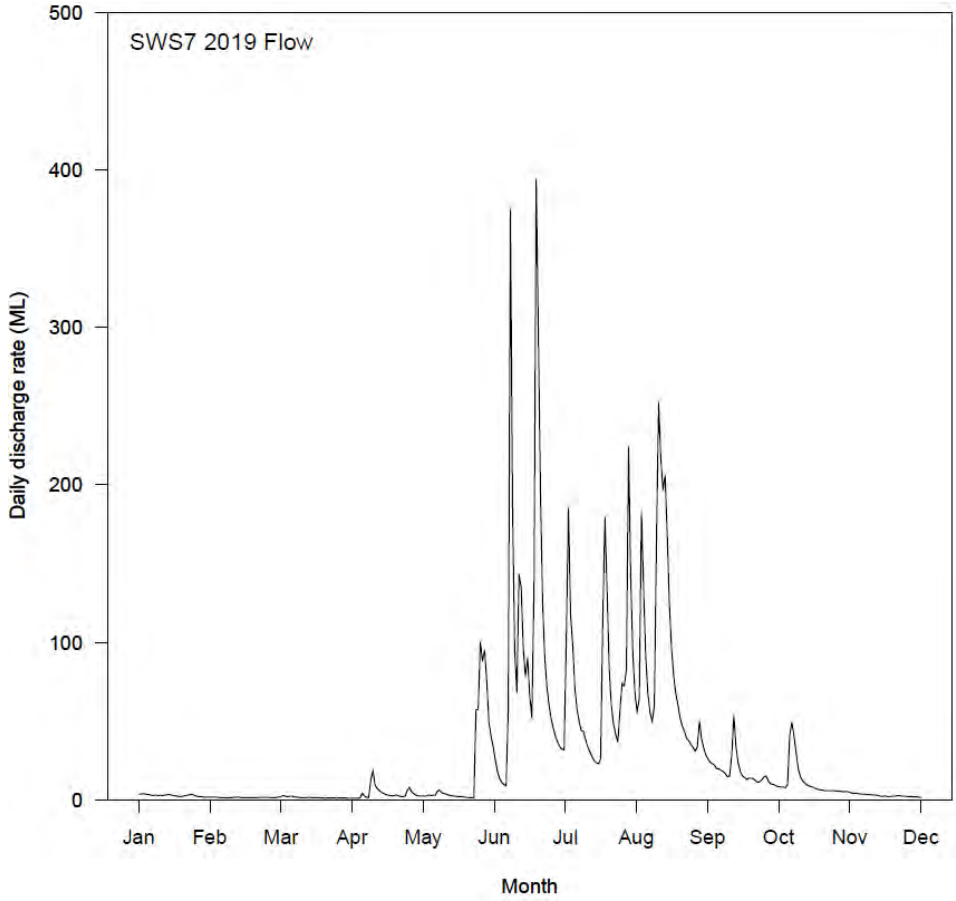

Figure 279. Daily discharge (ML) at the Southern River gauging station (6160133 – at site of SWS7).

The 2019 hydrograph data shows a seasonal response to rainfall events with peak flow occurring between June and July (Figure 279).

Table 29. 2019 monthly sample numbers, minimum and maximum values at SWS7.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	2	2	2	2	3	2	1	2	2	3	2	1
min	1.000	0.850	0.640	0.590	0.630	0.820	2.100	1.100	1.300	1.100	1.100	1.100
max	1.100	0.870	0.700	0.620	0.750	1.600	2.100	1.500	1.400	1.200	1.100	1.100
med	**1.050**	**0.860**	**0.670**	**0.605**	**0.720**	**1.210**	**2.100**	**1.300**	**1.350**	**1.150**	**1.100**	**1.100**
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.030	0.049	0.034	0.032	0.034	0.038	0.055	0.033	0.029	0.027	0.026	0.025
max	0.033	0.068	0.038	0.042	0.051	0.042	0.055	0.034	0.030	0.034	0.028	0.025
med	**0.032**	**0.059**	**0.036**	**0.037**	**0.048**	**0.040**	**0.055**	**0.034**	**0.030**	**0.031**	**0.027**	**0.025**
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.087	0.081	0.032	0.038	0.091	0.250	1.000	0.440	0.430	0.240	0.180	0.140
max	0.110	0.099	0.034	0.038	0.096	0.590	1.000	0.690	0.490	0.260	0.220	0.140
med	**0.099**	**0.090**	**0.033**	**0.038**	**0.092**	**0.420**	**1.000**	**0.565**	**0.460**	**0.250**	**0.200**	**0.140**
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.640	0.500	0.460	0.450	0.490	0.430	0.770	0.660	0.810	0.800	0.790	0.930
max	0.770	0.520	0.540	0.460	0.580	0.610	0.770	0.670	0.820	0.870	0.800	0.930
med	**0.705**	**0.510**	**0.500**	**0.455**	**0.580**	**0.520**	**0.770**	**0.665**	**0.815**	**0.835**	**0.795**	**0.930**
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.190	0.180	0.190	0.130	0.110	0.075	0.099	0.088	0.110	0.096	0.100	0.170
max	0.210	0.210	0.190	0.180	0.120	0.087	0.099	0.110	0.120	0.100	0.110	0.170
med	**0.200**	**0.195**	**0.190**	**0.155**	**0.110**	**0.081**	**0.099**	**0.099**	**0.115**	**0.098**	**0.105**	**0.170**
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	0.110	0.120	0.130	0.100	0.074	0.034	0.059	0.051	0.067	0.067	0.070	0.097
max	0.140	0.130	0.130	0.100	0.093	0.039	0.059	0.072	0.085	0.078	0.072	0.097
med	**0.125**	**0.125**	**0.130**	**0.100**	**0.076**	**0.037**	**0.059**	**0.062**	**0.076**	**0.073**	**0.071**	**0.097**
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	24.00	17.00	16.00	14.00	16.00	10.00	18.00	14.00	17.00	23.00	22.00	25.00
max	25.00	19.00	16.00	15.00	19.00	14.00	18.00	20.00	23.00	27.00	23.00	25.00
med	**24.50**	**18.00**	**16.00**	**14.50**	**17.00**	**12.00**	**18.00**	**17.00**	**20.00**	**25.00**	**22.50**	**25.00**
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	9.000	10.00	5.000	8.000	2.000	8.000	11.00	6.000	6.000	4.000	4.000	8.000
max	11.00	18.00	6.000	16.00	4.000	10.00	11.00	12.00	10.00	4.000	4.000	8.000
med	**10.00**	**14.00**	**5.500**	**12.00**	**3.000**	**9.000**	**11.00**	**9.000**	**8.000**	**4.000**	**4.000**	**8.000**
DO (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	4.270	3.280	2.840	3.780	5.490	7.930	8.450	8.640	7.640	6.330	5.550	4.570
max	4.350	3.500	3.810	4.240	5.750	8.320	8.450	8.890	8.210	7.520	6.010	4.570
med	**4.310**	**3.390**	**3.325**	**4.010**	**5.730**	**8.125**	**8.450**	**8.765**	**7.925**	**7.250**	**5.780**	**4.570**
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	2	2	3	2	1	2	2	3	2	1
min	1.003	0.997	1.010	1.032	0.850	0.449	0.652	0.603	0.575	0.740	0.864	1.013
max	1.021	1.021	1.053	1.047	1.033	0.575	0.652	0.644	0.804	0.937	0.952	1.013
med	**1.012**	**1.009**	**1.032**	**1.040**	**0.919**	**0.512**	**0.652**	**0.623**	**0.690**	**0.819**	**0.908**	**1.013**

Concentrations of TN and NO_x-N typically followed the seasonal trend in background data exhibiting a marked increase in winter which corresponded with peak flows in Southern River (Figure 269, 271 and 278). Concentrations of NH_3-N and DOrgN in 2019 were also generally within the range of background data but did not exhibit any obvious trends (Figure 270 and 272). Concentrations of TP and FRP tended to follow the trends of background data, with highest concentrations observed in summer and lowest concentrations observed in winter (Figures 273 and 274).

Concentrations of TN and NO_x-N exceeded their respective trigger value of 1.2 mg/L and 0.15 mg/L between June and September for TN and from June to November for NO_x-N (Figures 269 and 271). These exceedances are likely a response to the heavy rainfall events recorded at the beginning of winter (Figure341). Concentrations of TP and FRP exceeded their respective trigger values of 0.065 mg/L and 0.04 mg/L throughout the 2019 reporting period, except for June for FRP (Figures 273 and 274).

In 2019, concentrations of DOC were typically toward the lower limit or below the range of background data (Figure 275). Concentrations of TSS were highly variable in 2019 but tended to be toward the upper extent or greater than the range of background data (Figure 276). DO levels were low in February and March but were otherwise greater than 4 mg/L for the rest of the year (Figure 277, Table 29). Specific conductivity was within the range of the historic dataset (Figure 278).

28. Neerigen Brook (AW05)

AW05 total nitrogen (TN)

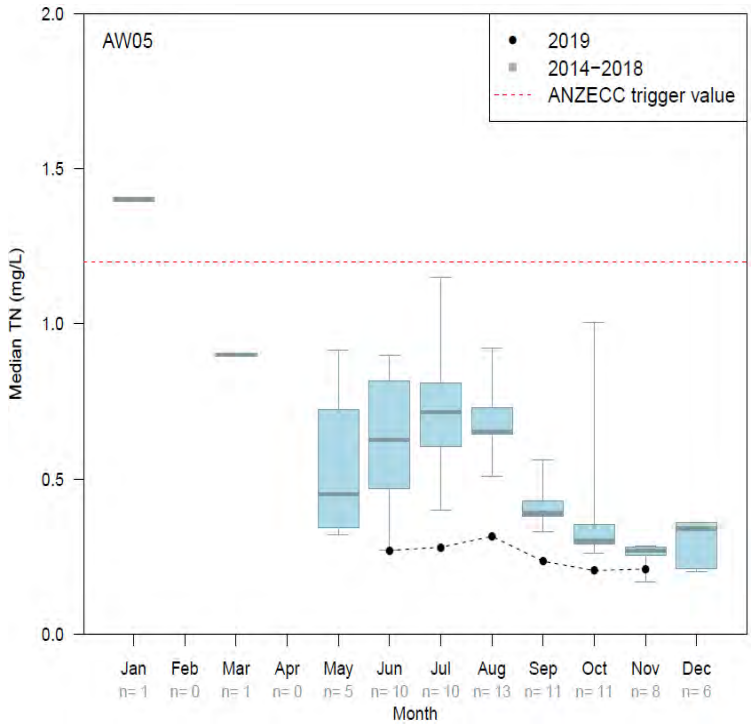

Figure 280. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site AW05. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

AW05 ammoniacal nitrogen (NH_3-N)

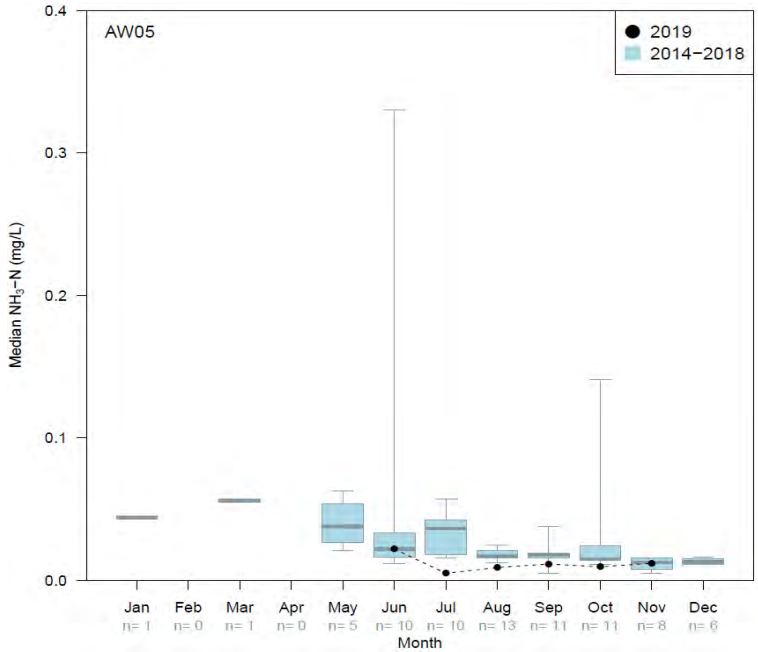

Figure 281. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site AW05. Number of samples (n) is provided for the historical data.

AW05 total oxidised nitrogen (NO_x-N)

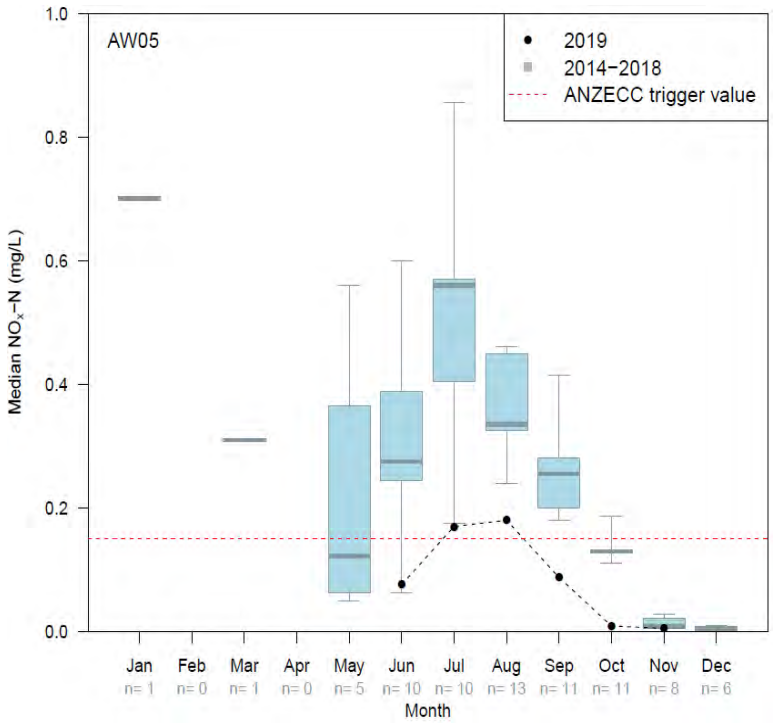

Figure 282. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site AW05. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

AW05 dissolved organic nitrogen (DOrgN)

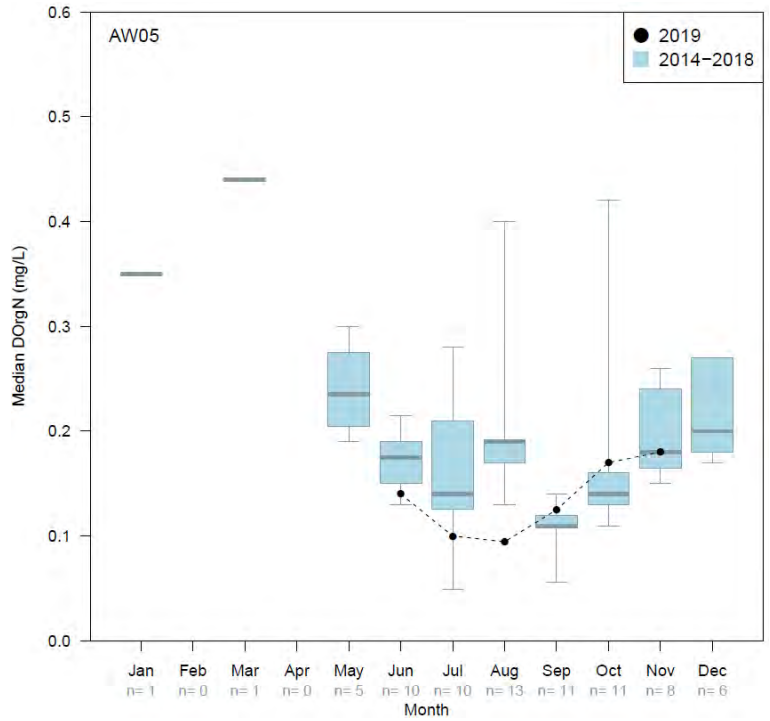

Figure 283. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site AW05. Number of samples (n) is provided for the historical data.

AW05 total phosphorus (TP)

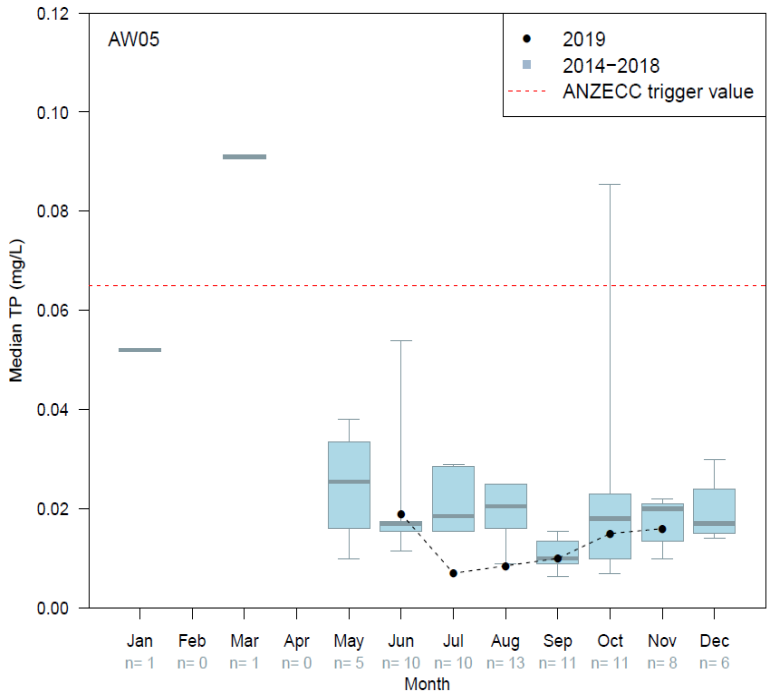

Figure 284. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site AW05. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

AW05 filterable reactive phosphorus (FRP)

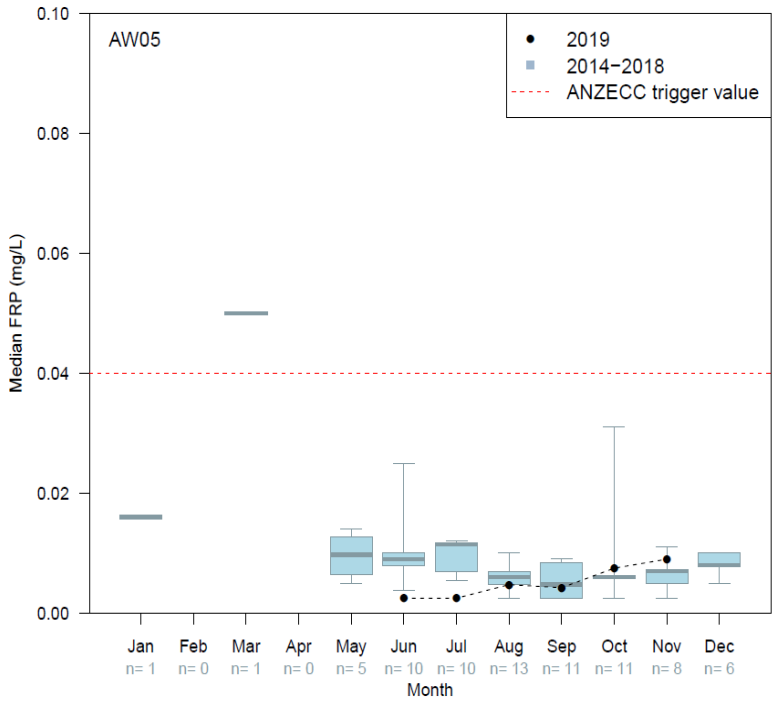

Figure 285. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site AW05. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

AW05 dissolved organic carbon (DOC)

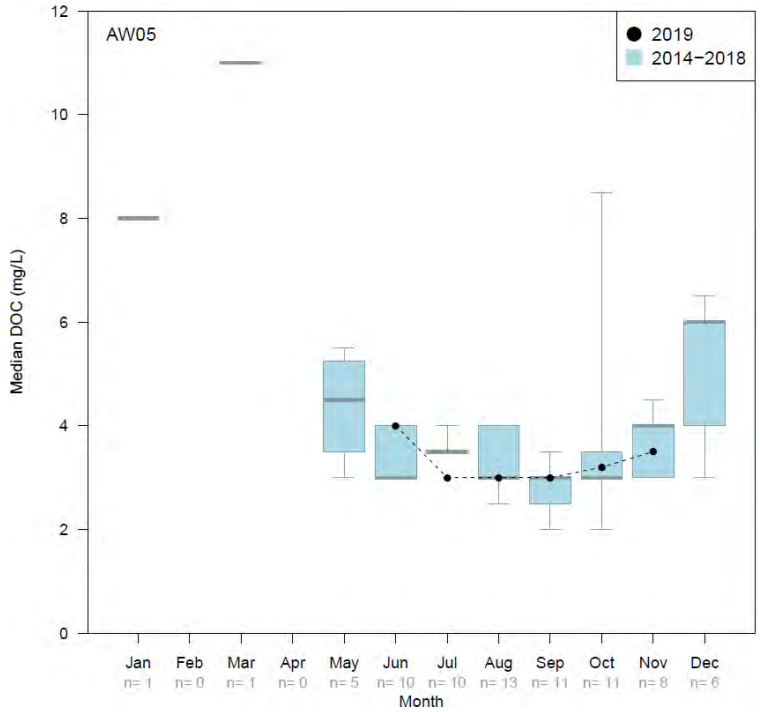

Figure 286. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site AW05. Number of samples (n) is provided for the historical data.

AW05 total suspended solids (TSS)

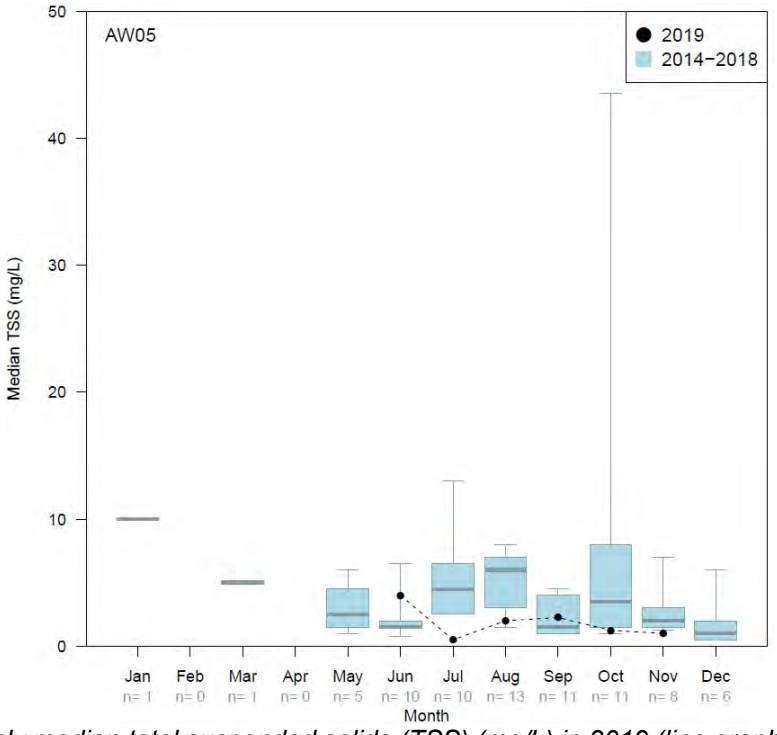

Figure 287. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site AW05. Number of samples (n) is provided for the historical data.

AW05 dissolved oxygen (DO)

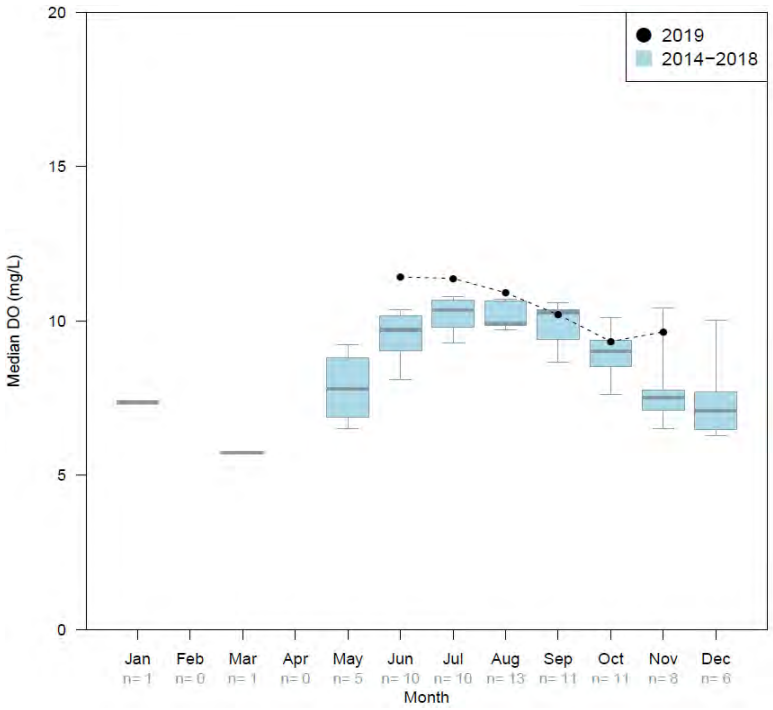

Figure 288. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site AW05. Number of samples (n) is provided for the historical data.

AW05 specific conductivity (Sp. cond)

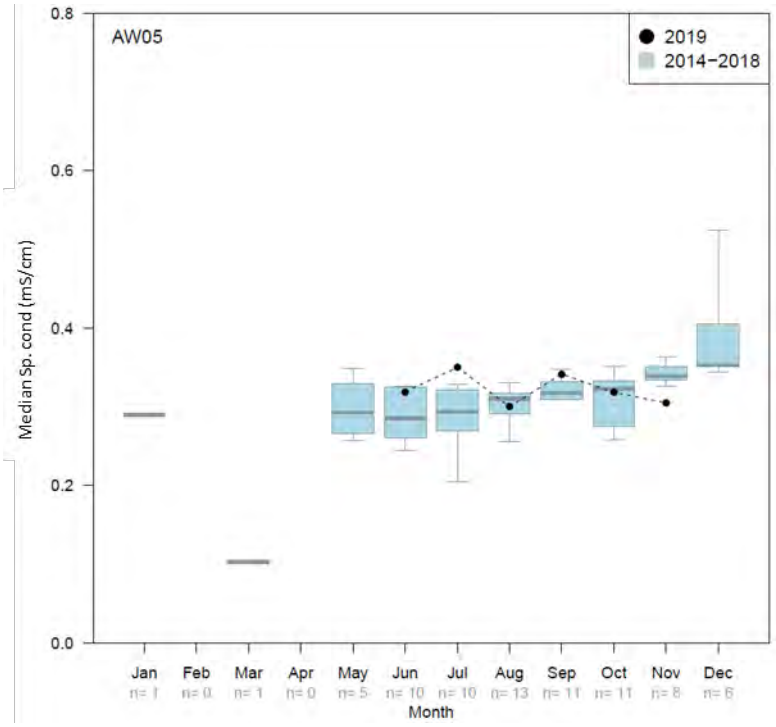

Figure 289. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site AW05. Number of samples (n) is provided for the historical data.

Table 30. 2019 monthly sample numbers, minimum and maximum values at AW05.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	1	3	2	2	2	1	0
min						0.270	0.210	0.310	0.210	0.200	0.210	
max						0.270	0.610	0.320	0.260	0.210	0.210	
med						**0.270**	**0.280**	**0.315**	**0.235**	**0.205**	**0.210**	
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	3	2	2	2	1	0
min						0.022	0.005	0.005	0.005	0.005	0.012	
max						0.022	0.011	0.013	0.018	0.014	0.012	
med						**0.022**	**0.005**	**0.009**	**0.012**	**0.010**	**0.012**	
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	3	2	2	2	1	0
min						0.076	0.097	0.170	0.045	0.005	0.005	
max						0.076	0.330	0.190	0.130	0.013	0.005	
med						**0.076**	**0.170**	**0.180**	**0.088**	**0.009**	**0.005**	
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	3	2	2	2	1	0
min						0.140	0.095	0.079	0.100	0.160	0.180	
max						0.140	0.260	0.110	0.150	0.180	0.180	
med						**0.140**	**0.100**	**0.095**	**0.125**	**0.170**	**0.180**	
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	3	2	2	2	1	0
min						0.019	0.003	0.007	0.009	0.012	0.016	
max						0.019	0.019	0.010	0.011	0.018	0.016	
med						**0.019**	**0.007**	**0.009**	**0.010**	**0.015**	**0.016**	
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	3	2	2	2	1	0
min						0.003	0.003	0.003	0.003	0.005	0.009	
max						0.003	0.006	0.007	0.006	0.010	0.009	
med						**0.003**	**0.003**	**0.005**	**0.004**	**0.008**	**0.009**	
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	3	2	2	2	1	0
min						4.000	3.000	3.000	3.000	3.000	3.500	
max						4.000	3.000	3.000	3.000	3.400	3.500	
med						**4.000**	**3.000**	**3.000**	**3.000**	**3.200**	**3.500**	
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	3	2	2	2	1	0
min						4.000	0.500	1.000	0.500	0.500	1.000	
max						4.000	0.500	3.000	4.000	2.000	1.000	
med						**4.000**	**0.500**	**2.000**	**2.250**	**1.250**	**1.000**	
DO (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	3	2	2	2	1	0
min						11.42	10.92	10.57	9.950	9.330	9.640	
max						11.42	11.50	11.25	10.45	9.330	9.640	
med						**11.42**	**11.37**	**10.91**	**10.20**	**9.330**	**9.640**	
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	3	2	2	2	1	0
min						0.319	0.339	0.245	0.324	0.293	0.305	
max						0.319	0.357	0.355	0.359	0.343	0.305	
med						**0.319**	**0.350**	**0.300**	**0.342**	**0.318**	**0.305**	

NB: Daily discharge data is not available for AW05 as this site is not gauged. Due to the ephemeral nature of flow in Neerigen Brook and the below average rainfall in 2019, samples were only collected between June and November 2019.

In those months sampled, concentrations of TN, NH_3-N, NO_x-N and DOrgN were typically towards the lower limit or below the range of background data, except for DOrgN in September to November when concentrations tended towards the upper extent (Figures 280-283). Concentrations of TP and FRP were typically low and tended to be within or below the range of background data (Figure 284-285).

Where data was available, concentrations of TN, TP and FRP remained below the ANZECC trigger values for lowland rivers of 1.2 mg/L, 0.065 mg/L and 0.04 mg/L, respectively. Concentrations of NO_x-N however exceeded the ANZECC trigger value of 0.15 mg/L in July and August, which is likely attributable to increased seasonal flow.

In 2019, concentrations of DOC and TSS were low and generally within the range of background data (Figure 286 and 287). In all months sampled, dissolved oxygen concentrations were >9 mg/L (Figure 288, Table 30). Specific conductivity was relatively constant between June and November and generally within the range of historic data (Figure 289).

29. Susannah Brook (SWN11)

SWN11 total nitrogen (TN)

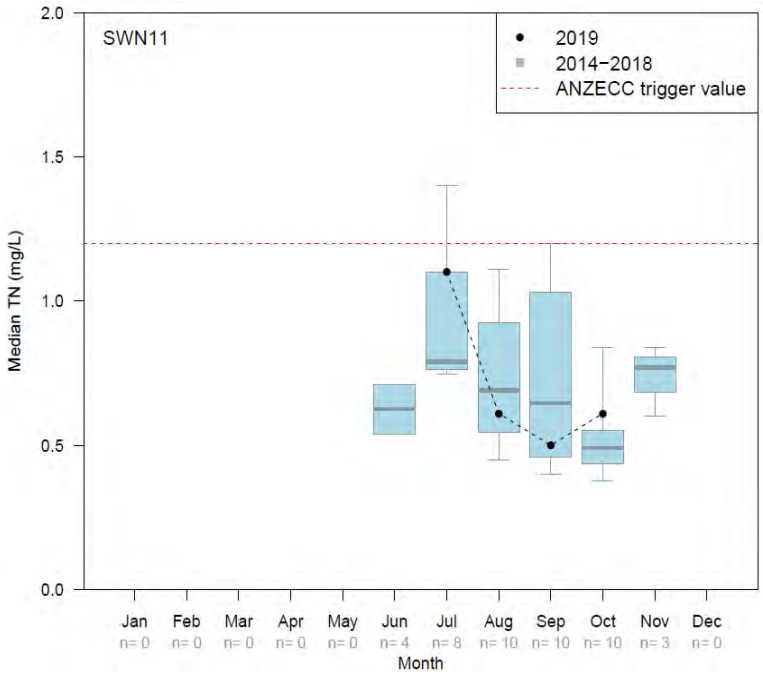

Figure 290. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN11. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

SWN11 ammoniacal nitrogen (NH_3-N)

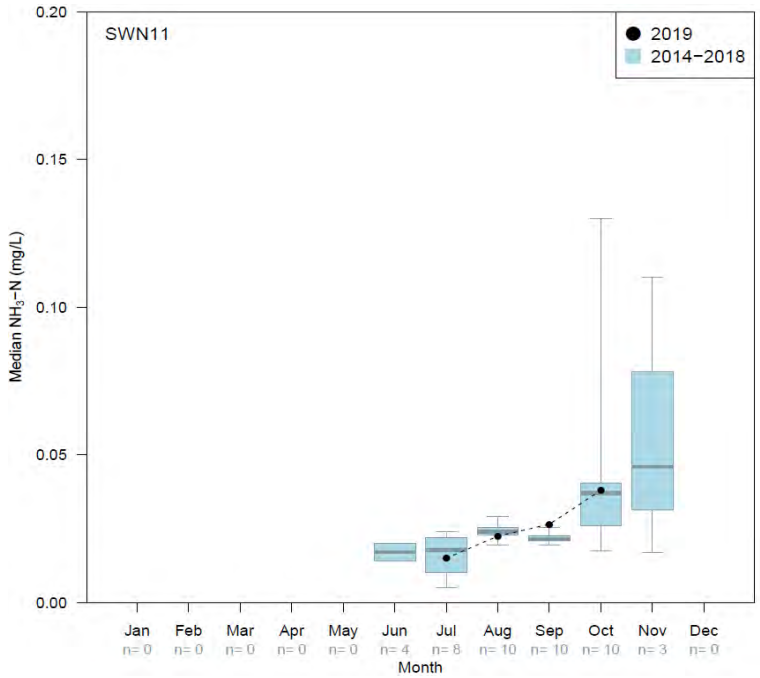

Figure 291. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN11. Number of samples (n) is provided for the historical data.

SWN11 total oxidised nitrogen (NO_x-N)

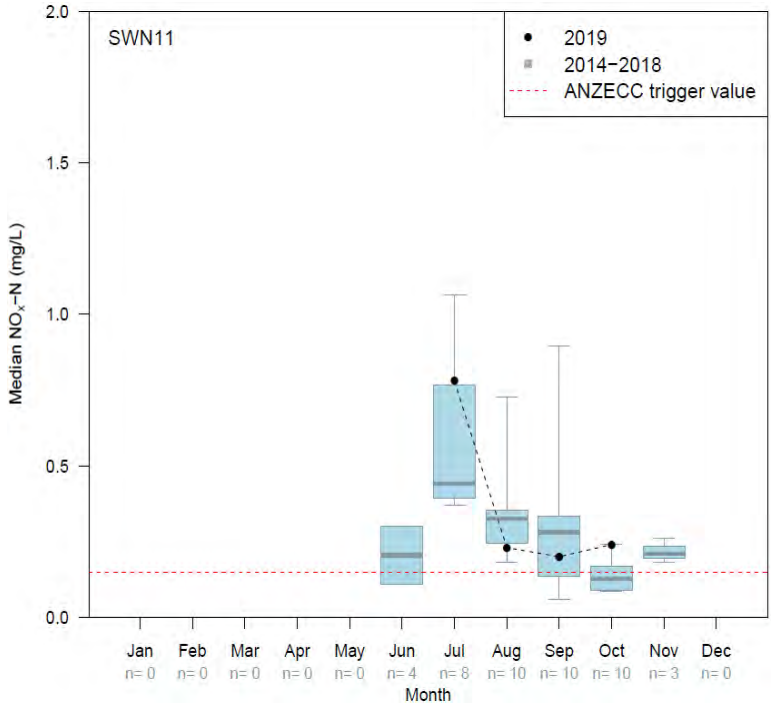

Figure 292. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN11. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

SWN11 dissolved organic nitrogen (DOrgN)

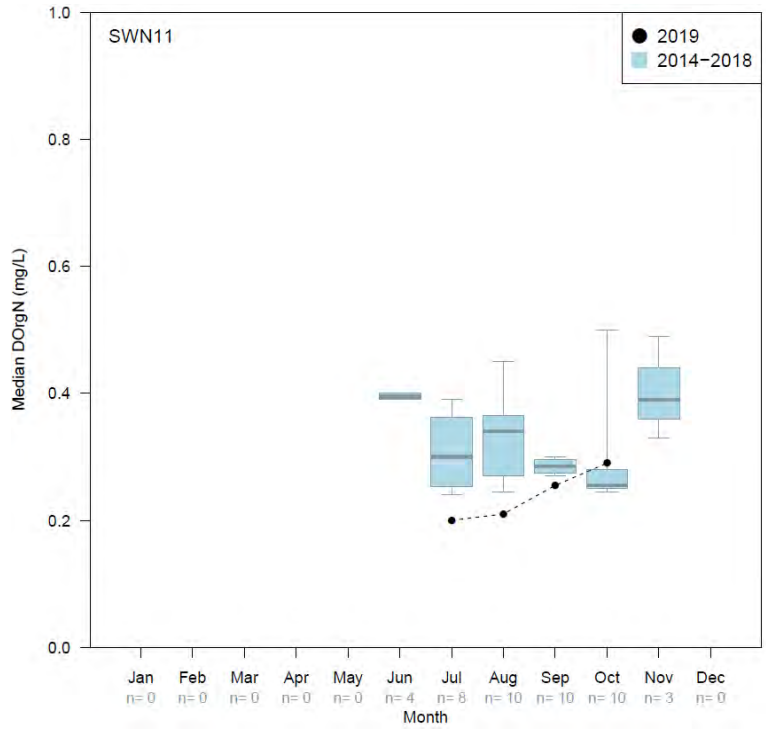

Figure 293. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN11. Number of samples (n) is provided for the historical data.

SWN11 total phosphorus (TP)

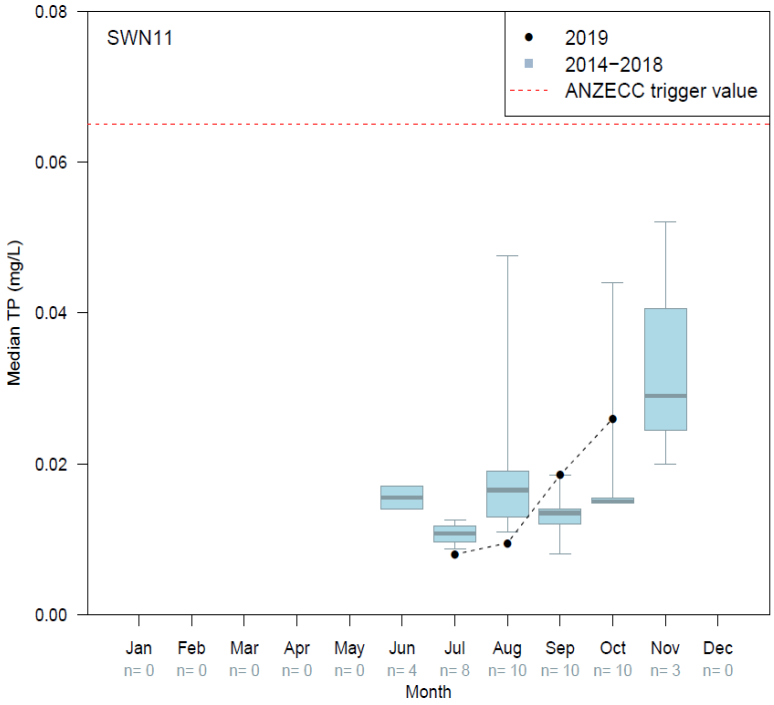

Figure 294. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN11. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

SWN11 filterable reactive phosphorus (FRP)

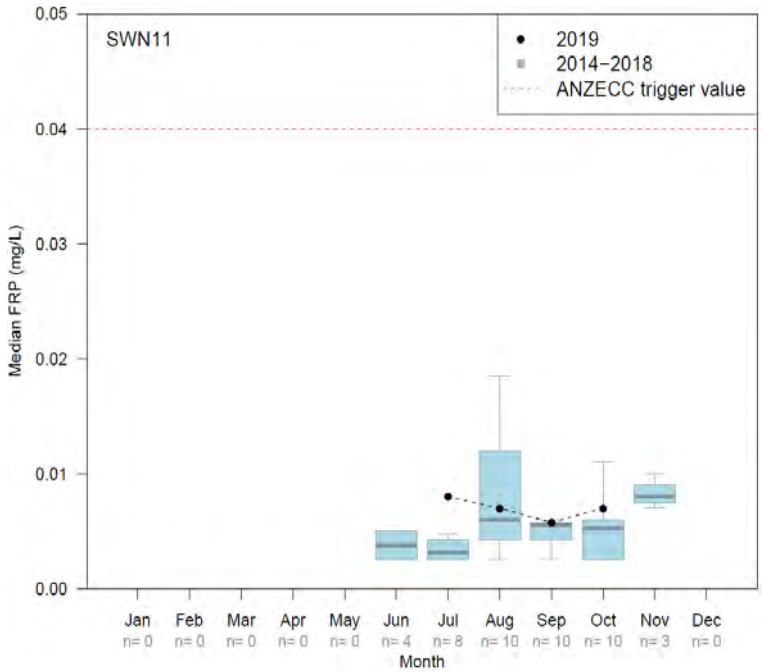

Figure 295. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN11. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

SWN11 dissolved organic carbon (DOC)

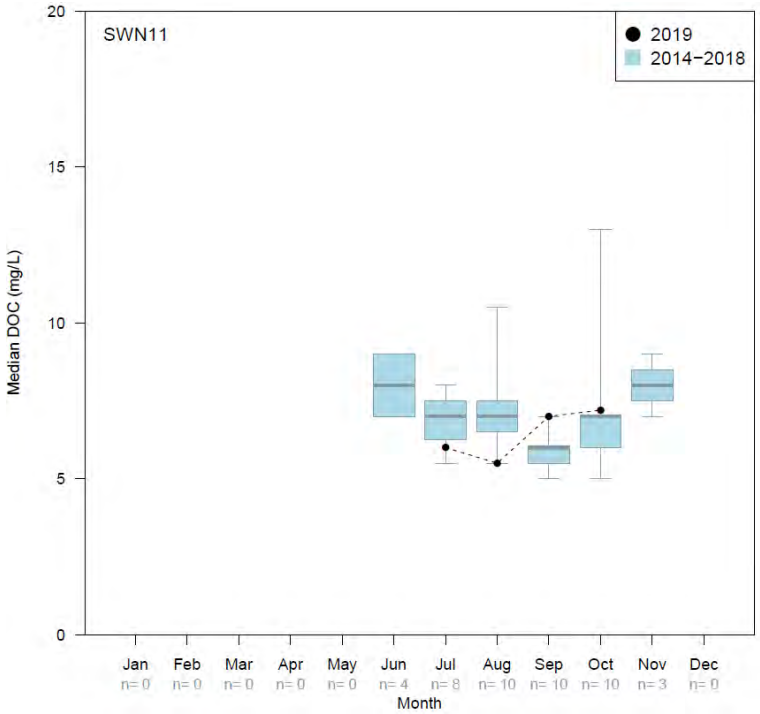

Figure 296. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN11. Number of samples (n) is provided for the historical data.

SWN11 total suspended solids (TSS)

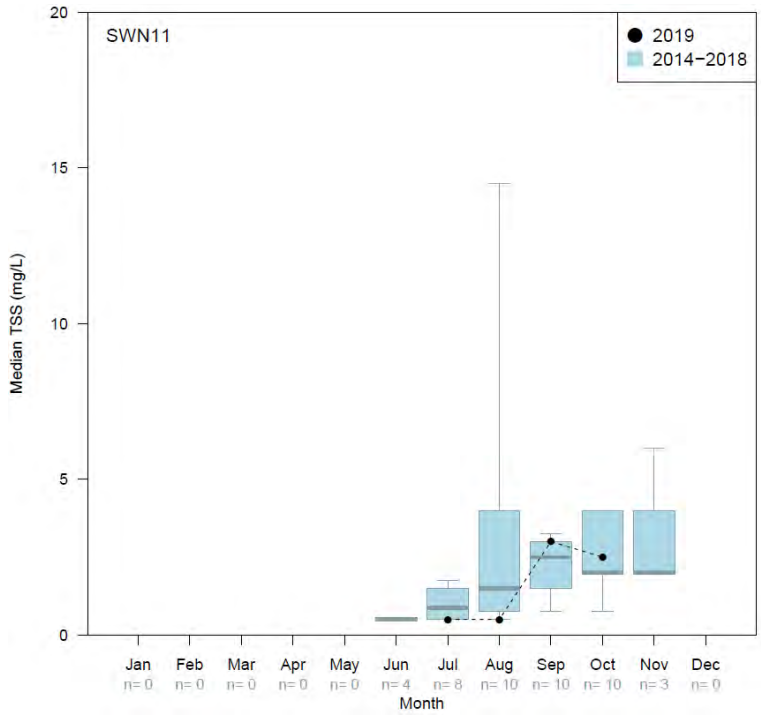

Figure 297. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN11. Number of samples (n) is provided for the historical data.

SWN11 dissolved oxygen (DO)

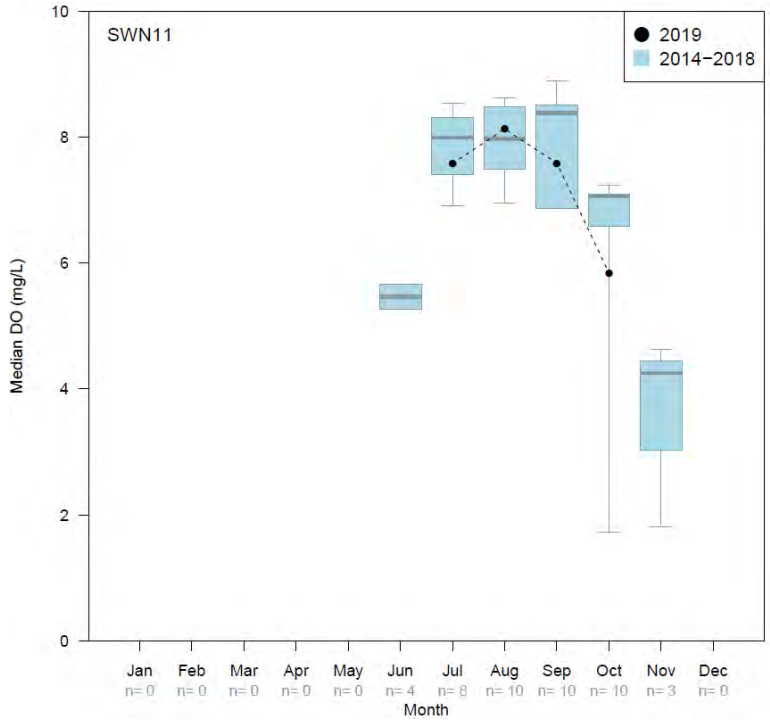

Figure 298. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN11. Number of samples (n) is provided for the historical data.

SWN11 specific conductivity (Sp. cond)

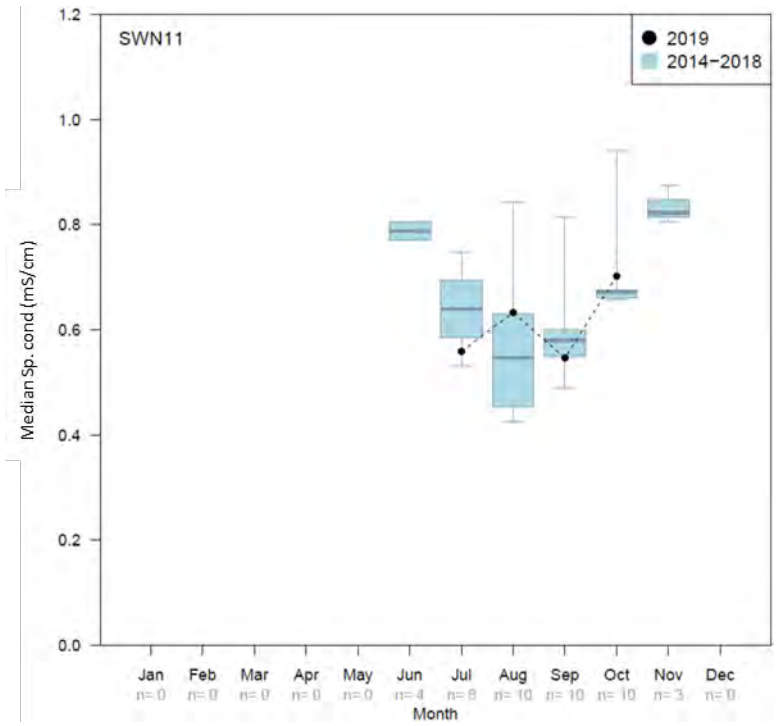

Figure 299. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWN11. Number of samples (n) is provided for the historical data.

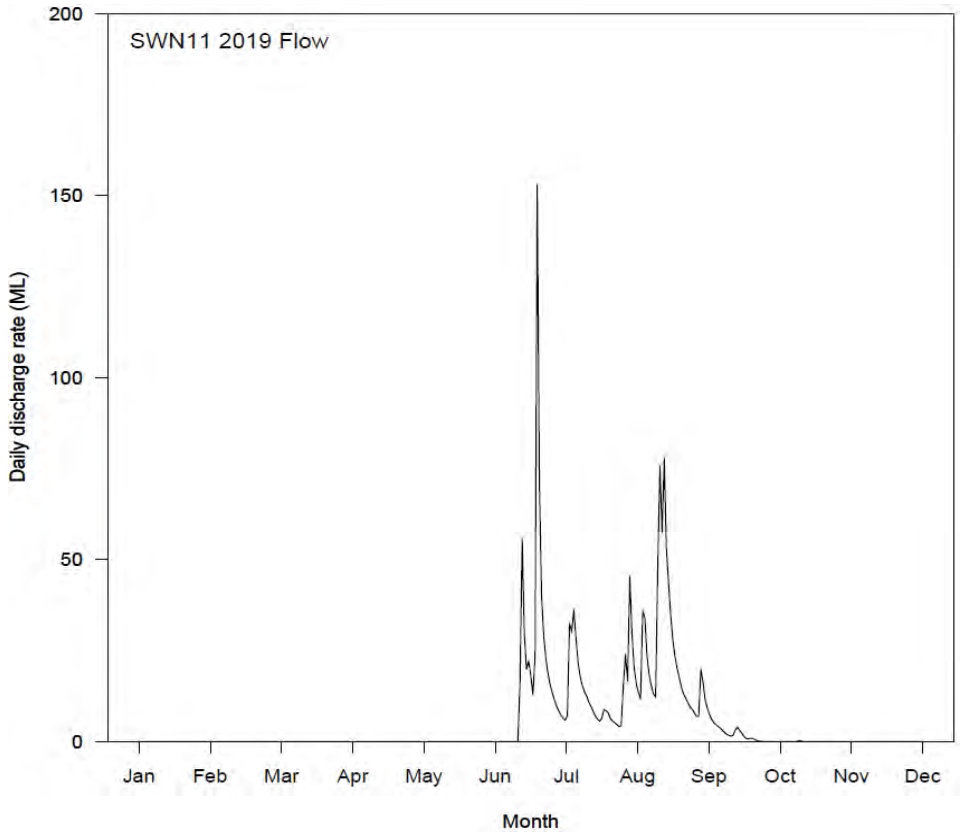

Figure 300. Daily discharge (ML) at the Susannah Brook gauging station (616099 – at site of SWN11).

NB: Due to the highly ephemeral nature of flow in Susannah Brook and the below average rainfall in 2019, samples were only collected between July and October 2019.

Concentrations of TN and NO_x-N in July 2019 were high relative to those in August to October and are likely attributable to peak flows in early winter (Figure 290, 292 and 300). This trend is consistent with background data. Concentrations of NH_3-N and DOrgN increased slightly between July and October 2019 and while NH_3-N concentrations were consistent with background data, those for DOrgN were below the historic range between July and September (Figure 291 and 293). Overall, concentrations of TP and FRP were low, but increased between July and October in the case of TP (Figure 294 and 295).

Concentrations of TN, TP and FRP remained well below their respective ANZECC trigger values for lowland rivers of 1.2 mg/L, 0.065 mg/L and 0.04 mg/L (Figure 290, 294 and 295). Conversely, concentrations of NO_x-N always exceeded the ANZECC trigger value of 0.15 mg/L in the 2019 reporting period (Figure 292).

In those months sampled, concentration of DOC and TSS were low and within the range of background data (Figures 296 and 297). Although dissolved oxygen decreased in November, concentrations were always >6 mg/L and within the range of background data (Figure 298, Table 31). Median specific conductivity was within the range of the historic dataset (Figure 299).

Table 31. 2019 monthly sample numbers, minimum and maximum values at SWN11.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	0	1	2	2	2	0	0
min							1.100	0.490	0.410	0.540		
max							1.100	0.730	0.590	0.680		
med							**1.100**	**0.610**	**0.500**	**0.610**		
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	1	2	2	2	0	0
min							0.015	0.019	0.023	0.037		
max							0.015	0.026	0.030	0.039		
med							**0.015**	**0.023**	**0.027**	**0.038**		
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	1	2	2	2	0	0
min							0.780	0.170	0.150	0.190		
max							0.780	0.290	0.250	0.290		
med							0.780	0.230	0.200	0.240		
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	1	2	2	2	0	0
min							0.200	0.150	0.210	0.270		
max							0.200	0.270	0.300	0.310		
med							**0.200**	**0.210**	**0.255**	**0.290**		
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	1	2	2	2	0	0
min							0.008	0.009	0.015	0.024		
max							0.008	0.010	0.022	0.028		
med							**0.008**	**0.010**	**0.019**	**0.026**		
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	1	2	2	2	0	0
min							0.008	0.006	0.003	0.005		
max							0.008	0.008	0.009	0.009		
med							**0.008**	**0.007**	**0.006**	**0.007**		
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	1	2	2	2	0	0
min							6.000	5.000	7.000	7.000		
max							6.000	6.000	7.000	7.400		
med							**6.000**	**5.500**	**7.000**	**7.200**		
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	1	2	2	2	0	0
min							0.500	0.500	3.000	2.000		
max							0.500	0.500	3.000	3.000		
med							**0.500**	**0.500**	**3.000**	**2.500**		
DO (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	1	2	2	2	0	0
min							7.580	7.540	6.620	5.250		
max							7.580	8.710	8.550	6.430		
med							**7.580**	**8.125**	**7.585**	**5.840**		
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	0	1	2	2	2	0	0
min							0.559	0.608	0.482	0.597		
max							0.559	0.658	0.611	0.806		
med							**0.559**	**0.633**	**0.546**	**0.701**		

30. Upper Swan (CSMDREID)

CSMDREID total nitrogen (TN)

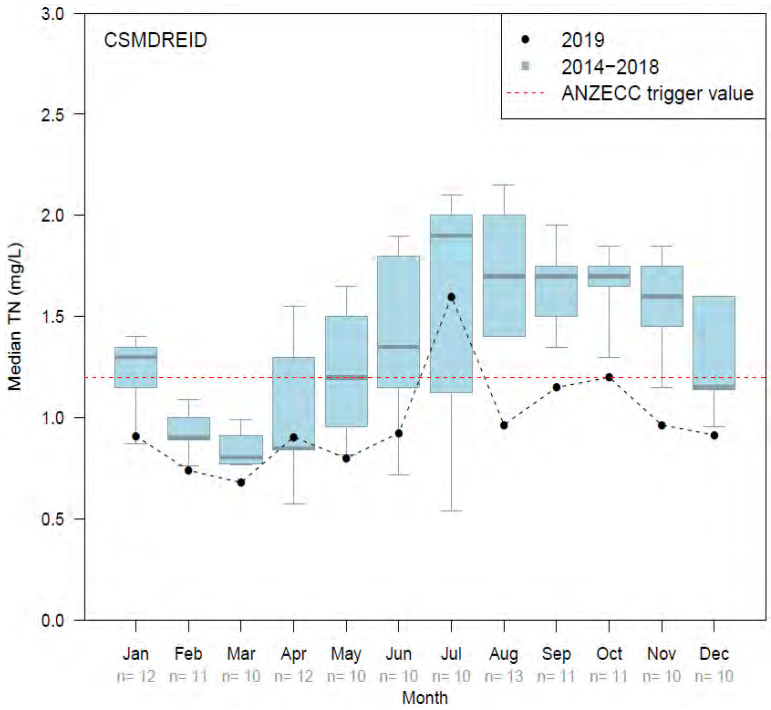

Figure 301. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CSMDREID. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

CSMDREID ammoniacal nitrogen (NH_3-N)

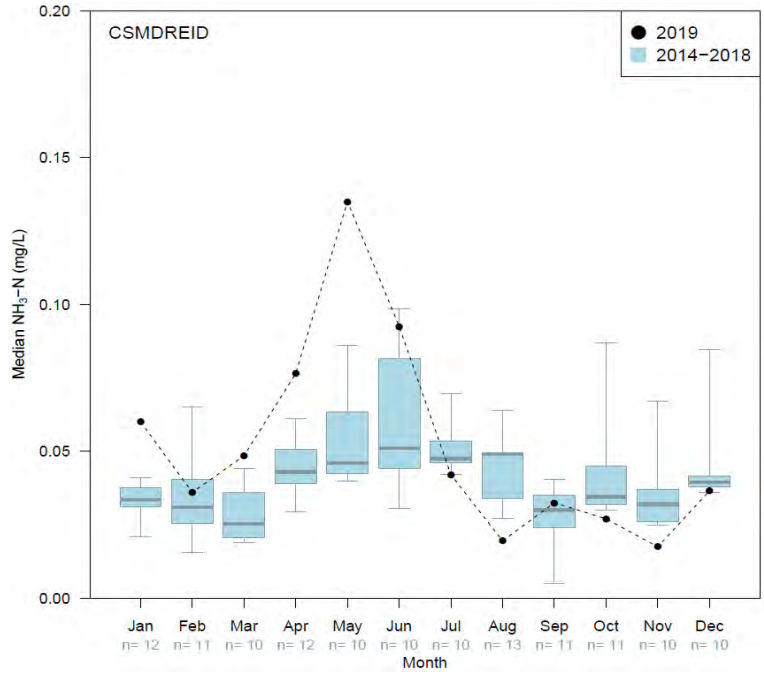

Figure 302. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CSMDREID. Number of samples (n) is provided for the historical data.

CSMDREID total oxidised nitrogen (NO_x-N)

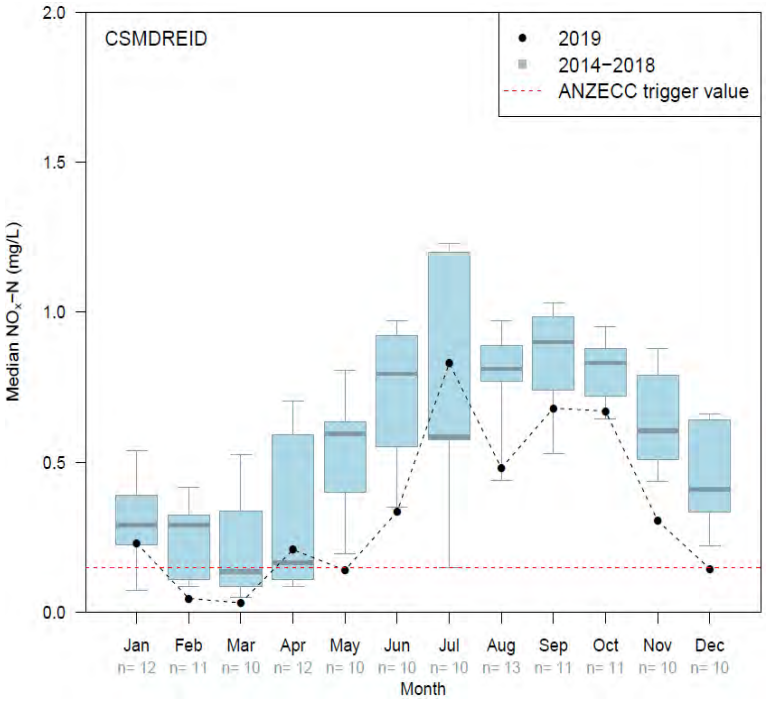

Figure 303. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CSMDREID. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

CSMDREID dissolved organic nitrogen (DOrgN)

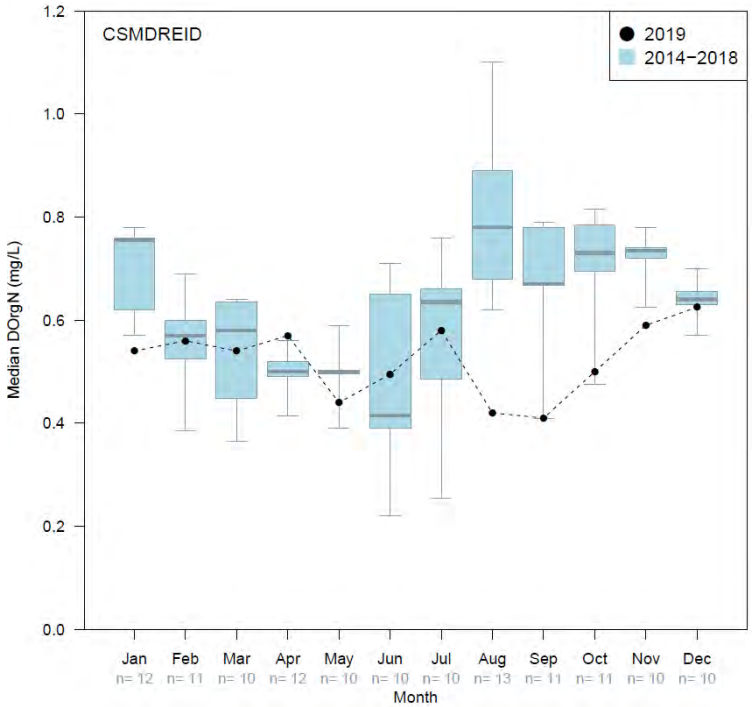

Figure 304. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CSMDREID. Number of samples (n) is provided for the historical data.

CSMDREID total phosphorus (TP)

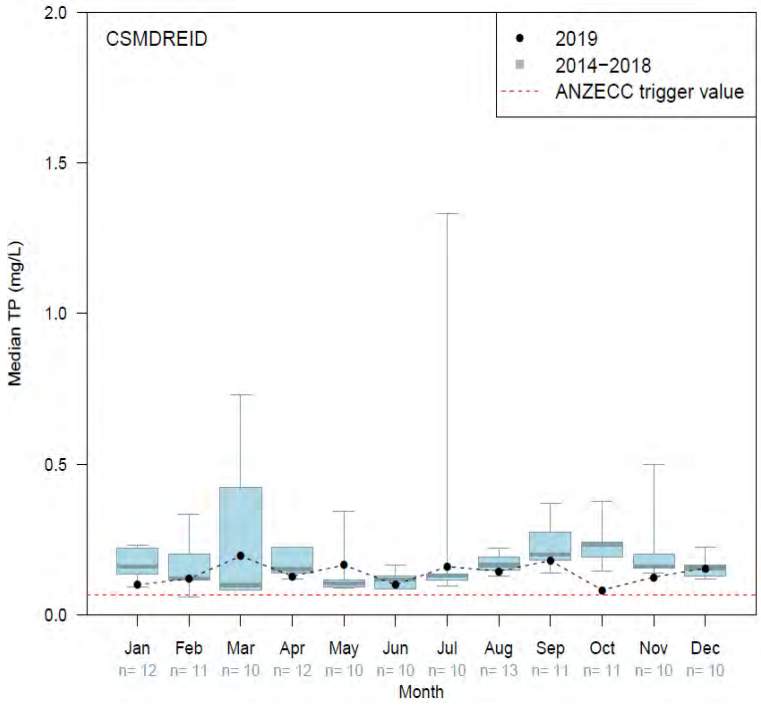

Figure 305. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CSMDREID. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

CSMDREID filterable reactive phosphorus (FRP)

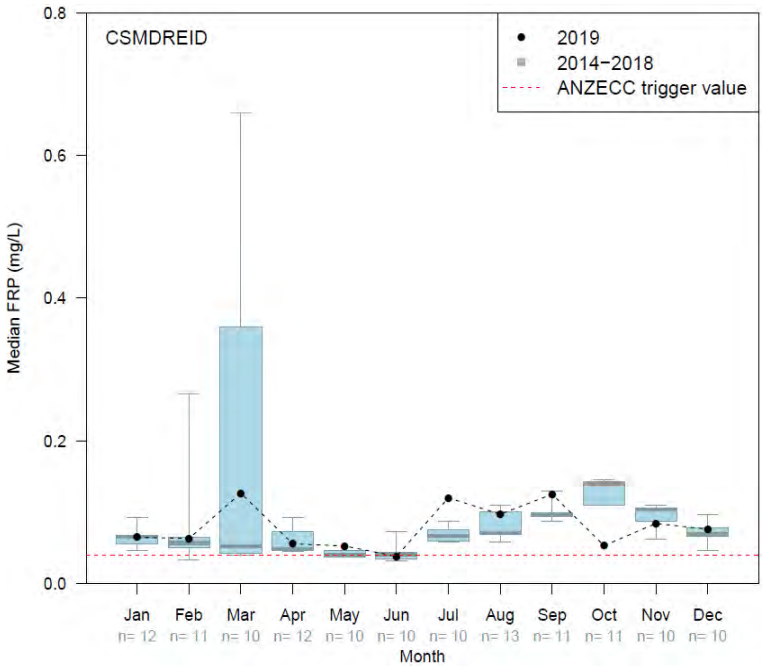

Figure 306. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CSMDREID. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

CSMDREID dissolved organic carbon (DOC)

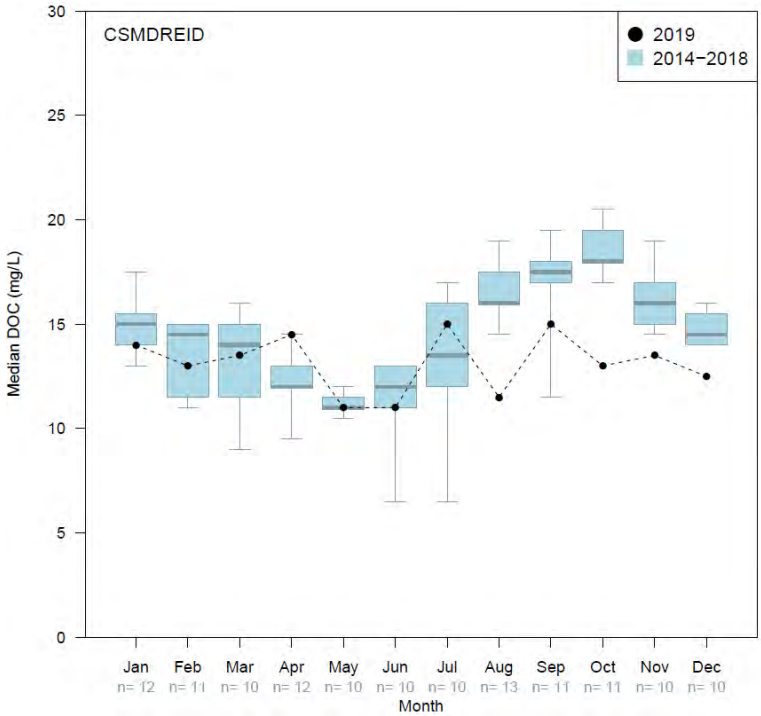

Figure 307. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CSMDREID. Number of samples (n) is provided for the historical data.

CSMDREID total suspended solids (TSS)

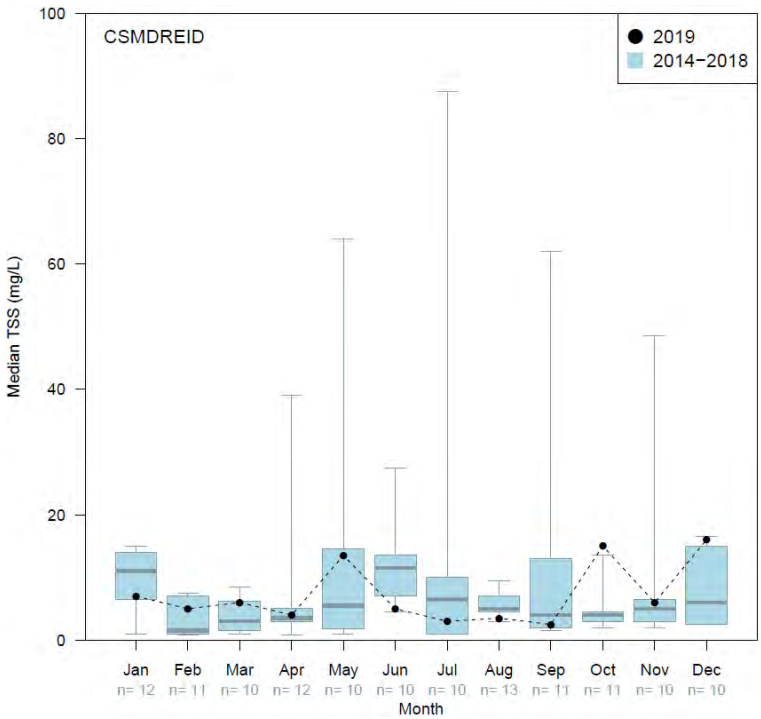

Figure 308. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CSMDREID. Number of samples (n) is provided for the historical data.

CSMDREID dissolved oxygen (DO)

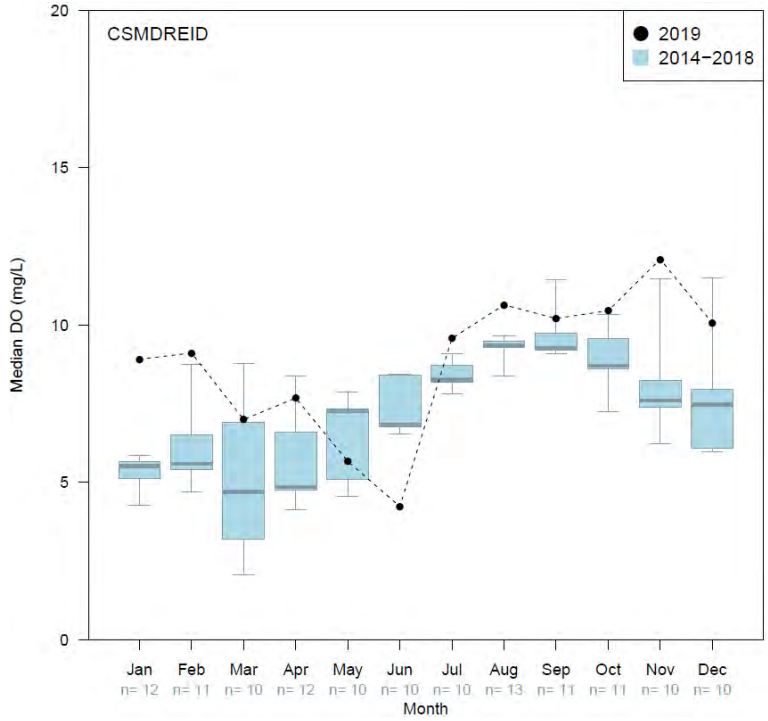

Figure 309. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CSMDREID. Number of samples (n) is provided for the historical data.

CSMDREID specific conductivity (Sp. cond)

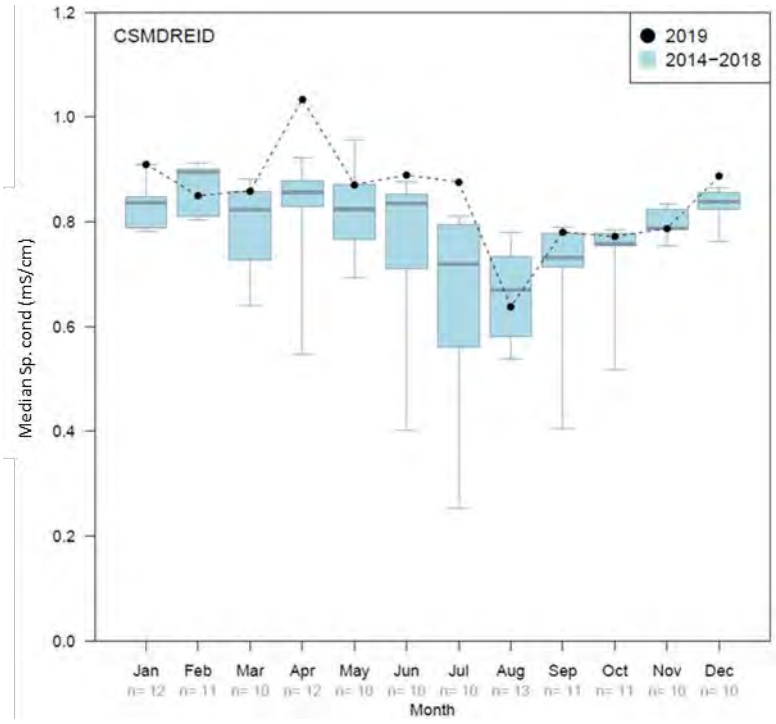

Figure 310. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CSMDREID. Number of samples (n) is provided for the historical data.

Table 32. 2019 monthly sample numbers, minimum and maximum values at CSMDREID.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	3	2	2	2	2	2	3	2	3	2	2	2
min	0.880	0.740	0.630	0.610	0.730	0.850	1.400	0.630	1.100	1.200	0.830	0.870
max	0.980	0.740	0.730	1.200	0.870	1.000	1.700	1.300	1.200	1.200	1.100	0.960
med	**0.910**	**0.740**	**0.680**	**0.905**	**0.800**	**0.925**	**1.600**	**0.965**	**1.150**	**1.200**	**0.965**	**0.915**
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	3	2	2	2
min	0.043	0.036	0.047	0.043	0.130	0.088	0.005	0.019	0.030	0.027	0.005	0.005
max	0.068	0.036	0.050	0.110	0.140	0.097	0.060	0.020	0.035	0.027	0.030	0.068
med	**0.060**	**0.036**	**0.049**	**0.077**	**0.135**	**0.093**	**0.042**	**0.020**	**0.033**	**0.027**	**0.018**	**0.037**
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	3	2	2	2
min	0.200	0.046	0.017	0.087	0.110	0.190	0.800	0.260	0.670	0.670	0.180	0.120
max	0.240	0.046	0.045	0.330	0.170	0.480	1.000	0.700	0.690	0.670	0.430	0.170
med	**0.230**	**0.046**	**0.031**	**0.209**	**0.140**	**0.335**	**0.830**	**0.480**	**0.680**	**0.670**	**0.305**	**0.145**
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	3	2	2	2
min	0.470	0.560	0.540	0.390	0.420	0.450	0.570	0.310	0.340	0.500	0.580	0.620
max	0.610	0.560	0.540	0.750	0.460	0.540	0.860	0.530	0.480	0.500	0.600	0.630
med	**0.540**	**0.560**	**0.540**	**0.570**	**0.440**	**0.495**	**0.580**	**0.420**	**0.410**	**0.500**	**0.590**	**0.625**
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	3	2	2	2
min	0.095	0.120	0.140	0.097	0.130	0.070	0.100	0.110	0.150	0.082	0.120	0.120
max	0.110	0.120	0.250	0.160	0.200	0.130	0.170	0.180	0.210	0.082	0.130	0.190
med	**0.100**	**0.120**	**0.195**	**0.129**	**0.165**	**0.100**	**0.160**	**0.145**	**0.180**	**0.082**	**0.125**	**0.155**
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	3	2	2	2
min	0.059	0.063	0.083	0.055	0.050	0.035	0.044	0.054	0.100	0.053	0.082	0.075
max	0.074	0.063	0.170	0.056	0.055	0.041	0.120	0.140	0.150	0.053	0.086	0.077
med	**0.065**	**0.063**	**0.127**	**0.056**	**0.053**	**0.038**	**0.120**	**0.097**	**0.125**	**0.053**	**0.084**	**0.076**
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	3	2	2	2
min	14.00	13.00	13.00	11.00	11.00	11.00	12.00	8.000	14.00	13.00	13.00	12.00
max	14.00	13.00	14.00	18.00	11.00	11.00	15.00	15.00	16.00	13.00	14.00	13.00
med	**14.00**	**13.00**	**13.50**	**14.50**	**11.00**	**11.00**	**15.00**	**11.50**	**15.00**	**13.00**	**13.50**	**12.5**
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	3	2	2	2
min	1.000	5.000	3.000	2.000	8.000	2.000	2.000	3.000	2.000	15.00	5.000	10.00
max	9.000	5.000	9.000	6.000	19.00	8.000	4.000	4.000	3.000	15.00	7.000	22.00
med	**7.000**	**5.000**	**6.000**	**4.000**	**13.50**	**5.000**	**3.000**	**3.500**	**2.500**	**15.00**	**6.000**	**16.00**
DO (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	3	2	2	2
min	8.690	8.790	6.170	6.860	3.830	0.550	8.580	9.560	10.14	10.28	11.36	10.00
max	11.50	9.420	7.820	8.490	7.500	7.910	11.46	11.71	10.27	10.62	12.81	10.11
med	**8.910**	**9.105**	**6.995**	**7.675**	**5.665**	**4.230**	**9.570**	**10.64**	**10.21**	**10.45**	**12.09**	**10.06**
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	3	2	2	2	2	2	3	2	3	2	2	2
min	0.865	0.846	0.859	0.899	0.855	0.854	0.820	0.485	0.780	0.733	0.779	0.875
max	0.925	0.853	0.859	1.168	0.887	0.924	0.881	0.791	0.781	0.810	0.796	0.899
med	**0.910**	**0.850**	**0.859**	**1.034**	**0.871**	**0.889**	**0.876**	**0.638**	**0.780**	**0.772**	**0.787**	**0.887**

NB: Daily discharge data is not available for CSMDREID as this site is not gauged.

In 2019, concentrations of TN and NO_x-N tended to be towards the lower limit or below the range of background data, particularly between August and September. Concentrations of both TN and NO_x-N were highest in July, which can likely be attributed to the onset of rain in early winter (Figure 301, 303 and 341). Concentrations of NH_3-N were typically at the upper extent or above the range of background data between January and June, but towards the lower limit or below that range from July to December. The highest concentrations of NH_3-N were observed in May 2019 (Figure 302). Concentrations of DOrgN were generally towards the lower extent of the historic range, particularly between August and December (Figure 304). Concentration of TP and FRP in the 2019 reporting period were generally within the range of background data (Figure 305 and 306).

In 2019, concentrations of TN we at or below the ANZECC trigger value for lowland rivers of 1.2 mg/L, except in July when the median concentration was 1.6 mg/L (Figure 301, Table 32). Concentrations of NO_x-N however exceeded the trigger value of 0.15 mg/L for most of the 2019 reporting period, with the exceptions of February, March, May, and December (Figure 303). The concentrations of TP and FRP in 2019 exceeded their respective trigger values of 0.065 mg/L and 0.04 mg/L, except for FRP in June which was slightly below the trigger (Figures 305 and 306).

DOC levels in 2019 were generally toward the lower limit or below the range of historic data, particularly from August to December (Figure 307). TSS was usually within the range of the historic data, which was typically highly variable (Figure 308). DO was generally at the upper extent or above the range of background data, except for May and June 2019, which were notably lower but still > 4 mg/L (Figure 309, Table 32). In 2019, specific conductivity generally followed the trend of background data, but was slightly elevated in April (Figure 310).

31. Upper Swan (WNDCK)

WNDCK total nitrogen (TN)

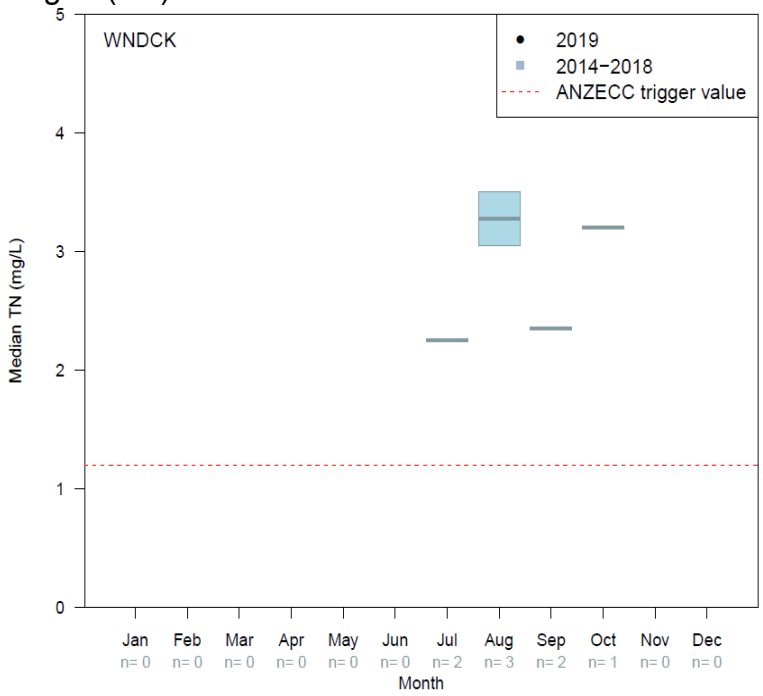

Figure 311. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site WNDCK. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

WNDCK ammoniacal nitrogen (NH_3-N)

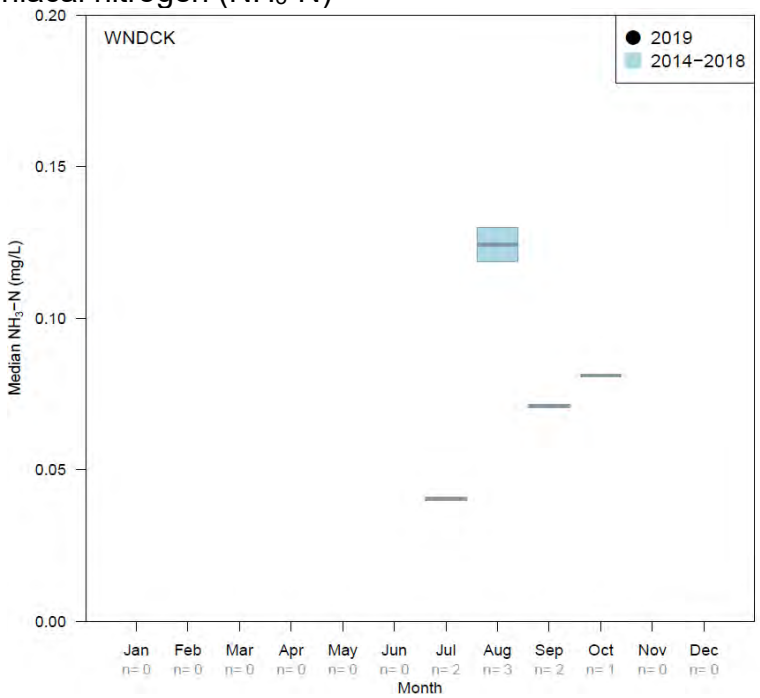

Figure 312. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site WNDCK. Number of samples (n) is provided for the historical data.

WNDCK total oxidised nitrogen (NO_x-N)

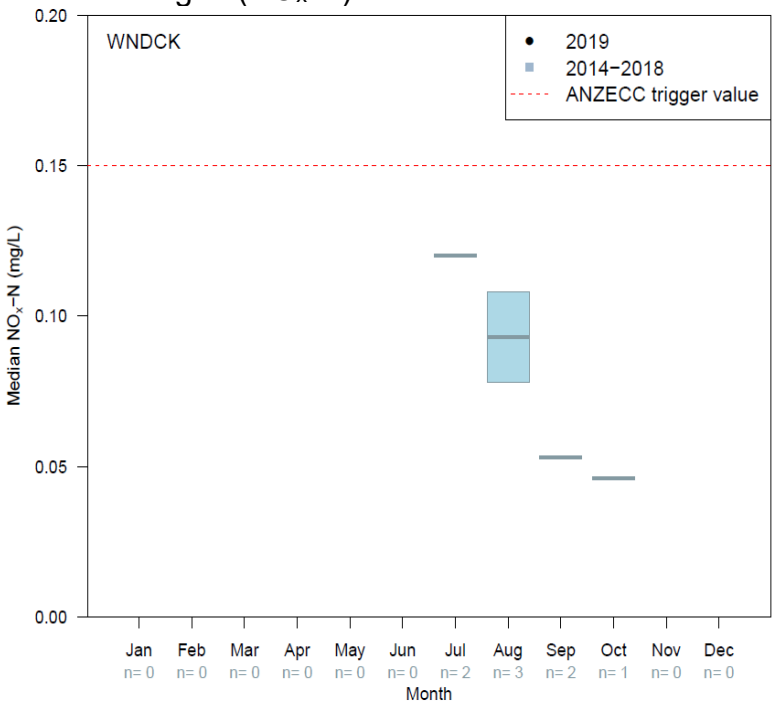

Figure 313. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site WNDCK. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

WNDCK dissolved organic nitrogen (DOrgN)

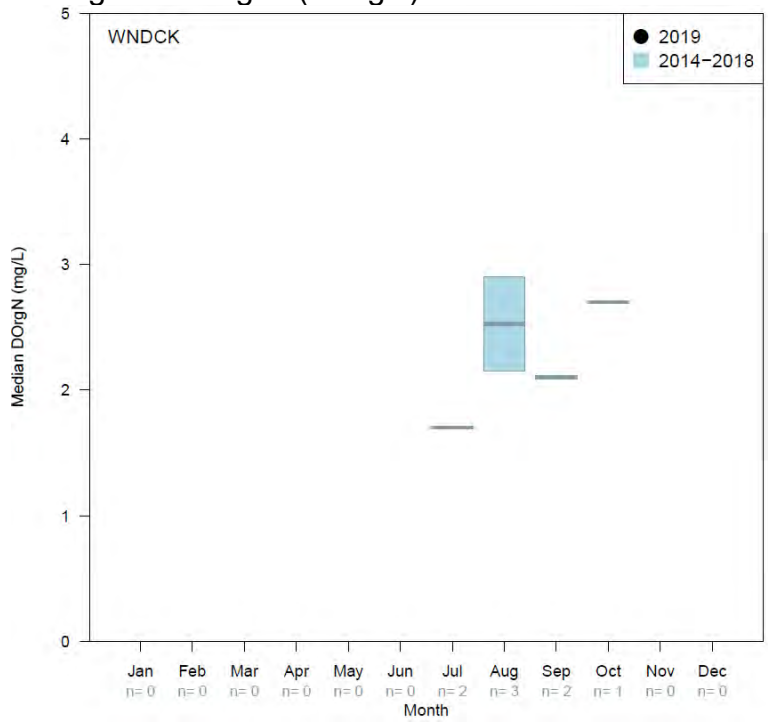

Figure 314. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site WNDCK. Number of samples (n) is provided for the historical data.

WNDCK total phosphorus (TP)

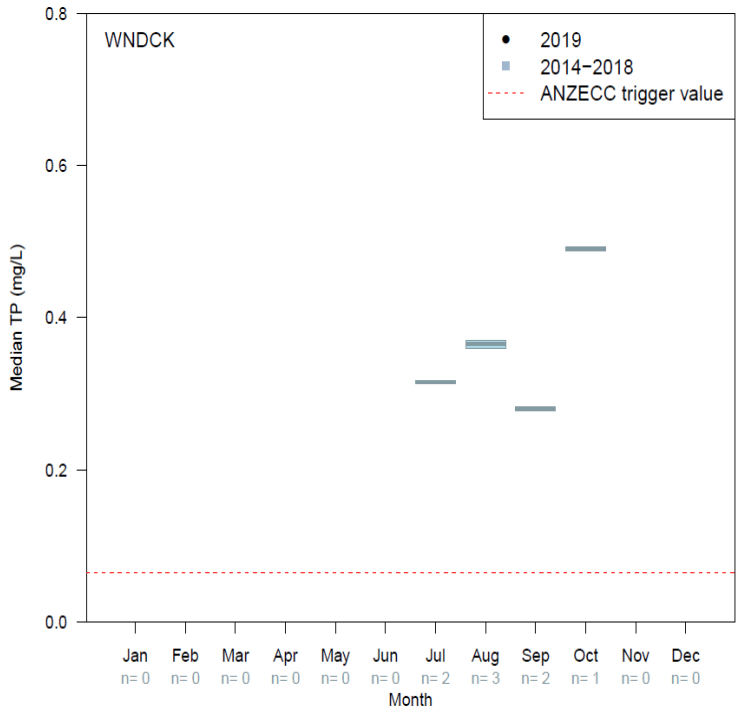

Figure 315. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site WNDCK. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

WNDCK filterable reactive phosphorus (FRP)

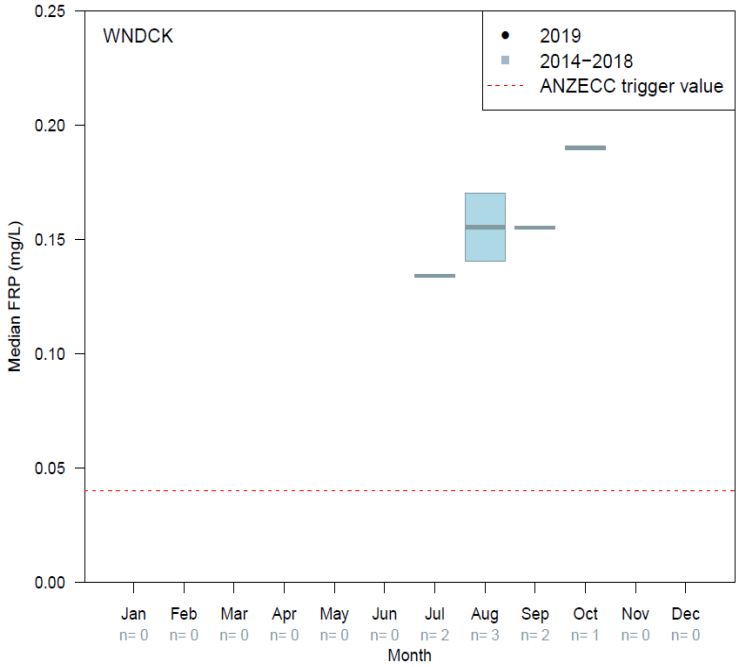

Figure 316. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site WNDCK. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

WNDCK dissolved organic carbon (DOC)

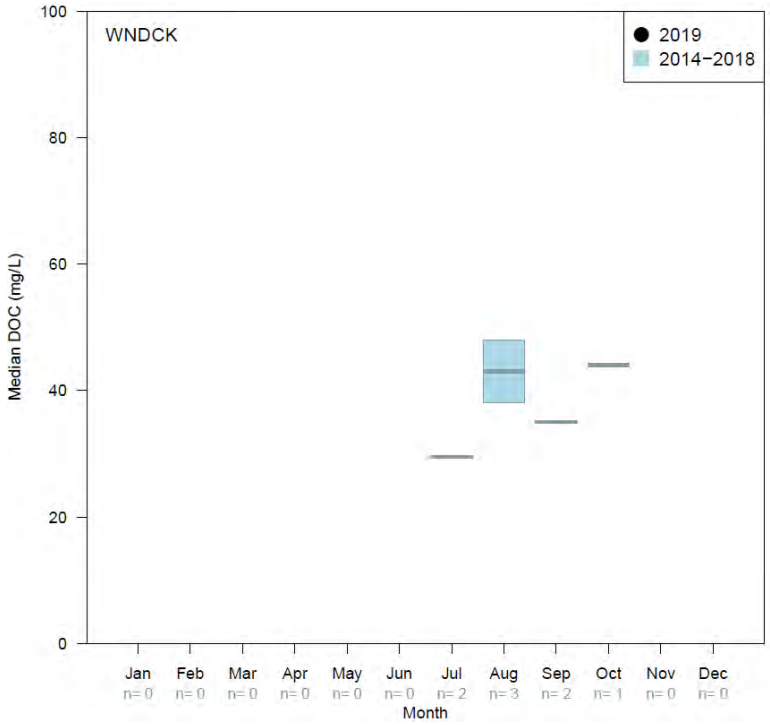

Figure 317. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site WNDCK. Number of samples (n) is provided for the historical data.

WNDCK total suspended solids (TSS)

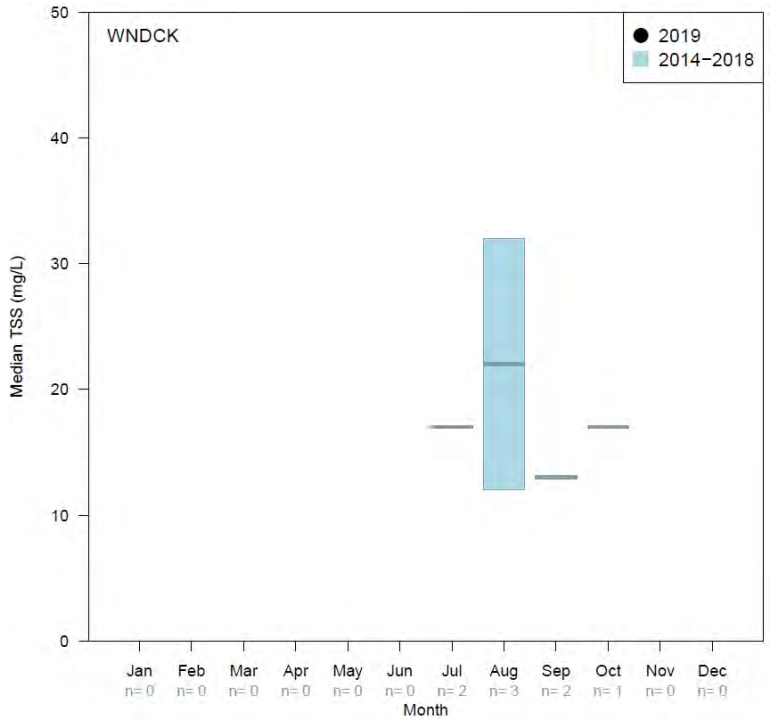

Figure 318. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site WNDCK. Number of samples (n) is provided for the historical data.

WNDCK dissolved oxygen (DO)

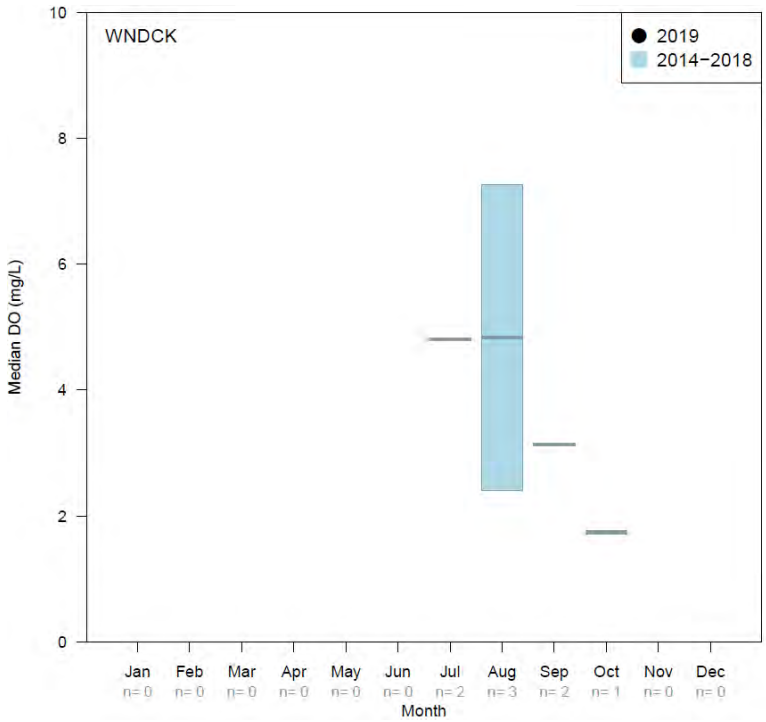

Figure 319. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site WNDCK. Number of samples (n) is provided for the historical data.

WNDCK specific conductivity (Sp. cond)

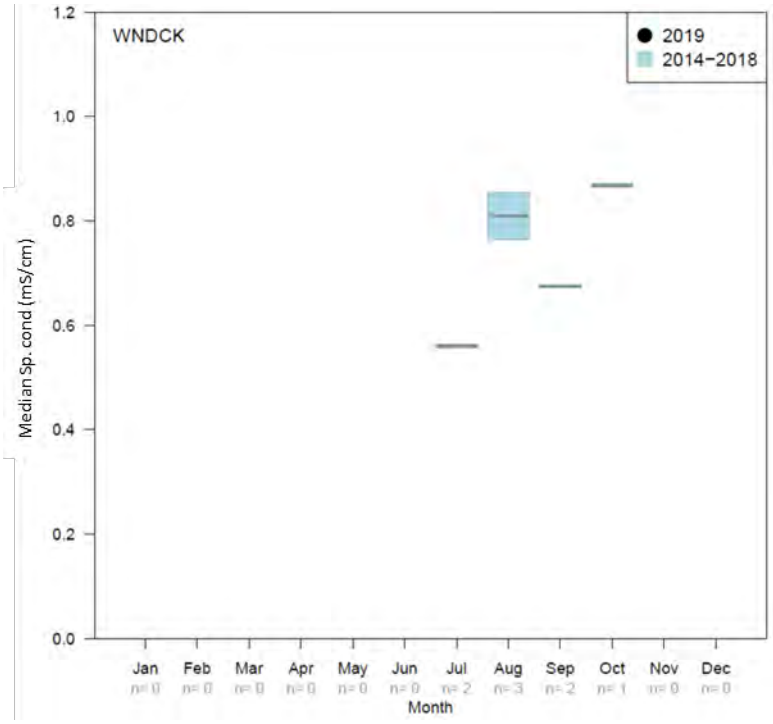

Figure 320. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site WNDCK. Number of samples (n) is provided for the historical data.

Table 33. 2019 monthly sample numbers, minimum and maximum values at WNDCK.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	0	0	0	0	0	0	0
min												
max												
med												
NH_3-N (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	0	0	0	0	0	0	0
min												
max												
med												
NO_x-N (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	0	0	0	0	0	0	0
min												
max												
med												
DOrgN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	0	0	0	0	0	0	0
min												
max												
med												
TP (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	0	0	0	0	0	0	0
min												
max												
med												
FRP (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	0	0	0	0	0	0	0
min												
max												
med												
DOC (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	0	0	0	0	0	0	0
min												
max												
med												
TSS (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	0	0	0	0	0	0	0
min												
max												
med												
DO (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	0	0	0	0	0	0	0
min												
max												
med												
Sp. cond(mS/cm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	0	0	0	0	0	0	0
min												
max												
med												

Due to restricted access, no data was collected from Wandoo Creek in 2019 (Table 33). There is also limited background data available for this site (Figures 311-320).

32. Yule Brook (SWS3)

SWS3 total nitrogen (TN)

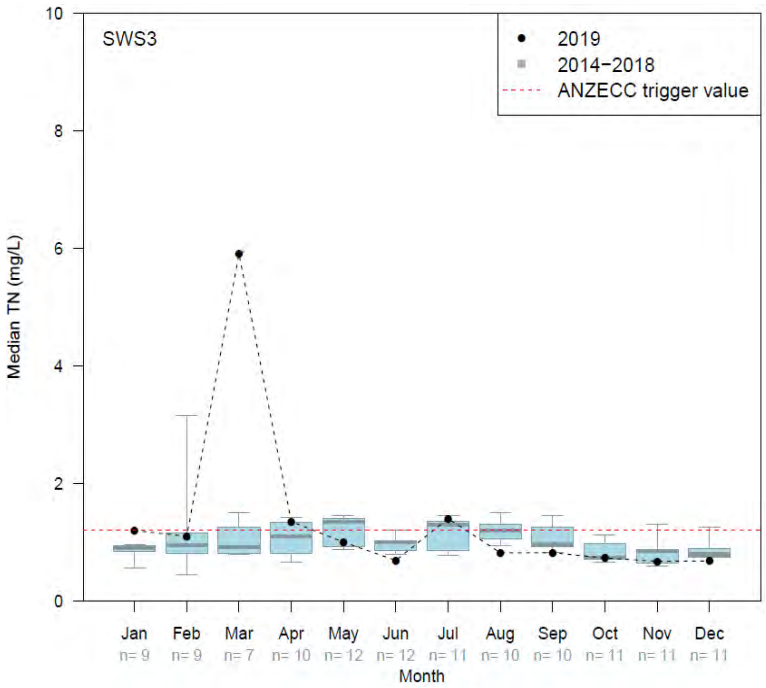

Figure 321. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS3. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

SWS3 ammoniacal nitrogen (NH_3-N)

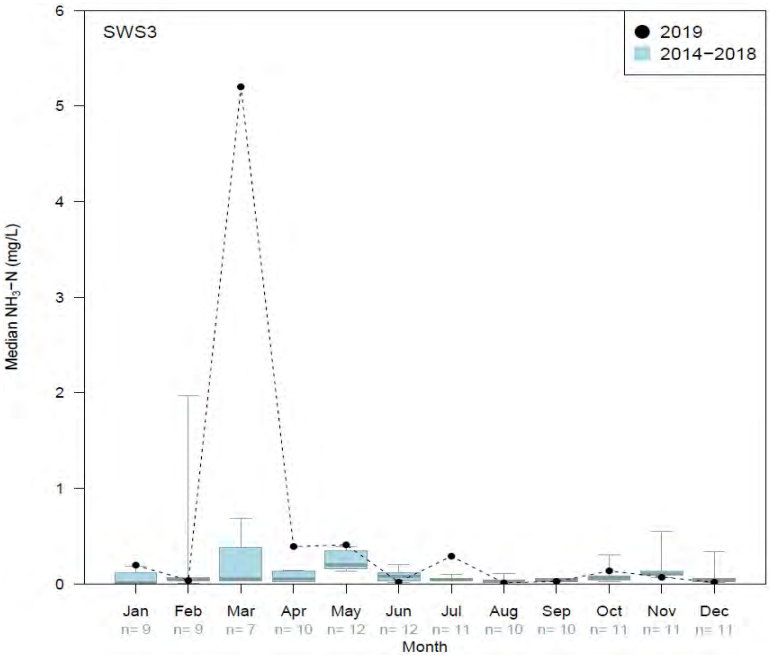

Figure 322. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS3. Number of samples (n) is provided for the historical data.

SWS3 total oxidised nitrogen (NO_x-N)

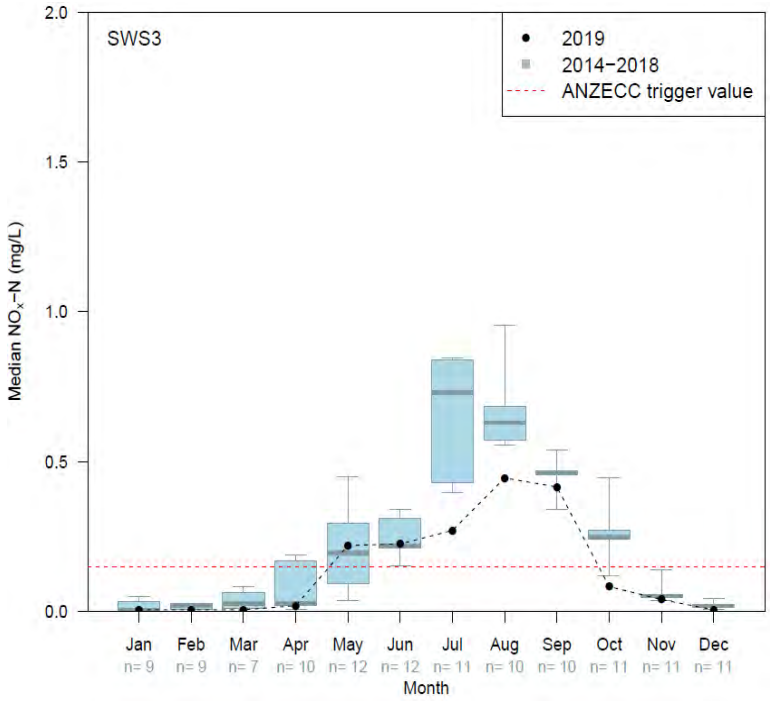

Figure 323. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS3. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

SWS3 dissolved organic nitrogen (DOrgN)

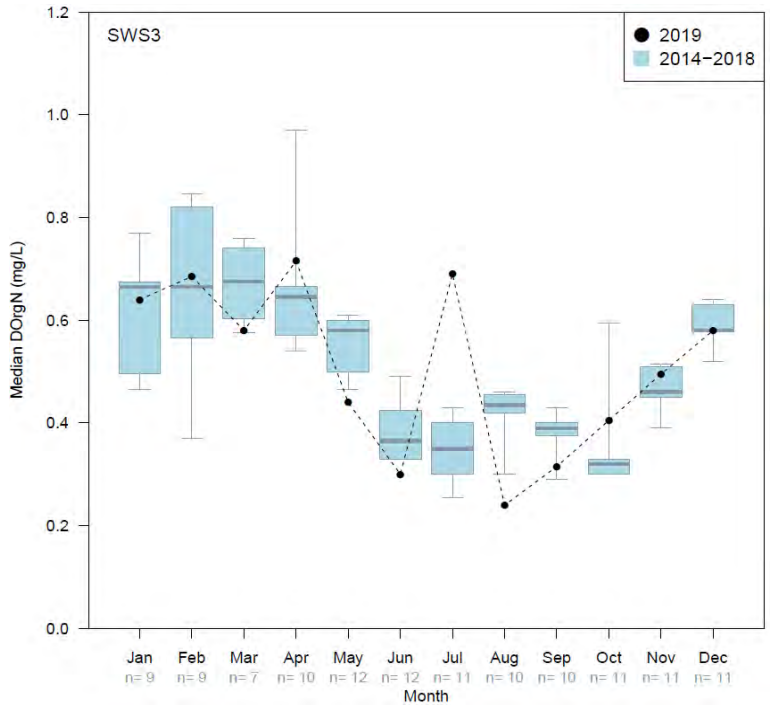

Figure 324. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS3. Number of samples (n) is provided for the historical data.

SWS3 total phosphorus (TP)

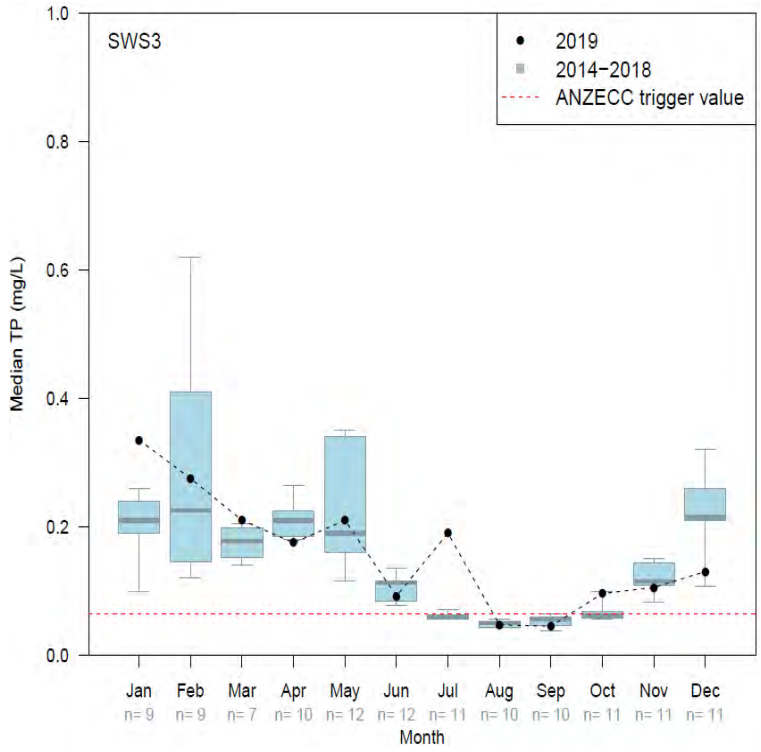

Figure 325. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS3. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

SWS3 filterable reactive phosphorus (FRP)

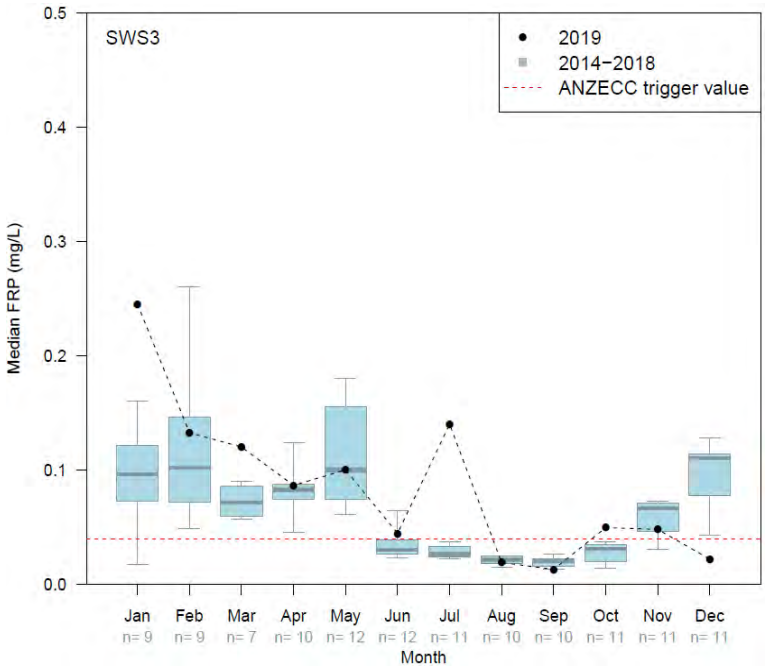

Figure 326. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS3. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

SWS3 dissolved organic carbon (DOC)

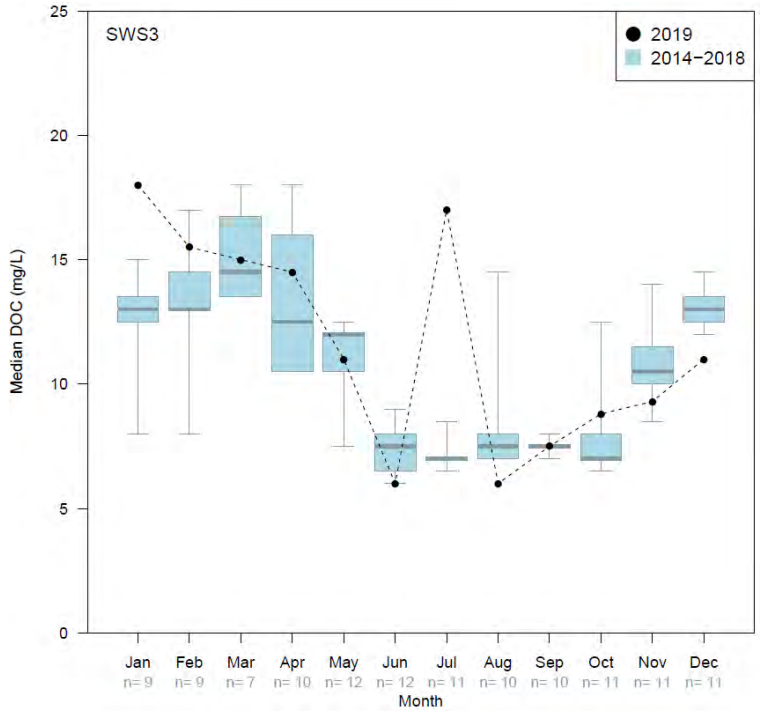

Figure 327. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS3. Number of samples (n) is provided for the historical data.

SWS3 total suspended solids (TSS)

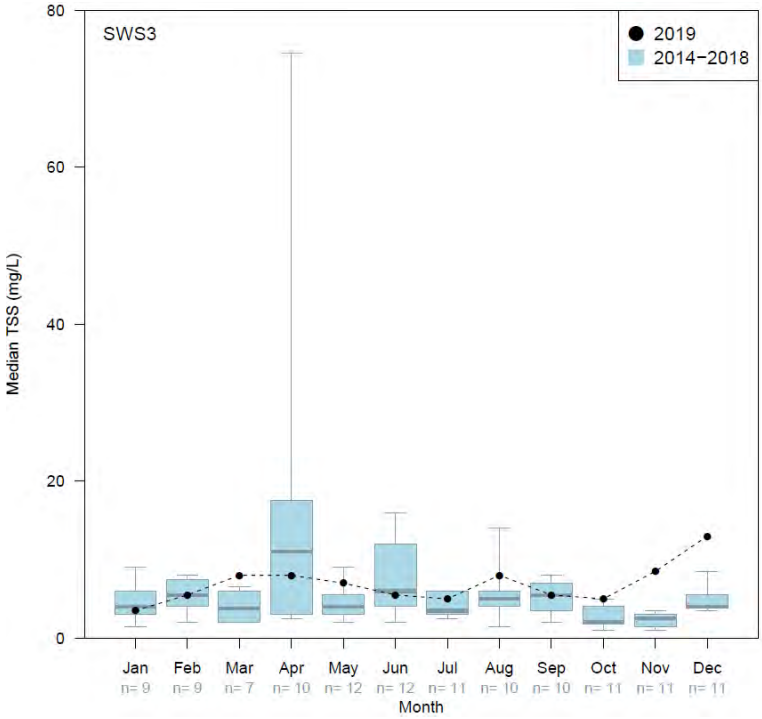

Figure 328. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS3. Number of samples (n) is provided for the historical data.

SWS3 dissolved oxygen (DO)

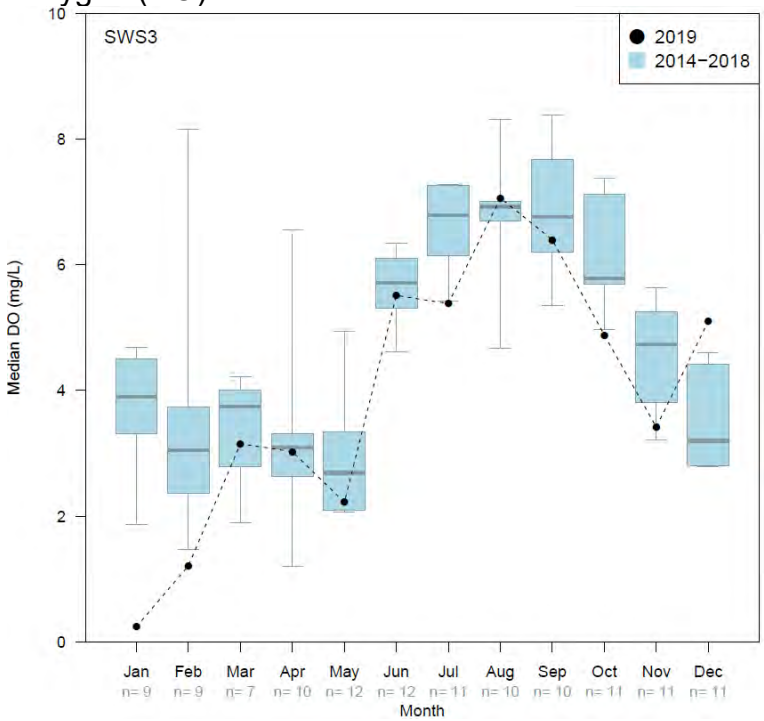

Figure 329. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS3. Number of samples (n) is provided for the historical data.

SWS3 specific conductivity (Sp. cond)

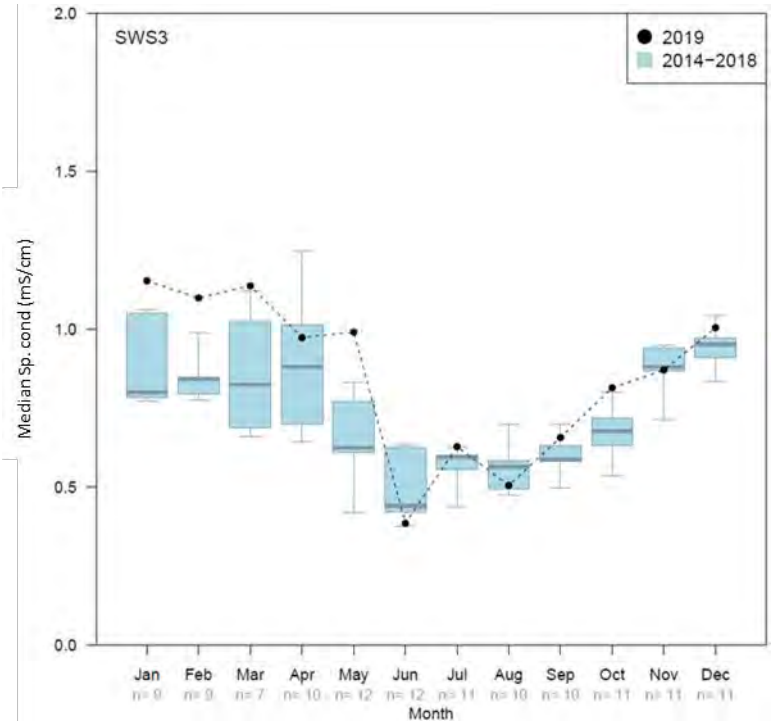

Figure 330. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site SWS3. Number of samples (n) is provided for the historical data.

Table 34. 2019 monthly sample numbers, minimum and maximum values at SWS3.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	2	2	1	2	3	2	1	2	2	3	2	1
min	1.100	1.100	5.900	1.300	0.890	0.630	1.400	0.760	0.710	0.660	0.560	0.680
max	1.300	1.100	5.900	1.400	2.100	0.750	1.400	0.880	0.930	0.800	0.790	0.680
med	**1.200**	**1.100**	**5.900**	**1.350**	**1.000**	**0.690**	**1.400**	**0.820**	**0.820**	**0.730**	**0.675**	**0.680**
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	1	2	3	2	1	2	2	3	2	1
min	0.190	0.037	5.200	0.290	0.140	0.005	0.290	0.011	0.005	0.042	0.017	0.016
max	0.200	0.041	5.200	0.490	1.000	0.035	0.290	0.012	0.046	0.230	0.130	0.016
med	**0.195**	**0.039**	**5.200**	**0.390**	**0.410**	**0.020**	**0.290**	**0.012**	**0.026**	**0.136**	**0.074**	**0.016**
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	1	2	3	2	1	2	2	3	2	1
min	0.005	0.005	0.005	0.019	0.048	0.200	0.270	0.390	0.280	0.065	0.005	0.005
max	0.005	0.005	0.005	0.019	0.330	0.250	0.270	0.500	0.550	0.100	0.074	0.005
med	**0.005**	**0.005**	**0.005**	**0.019**	**0.220**	**0.225**	**0.270**	**0.445**	**0.415**	**0.083**	**0.040**	**0.005**
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	1	2	3	2	1	2	2	3	2	1
min	0.610	0.680	0.580	0.690	0.380	0.290	0.690	0.230	0.310	0.400	0.480	0.580
max	0.670	0.690	0.580	0.740	0.500	0.310	0.690	0.250	0.320	0.410	0.510	0.580
med	**0.640**	**0.685**	**0.580**	**0.715**	**0.440**	**0.300**	**0.690**	**0.240**	**0.315**	**0.405**	**0.495**	**0.580**
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	1	2	3	2	1	2	2	3	2	1
min	0.320	0.270	0.210	0.130	0.170	0.084	0.190	0.042	0.045	0.096	0.091	0.130
max	0.350	0.280	0.210	0.220	0.230	0.100	0.190	0.053	0.045	0.096	0.120	0.130
med	**0.335**	**0.275**	**0.210**	**0.175**	**0.210**	**0.092**	**0.190**	**0.048**	**0.045**	**0.096**	**0.106**	**0.130**
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	1	2	3	2	1	2	2	3	2	1
min	0.220	0.085	0.120	0.033	0.074	0.044	0.140	0.016	0.010	0.047	0.047	0.022
max	0.270	0.180	0.120	0.140	0.120	0.045	0.140	0.022	0.016	0.052	0.049	0.022
med	**0.245**	**0.133**	**0.120**	**0.087**	**0.100**	**0.045**	**0.140**	**0.019**	**0.013**	**0.050**	**0.048**	**0.022**
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	1	2	3	2	1	2	2	3	2	1
min	17.00	14.00	15.00	13.00	10.00	6.00	17.00	6.00	7.00	8.70	8.600	11.00
max	19.00	17.00	15.00	16.00	13.00	6.00	17.00	6.00	8.00	8.90	10.00	11.00
med	**18.00**	**15.50**	**15.00**	**14.50**	**11.00**	**6.00**	**17.00**	**6.00**	**7.50**	**8.80**	**9.300**	**11.00**
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	1	2	3	2	1	2	2	3	2	1
min	3.000	3.000	8.000	4.000	5.000	5.000	5.000	6.000	4.000	4.000	2.000	13.00
max	4.000	8.000	8.000	12.00	9.000	6.000	5.000	10.00	7.000	6.000	15.00	13.00
med	**3.500**	**5.500**	**8.000**	**8.000**	**7.000**	**5.500**	**5.000**	**8.000**	**5.500**	**5.000**	**8.500**	**13.00**
DO (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	1	2	3	2	1	2	2	3	2	1
min	0.130	1.120	3.150	1.920	1.290	4.880	5.380	6.990	5.340	4.390	2.930	5.100
max	0.350	1.300	3.150	4.130	4.330	6.140	5.380	7.130	7.450	5.000	3.900	5.100
med	**0.240**	**1.210**	**3.150**	**3.025**	**2.220**	**5.510**	**5.380**	**7.060**	**6.395**	**4.880**	**3.415**	**5.100**
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	2	2	1	2	3	2	1	2	2	3	2	1
min	1.144	1.098	1.137	0.951	0.837	0.318	0.628	0.384	0.534	0.739	0.804	1.005
max	1.162	1.099	1.137	0.995	0.996	0.452	0.628	0.626	0.780	0.965	0.937	1.005
med	**1.153**	**1.099**	**1.137**	**0.973**	**0.991**	**0.385**	**0.628**	**0.505**	**0.657**	**0.814**	**0.871**	**1.005**

NB: Daily discharge data is not available for SWS3 as this site is not gauged.

In 2019, concentrations of TN and NH_3-N generally followed the trends of background data apart from highly elevated concentrations in March and slightly elevated concentrations in July (Figure 321 and 322). Concentrations of NO_x-N in 2019 generally followed the seasonal trend of background data, although the elevated concentrations from mid-winter to early spring were towards the lower extent or below the historic range (Figure 323). Concentrations of DOrgN typically followed the trend of background data, except for highly elevated concentrations in July 2019, a trend that was also exhibited by DOC (Figures 324 and 327). Concentrations of TP and FRP were within the range of background data, except for elevated concentrations in January, March, and July, with the latter likely the result of winter rainfall and increased surface runoff from the catchment (Figure 325, 326 and 341).

The concentrations of TN in 2019 remained below the ANZECC trigger value for lowland rivers of 1.2 mg/L, except in March, April, and June (Figure 321). The concentration of NO_x-N exceeded its trigger value of 0.15 mg/L between May and September (Figure 323). TP and FRP concentrations exceeded their respective trigger values of 0.065 mg/L and 0.04 mg/L, except in August and September, and December for FRP (Figures 325 and 326).

TSS was generally within the historic range but increased beyond the upper limit of that range in November and December (Figure 328). Dissolved oxygen concentrations were <2 mg/L in January and February 2019, but otherwise generally followed the trend of the highly variable background data (Figure 329, Table 34). Specific conductivity was also consistent with historic values, except from January to March and in May, when elevated values were recorded (Figure 330).

33. Mount's Bay Main Drain (CCDRMBRD)

CCDRMBRD total nitrogen (TN)

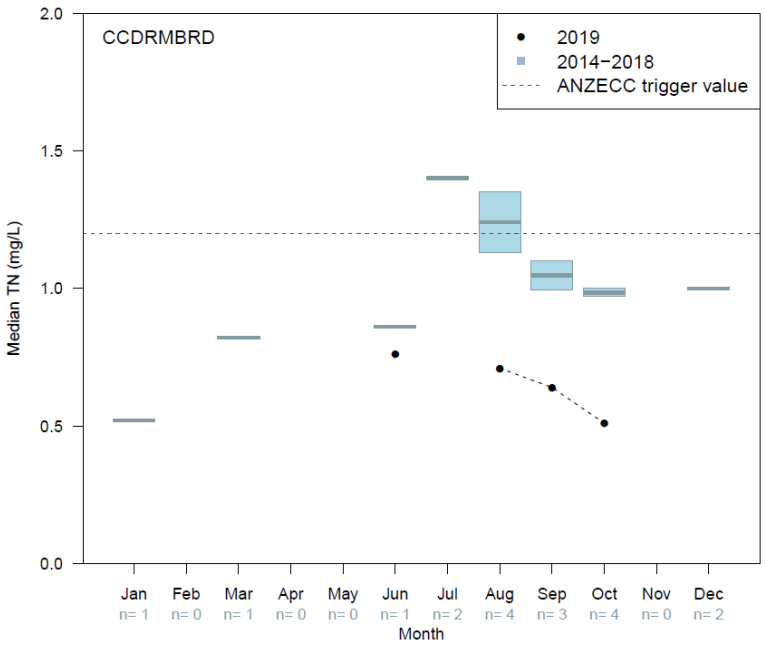

Figure 331. Monthly median total nitrogen (TN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CCDRMBRD. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TN is provided for comparison against the current and historical data (red dotted line).

CCDRMBRD ammoniacal nitrogen (NH_3-N)

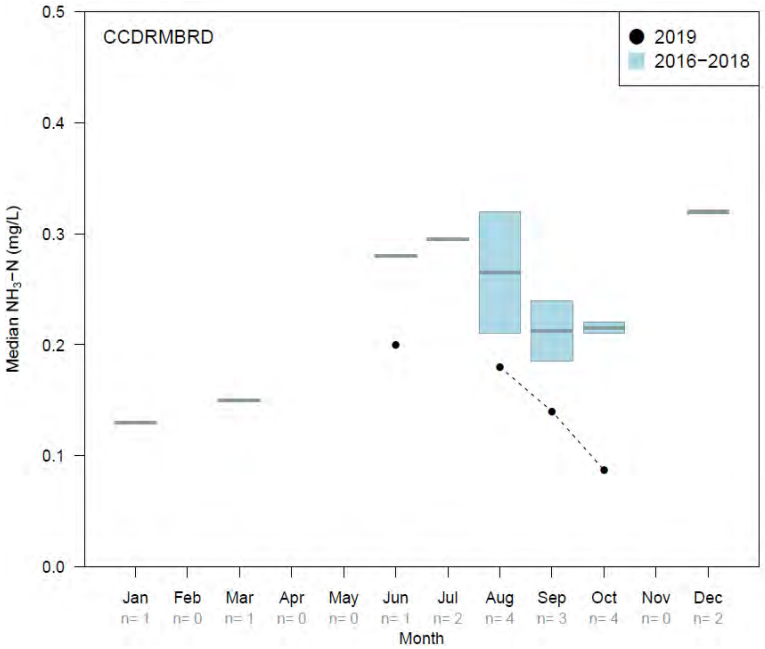

Figure 332. Monthly median ammoniacal nitrogen (NH_3-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CCDRMBRD. Number of samples (n) is provided for the historical data.

CCDRMBRD total oxidised nitrogen (NO_x-N)

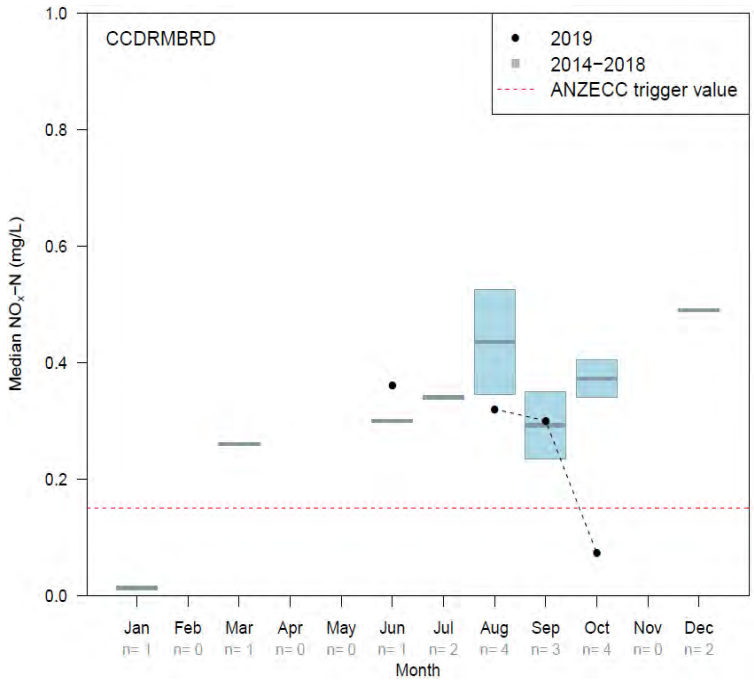

Figure 333. Monthly median total oxidised nitrogen (NO_x-N) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CCDRMBRD. Number of samples (n) is provided for the historical data. The ANZECC trigger value for NO_x-N is provided for comparison against the current and historical data (red dotted line).

CCDRMBRD dissolved organic nitrogen (DOrgN)

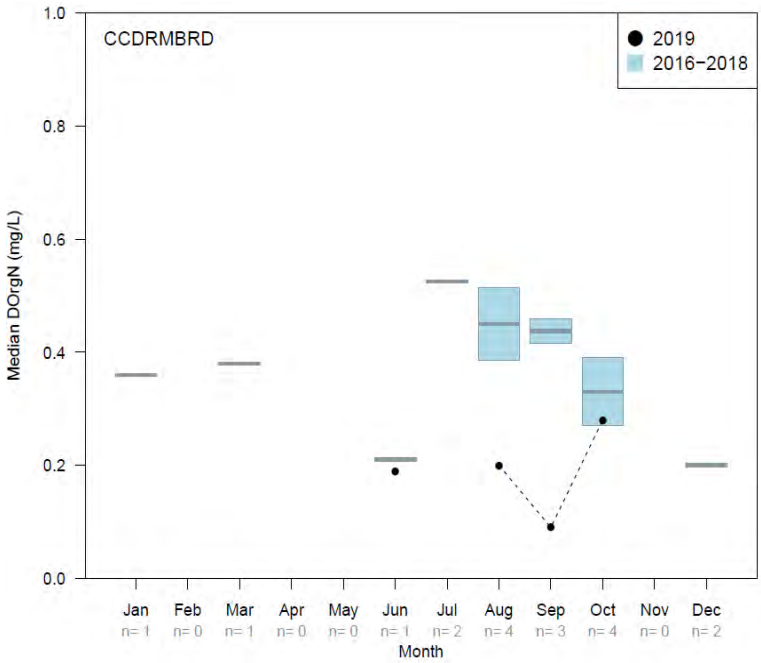

Figure 334. Monthly median dissolved organic nitrogen (DOrgN) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CCDRMBRD. Number of samples (n) is provided for the historical data.

CCDRMBRD total phosphorus (TP)

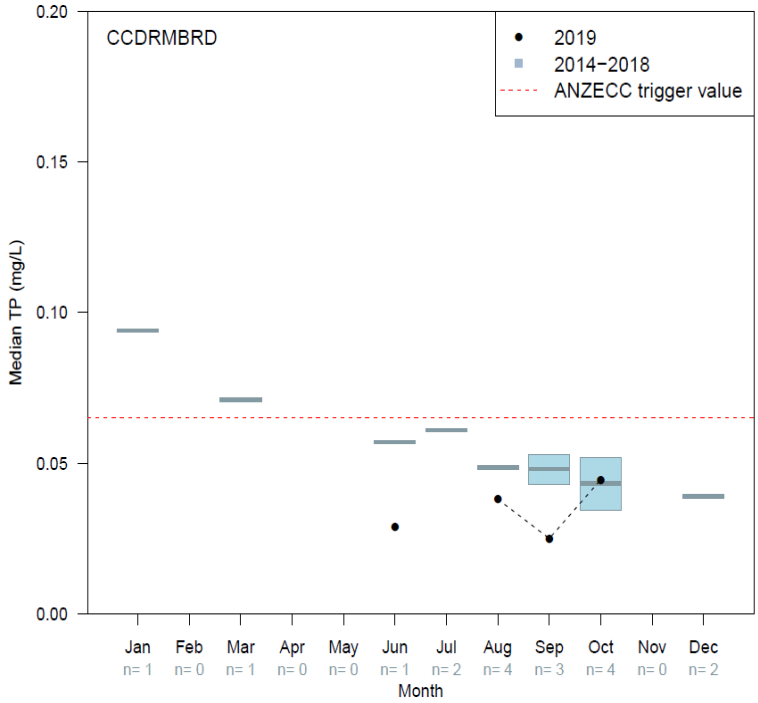

Figure 335. Monthly median total phosphorus (TP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CCDRMBRD. Number of samples (n) is provided for the historical data. The ANZECC trigger value for TP is provided for comparison against the current and historical data (red dotted line).

CCDRMBRD filterable reactive phosphorus (FRP)

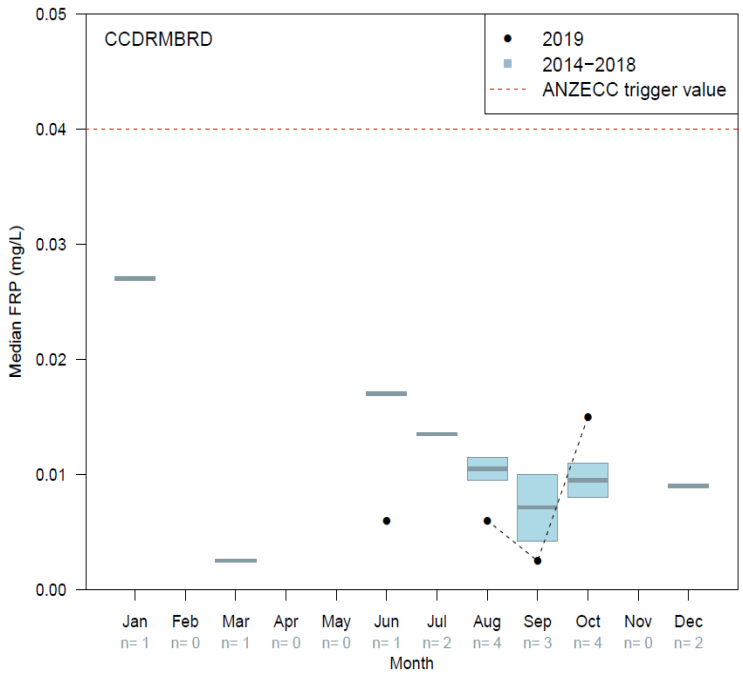

Figure 336. Monthly median filterable reactive phosphorus (FRP) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CCDRMBRD. Number of samples (n) is provided for the historical data. The ANZECC trigger value for FRP is provided for comparison against the current and historical data (red dotted line).

CCDRMBRD dissolved organic carbon (DOC)

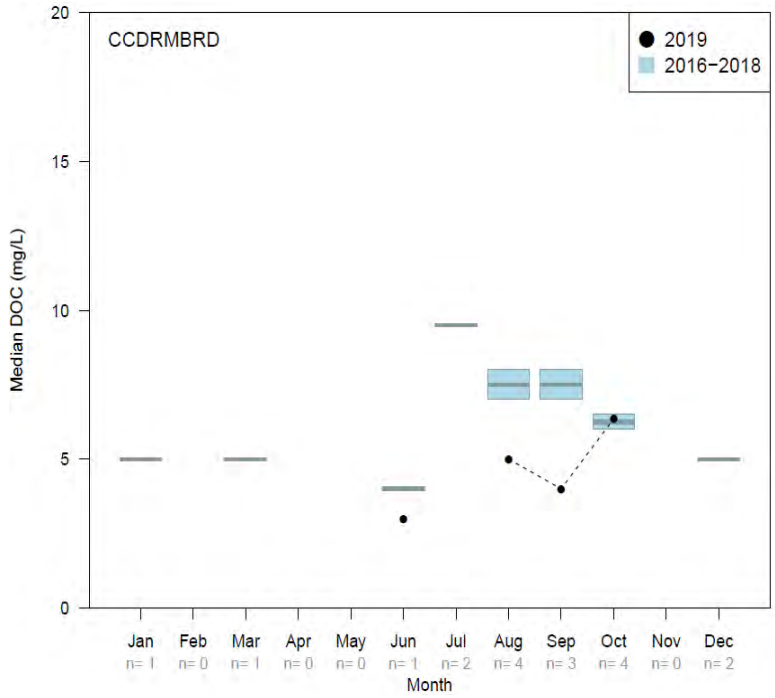

Figure 337. Monthly median dissolved organic carbon (DOC) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CCDRMBRD. Number of samples (n) is provided for the historical data.

CCDRMBRD total suspended solids (TSS)

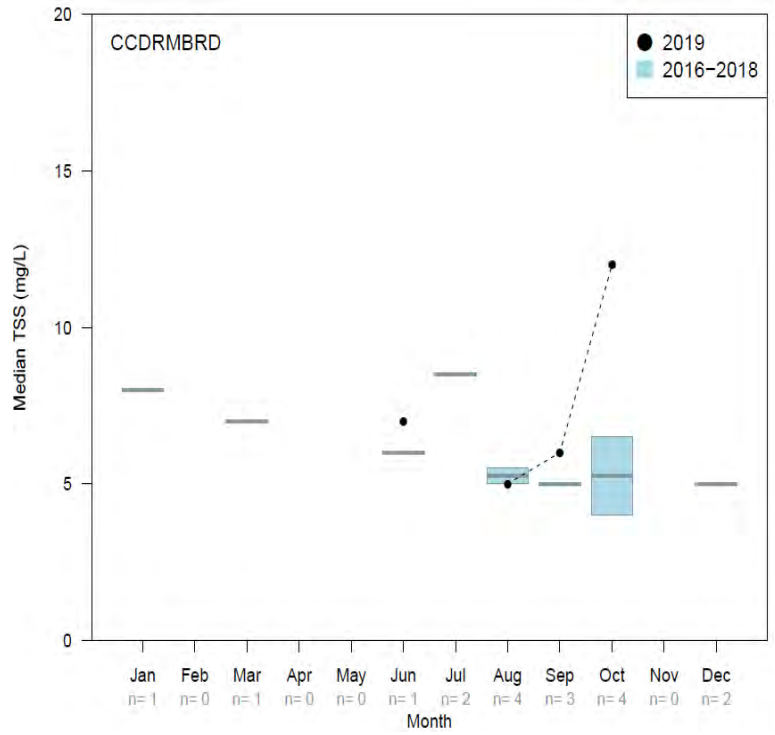

Figure 338. Monthly median total suspended solids (TSS) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CCDRMBRD. Number of samples (n) is provided for the historical data.

CCDRMBRD dissolved oxygen (DO)

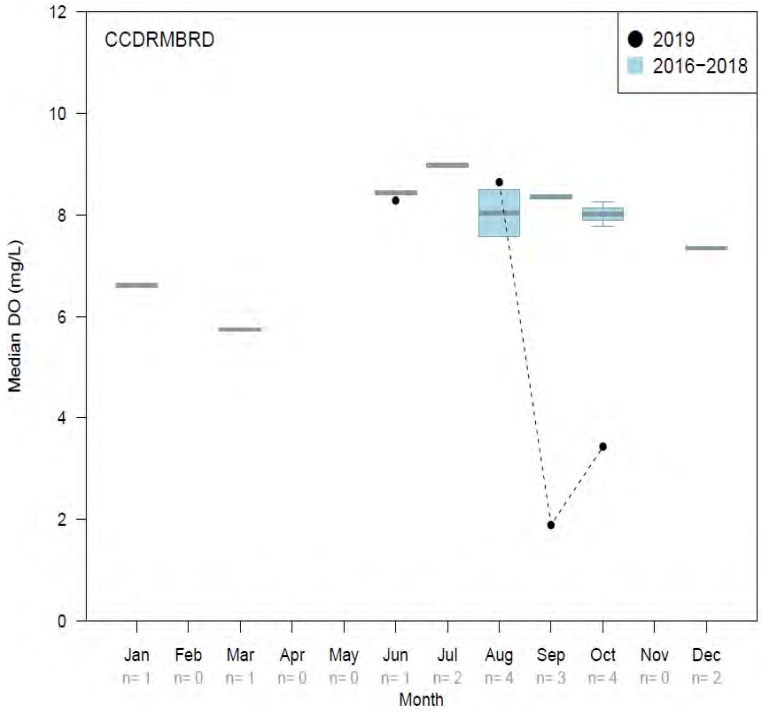

Figure 339. Monthly median dissolved oxygen (DO) (mg/L) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CCDRMBRD. Number of samples (n) is provided for the historical data.

CCDRMBRD specific conductivity (Sp. cond)

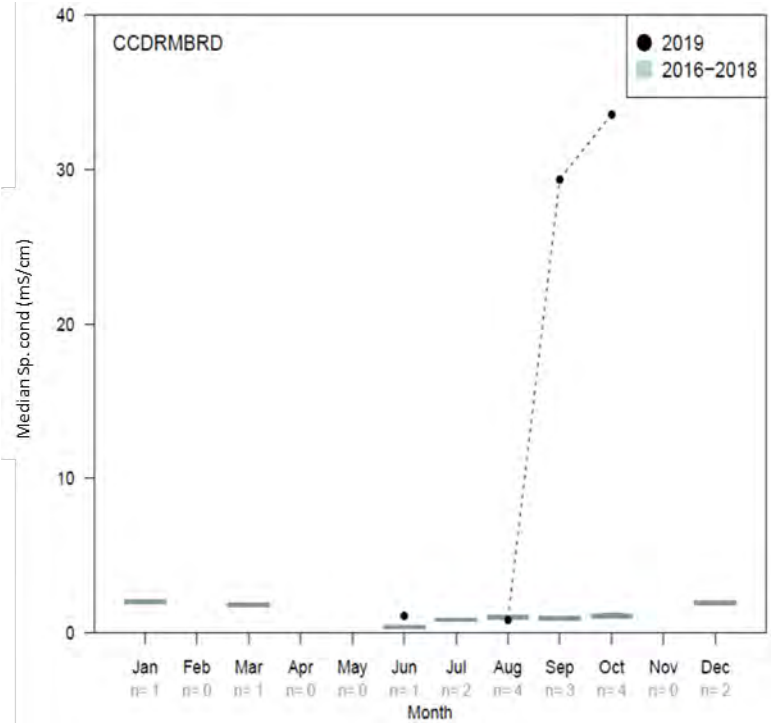

Figure 340. Monthly median specific conductivity (Sp. cond) (mS/cm) in 2019 (line graph) and monthly medians, 25th, 75th, 10th and 90th percentiles for the period 2014-2018 (box plot) for site CCDRMBRD. Number of samples (n) is provided for the historical data.

Table 35. 2019 monthly sample numbers, minimum and maximum values at CCDRMBRD.

TN (mg/L)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
n	0	0	0	0	0	1	0	1	1	3	0	0
min						0.760		0.710	0.640	0.450		
max						0.760		0.710	0.640	0.570		
med						**0.760**		**0.710**	**0.640**	**0.510**		
NH_3-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	0	1	1	3	0	0
min						0.200		0.180	0.140	0.082		
max						0.200		0.180	0.140	0.092		
med						**0.200**		**0.180**	**0.140**	**0.087**		
NO_x-N (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	0	1	1	3	0	0
min						0.360		0.320	0.300	0.051		
max						0.360		0.320	0.300	0.095		
med						**0.360**		**0.320**	**0.300**	**0.073**		
DOrgN (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	0	1	1	3	0	0
min						0.190		0.200	0.090	0.260		
max						0.190		0.200	0.090	0.300		
med						**0.190**		**0.200**	**0.090**	**0.280**		
TP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	0	1	1	3	0	0
min						0.029		0.038	0.025	0.034		
max						0.029		0.038	0.025	0.055		
med						**0.029**		**0.038**	**0.025**	**0.045**		
FRP (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	0	1	1	3	0	0
min						0.006		0.006	0.003	0.009		
max						0.006		0.006	0.003	0.021		
med						**0.006**		**0.006**	**0.003**	**0.015**		
DOC (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	0	1	1	3	0	0
min						3.000		5.000	4.000	5.700		
max						3.000		5.000	4.000	7.000		
med						**3.000**		**5.000**	**4.000**	**6.350**		
TSS (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	0	1	1	3	0	0
min						7.000		5.000	6.000	7.000		
max						7.000		5.000	6.000	17.00		
med						**7.000**		**5.000**	**6.000**	**12.00**		
DO (mg/L)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	0	1	1	3	0	0
min						8.280		8.650	1.890	2.330		
max						8.280		8.650	1.890	4.520		
med						**8.280**		**8.650**	**1.890**	**3.425**		
Sp. cond (mS/cm)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
n	0	0	0	0	0	1	0	1	1	3	0	0
min						1.081		0.850	29.380	28.798		
max						1.081		0.850	29.380	38.393		
med						**1.081**		**0.850**	**29.380**	**33.595**		

NB: Daily discharge data is not available for CCDRMBRD as this site is not gauged. The collection of data from this site began in 2016 and, as such, background data are medians calculated for 2016-2018, rather than 2014-2018 as with other sites. The access point for this drain is within the Perth Convention Centre car park and sampling is dependent on whether the site can be accessed. This site is also heavily influenced by tidal height within the estuary and sampling can only take place during a low tide when the drain is flowing freely. Specific conductivity indicates that samples collected in September and October were influenced by estuarine waters and this data should be disregarded (Figure 340, Table 35). Infrequent access to this site and unfavourable tides have resulted in only two samples (June and August) being available for 2019.

Concentration of TN, TP and FRP in June and August were well below the respective ANZECC trigger value for lowland rivers of 1.2 mg/L, 0.065 mg/L and 0.04 mg/L (Figure 331, 335 and 336). The concentration of NO_x-N however exceeded its trigger value of 0.15 mg/L in the single sampling event in each of those months (Figure 333).

DOC was below the range of the limited background data for both June and August, whereas TSS and DO concentrations were similar to the available background data (Figures 337-339).

34. SWANCATCH/SCWQIP data comparison

Table 36 2019 mean ± standard deviation for all SWANCATCH (bold) and SCWQIP (regular font) sites.

	TN		NH_3-N		NO_x-N		DOrgN		TP		FRP		DOC		TSS		DO		Specific Conductivity	
Site	**Mean**	**SD (±)**	**Mean**	**SD (±)**	**Mean**	**SD (±)**	**Mean**	**SD (±)**	**Mean**	**SD (±)**	**Mean**	**SD (±)**	**Mean**	**SD (±)**	**Mean**	**SD (±)**	**Mean**	**SD (±)**	**Mean**	**SD (±)**
SWN5	1.050	0.060	0.040	0.010	0.210	0.020	0.710	0.010	0.020	0.010	0.010	0.000	14.480	0.340	8.560	4.280	8.950	0.340	11.400	1.290
SWS2	1.380	0.190	0.090	0.040	0.290	0.090	0.870	0.090	0.090	0.010	0.050	0.010	21.720	2.170	9.100	1.920	6.080	0.430	0.850	0.150
SWS10	1.140	0.090	0.160	0.010	0.380	0.030	0.490	0.050	0.060	0.010	0.020	0.000	14.030	0.760	9.040	1.930	8.500	0.170	0.700	0.060
SWN12	1.020	0.100	0.040	0.000	0.260	0.040	0.630	0.060	0.050	0.010	0.030	0.000	16.820	0.580	5.320	1.050	6.830	0.190	0.600	0.040
SWS4	1.150	0.240	0.030	0.000	0.520	0.150	0.510	0.060	0.070	0.010	0.030	0.000	11.310	0.860	2.610	0.640	4.950	0.730	1.080	0.140
SWN8	0.850	0.170	0.020	0.000	0.340	0.120	0.450	0.080	0.030	0.010	0.020	0.000	8.830	0.930	1.530	0.760	7.830	1.010	1.120	0.260
SCCIS2	0.840	0.070	0.090	0.020	0.070	0.020	0.630	0.050	0.080	0.020	0.050	0.010	19.220	0.730	3.760	2.340	6.750	0.730	0.700	0.020
BAMDKD	0.940	0.110	0.080	0.020	0.110	0.050	0.650	0.070	0.130	0.020	0.090	0.020	17.690	1.680	4.440	2.190	5.280	0.830	0.660	0.080
CB13	1.100	0.080	0.160	0.060	0.640	0.040	0.220	0.060	0.040	0.010	0.010	0.000	5.710	0.250	3.600	0.990	9.820	0.790	0.730	0.020
SWN3	2.480	0.160	0.090	0.010	0.110	0.010	2.090	0.170	0.470	0.020	0.350	0.020	42.720	2.310	11.470	1.250	6.430	0.620	1.790	0.320
SWN9	1.410	0.180	0.030	0.000	0.130	0.030	1.170	0.180	0.160	0.020	0.110	0.010	26.890	2.270	4.280	1.480	4.300	0.720	1.100	0.170
EBGS01	0.600	0.050	0.150	0.010	0.010	0.010	0.330	0.030	0.070	0.000	0.030	0.000	9.380	0.880	12.440	0.800	4.870	0.740	0.700	0.050
SWN10	0.740	0.060	0.170	0.040	0.160	0.040	0.360	0.050	0.020	0.000	0.010	0.000	8.400	0.600	9.300	2.960	4.080	0.700	1.160	0.260
SCCIS4	1.230	0.240	0.030	0.010	0.320	0.120	0.770	0.120	0.080	0.010	0.030	0.010	11.790	1.180	9.460	1.360	7.150	1.510	2.020	0.160
HBBROCK	1.060	0.060	0.110	0.010	0.120	0.020	0.710	0.020	0.060	0.000	0.030	0.000	15.130	0.480	11.910	2.080	7.400	0.200	0.630	0.010
SWN7	0.700	0.050	0.050	0.010	0.310	0.030	0.250	0.040	0.030	0.010	0.020	0.010	6.370	0.350	2.500	0.590	6.410	0.200	0.810	0.070
SCCIS3	1.240	0.140	0.040	0.010	0.440	0.100	0.670	0.080	0.220	0.030	0.180	0.030	14.430	0.780	4.350	3.450	5.310	0.900	0.960	0.070
MIMDOUT	0.830	0.020	0.050	0.010	0.400	0.020	0.350	0.010	0.020	0.000	0.010	0.000	12.550	0.780	0.870	0.100	8.500	0.030	0.790	0.090
SWS1	0.850	0.150	0.100	0.040	0.140	0.030	0.480	0.050	0.170	0.040	0.110	0.020	11.750	1.300	6.280	2.520	6.070	0.400	0.540	0.080
CCDRMBRD	0.520	0.020	0.120	0.000	0.210	0.010	0.150	0.010	0.030	0.000	0.010	0.000	3.670	0.180	6.000	1.410	4.450	0.310	12.980	1.360
SCCIS12	0.510	0.080	0.020	0.010	0.090	0.020	0.340	0.060	0.020	0.000	0.010	0.000	9.330	1.250	7.030	1.570	8.190	0.820	0.550	0.100
KANAV	0.850	0.060	0.030	0.010	0.120	0.040	0.640	0.040	0.030	0.000	0.010	0.000	21.470	1.370	5.280	3.910	9.390	0.610	0.640	0.040
SCCIN3	2.180	0.040	0.050	0.000	0.110	0.040	1.940	0.050	0.090	0.010	0.050	0.010	47.300	2.130	5.070	1.900	7.410	0.260	0.830	0.030
SWS13	0.950	0.060	0.080	0.020	0.260	0.020	0.530	0.030	0.120	0.010	0.090	0.010	13.920	0.350	3.920	1.300	7.360	0.220	0.660	0.090
SCCIS1	0.800	0.110	0.240	0.060	0.070	0.020	0.350	0.040	0.020	0.010	0.000	0.000	10.330	0.450	9.900	3.420	2.680	0.550	0.500	0.030
WIFRD	1.620	0.540	0.160	0.050	0.310	0.100	1.050	0.350	0.180	0.070	0.120	0.020	27.980	7.050	8.110	8.760	7.190	0.140	0.510	0.050
SWS7	1.100	0.100	0.040	0.000	0.280	0.040	0.670	0.030	0.140	0.010	0.090	0.010	19.150	1.600	8.130	1.910	5.950	0.260	0.830	0.080
AW05	0.270	0.040	0.010	0.000	0.090	0.030	0.140	0.030	0.010	0.000	0.010	0.000	3.280	0.050	1.830	0.820	10.460	0.190	0.320	0.020
SWN11	0.710	0.100	0.030	0.000	0.360	0.060	0.240	0.040	0.020	0.000	0.010	0.000	6.430	0.250	1.630	0.180	7.280	0.760	0.610	0.070
SWS12	0.390	0.060	0.020	0.000	0.160	0.040	0.160	0.020	0.020	0.000	0.010	0.000	4.050	0.300	1.790	0.880	6.740	0.390	0.570	0.080
CSMDREID	0.980	0.140	0.050	0.010	0.350	0.090	0.530	0.070	0.140	0.030	0.080	0.020	13.040	1.260	7.100	2.960	8.890	1.380	0.840	0.050
WNDCK	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SWS3	1.390	0.120	0.580	0.070	0.140	0.040	0.510	0.020	0.160	0.010	0.080	0.020	11.660	0.750	6.880	2.350	3.990	0.570	0.820	0.090

35. Perth rainfall

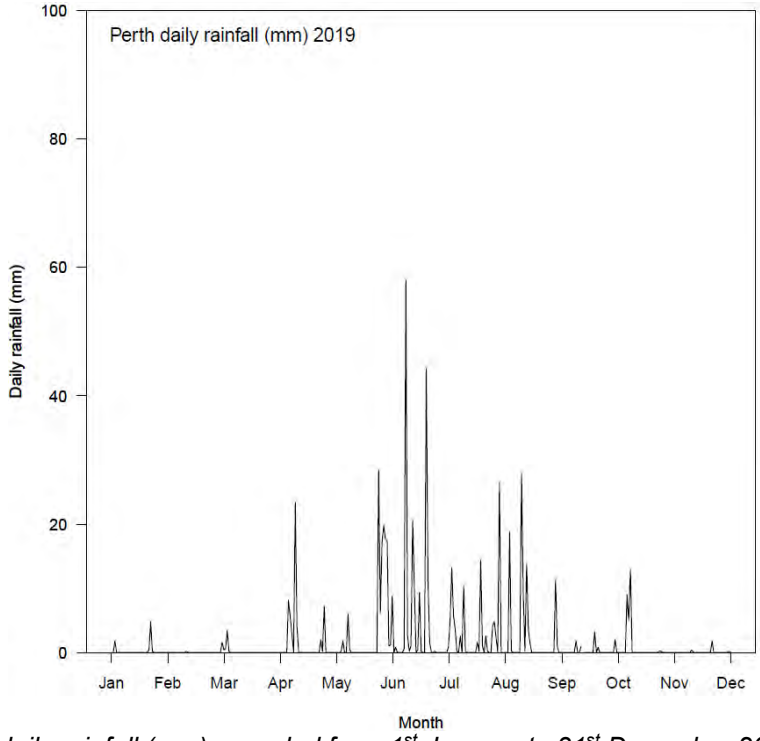

Figure 341. Perth daily rainfall (mm) recorded from 1st January to 31st December 2019 recorded by the Bureau of Meteorology at the Perth Metro station (009225).

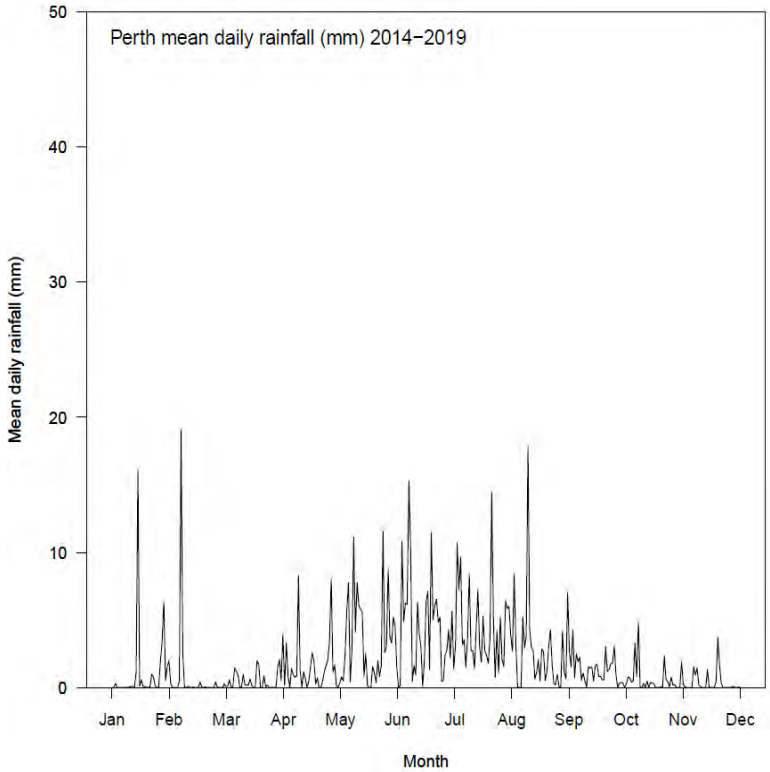

Figure 342. Perth mean daily rainfall (mm) recorded from the 1 January 2014 to 31 December 2019 recorded by the Bureau of Meteorology at Perth Metro station (009225). The unseasonal summer rainfall events of 2017 and 2018 are apparent.

36. Appendices

Appendix A: Swan-Canning Catchment Monitoring Program Quality Control Sampling Report SG-C-SWANCATCH 2019

Background

As part of the SG-C-SWANCATCH sampling program quality control samples are collected quarterly. These comprise of a field blank, a field replicate and a field duplicate sample collected from a randomly selected site.

The field blank was collected by taking deionised (DI) water into the field and, at the randomly selected site, filling a full set of sample bottles with the DI water using standard sampling protocols (e.g. parameters that would ordinarily be filtered prior to analysis were filtered).

The field replicate was collected by taking a second set of samples directly after the routine samples at the randomly selected site.

The field duplicate was collected by taking a large, clean, container into the field. At the randomly selected site it was rinsed with sample water and filled. It was then inverted several times to homogenise the sample after which the sample bottles are filled (with parameters requiring filtering, being filtered).

Quality Control Data 23rd January 2019

Using a random site selection strategy, SWS13 (South Belmont Main Drain) was selected as the site at which to collect quality control samples. No problems with the sampling equipment used to collect the chemical samples were recorded.

Blank Sample

A field blank sample was collected.

Table 37 Results of blank QC sample analysis

Parameter	LOR (mg/L)	Blank sample (mg/L)
SWS13 DOC	1.000	**<1**
SWS13 DON	0.025	**<0.025**
SWS13 NO_x-N	0.010	**<0.01**
SWS13 TN-N	0.025	**<0.025**
SWS13 NH_3-N	0.010	**<0.01**
SWS13 TP	0.005	**<0.005**
SWS13 FRP	0.005	**<0.005**
SWS13 TSS	**1.000**	**<1**

All parameters recorded concentrations below their respective LORs.

Replicate Sample

A replicate sample was collected for all chemical parameters monitored in this program; results are shown in Table 38, below.

Table 38 Results of Replicate QC sample analysis

Parameter	LOR (mg/L)	Original Sample (mg/L)	Replicate Sample (mg/L)	RPD
SWS13 DOC	1.000	27.000	27.000	**0**
SWS13 DON	0.025	0.640	0.630	**2**
SWS13 NO_x-N	0.010	0.200	0.200	**0**
SWS13 TN-N	0.025	1.300	1.200	**8**
SWS13 NH_3-N	0.010	0.044	0.047	**7**
SWS13 TP	0.005	0.190	0.190	**0**
SWS13 FRP	0.005	0.140	0.140	**0**
SWS13 TSS	**1.000**	**7.000**	**8.000**	**13**

The maximum acceptable relative percentage difference (RPD) is 44% where the concentration is greater than 5 times the LOR. All the RPD's returned were within this range.

Duplicate Sample

A duplicate sample was collected for all chemical parameters monitored in this program; results are shown in Table 39, below.

Table 39 Results of Duplicate QC sample analysis

Parameter	LOR (mg/L)	Duplicate Sample #1 (mg/L)	Duplicate Sample #2 (mg/L)	RPD
SWS13 DOC	1.000	26.000	26.000	**0**
SWS13 DON	0.025	0.540	0.530	**2**
SWS13 NO_x-N	0.010	0.200	0.200	**0**
SWS13 TN-N	0.025	1.200	1.200	**0**
SWS13 NH_3-N	0.010	0.042	0.041	**2**
SWS13 TP	0.005	0.190	0.200	**5**
SWS13 FRP	0.005	0.130	0.140	**7**
SWS13 TSS	**1.000**	**7.000**	**7.000**	**0**

The maximum acceptable RPD is 44% where the concentration is greater than 5 times the LOR. All the RPD's returned were within this range.

Summary

All the QC samples collected in January 2019 were acceptable.

Quality Control Data 3rd April 2019

Using a random site selection strategy, SWS7 (Southern River) was selected as the site at which to collect quality control samples. No problems with the sampling equipment used to collect the chemical samples were recorded.

Blank Sample

A field blank sample was collected.

Table 40 Results of blank QC sample analysis

Parameter	LOR (mg/L)	Blank sample (mg/L)
SWS7 DOC	1.000	**<1**
SWS7 DON	0.025	**<0.025**
SWS7 NO_x-N	0.010	**no data**
SWS7 TN-N	0.025	**<0.025**
SWS7 NH_3-N	0.010	**<0.01**
SWS7 TP	0.005	**<0.005**
SWS7 FRP	0.005	**<0.005**
SWS7 TSS	**1.000**	**<1**

All parameters recorded concentrations below their respective LORs.

Replicate Sample

A replicate sample was collected for all chemical parameters monitored in this program; results are shown in Table 41, below.

Table 41 Results of Replicate QC sample analysis

Parameter	LOR (mg/L)	Original Sample (mg/L)	Replicate Sample (mg/L)	RPD
SWS7 DOC	1.000	15.000	15.000	**0**
SWS7 DON	0.025	0.460	0.490	**6**
SWS7 NO_x-N	0.010	no data	no data	**n/a**
SWS7 TN-N	0.025	0.620	0.650	**5**
SWS7 NH_3-N	0.010	0.032	0.032	**0**
SWS7 TP	0.005	0.180	0.180	**0**
SWS7 FRP	0.005	0.100	0.110	**10**
SWS7 TSS	**1.000**	**8.000**	**6.000**	**29**

The maximum acceptable RPD is 44% where the concentration is greater than 5 times the LOR. Where data were available, all the RPD's returned were within this range.

Duplicate Sample

A duplicate sample was collected for all chemical parameters monitored in this program; results are shown in Table 42, below.

Table 42 Results of Duplicate QC sample analysis

Parameter	LOR (mg/L)	Duplicate Sample #1 (mg/L)	Duplicate Sample #2 (mg/L)	RPD
SWS7 DOC	1.000	15.000	15.000	**0**
SWS7 DON	0.025	0.470	0.470	**0**
SWS7 NO_x-N	0.010	no data	no data	**n/a**
SWS7 TN-N	0.025	0.620	0.630	**2**
SWS7 NH_3-N	0.010	0.031	0.030	**3**
SWS7 TP	0.005	0.180	0.180	**0**
SWS7 FRP	0.005	0.100	0.110	**10**
SWS7 TSS	**1.000**	**6.000**	**6.000**	**0**

The maximum acceptable RPD is 44% where the concentration is greater than 5 times the LOR. Where data were available, all the RPD's returned were within this range.

Summary

All the QC samples collected in April 2019 were acceptable.

Quality Control Data 24th July 2019

Using a random site selection strategy, SWN5 (AVON River) was selected as the site at which to collect quality control samples. No problems with the sampling equipment used to collect the chemical samples were recorded.

Blank Sample

A field blank sample was collected.

Table 43 Results of blank QC sample analysis

Parameter	LOR (mg/L)	Blank sample (mg/L)
SWN5 DOC	1.000	**<1**
SWN5 DON	0.025	**<0.025**
SWN5 NO_x-N	0.010	**0.019**
SWN5 TN-N	0.025	**0.053**

SWN5 NH_3-N	0.010	**<0.01**
SWN5 TP	0.005	**<0.005**
SWN5 FRP	0.005	**<0.005**
SWN5 TSS	**1.000**	**<1**

All parameters recorded concentrations below their respective LORs, except NO_x-N and TN-N.

Replicate Sample

A replicate sample was collected for all chemical analytes monitored in this program; results are shown in Table 44, below.

Table 44 Results of Replicate QC sample analysis

Parameter	LOR (mg/L)	Original Sample (mg/L)	Replicate Sample (mg/L)	RPD
SWN5 DOC	1.000	16.000	16.000	**0**
SWN5 DON	0.025	0.740	0.700	**6**
SWN5 NO_x-N	0.010	0.250	0.290	**15**
SWN5 TN-N	0.025	1.200	1.200	**0**
SWN5 NH_3-N	0.010	0.030	0.032	**6**
SWN5 TP	0.005	0.031	0.020	**43**
SWN5 FRP	0.005	0.009	0.025	**94**
SWN5 TSS	**1.000**	**0.009**	**8.000**	**200**

The maximum acceptable RPD is 44% where the concentration is greater than 5 times the LOR. All the RPDs returned were within this range, except FRP and TSS.

Duplicate Sample

A duplicate sample was collected for all chemical parameters monitored in this program; results are shown in Table 45, below.

Table 45 Results of Duplicate QC sample analysis

Parameter	LOR (mg/L)	Duplicate Sample #1 (mg/L)	Duplicate Sample #2 (mg/L)	RPD
SWN5 DOC	1.000	16.000	16.000	**0**
SWN5 DON	0.025	0.670	0.650	**3**
SWN5 NO_x-N	0.010	0.330	0.340	**3**
SWN5 TN-N	0.025	1.200	1.200	**0**
SWN5 NH_3-N	0.010	0.029	0.029	**0**
SWN5 TP	0.005	0.025	0.026	**4**

SWN5 FRP	0.005	0.025	0.025	**0**
SWN5 TSS	**1.000**	**8.000**	**9.000**	**12**

The maximum acceptable RPD is 44% where the concentration is greater than 5 times the LOR. All the RPD's returned were within this range.

Summary

Field blank samples exceeded the LOR for NO_x-N and TN-N. Replicate samples exceeded the RPDs for FRP and TSS. All remaining QC samples collected in July 2019 were acceptable.

Quality Control Data 16th October 2019

Using a random site selection strategy, SWN3 (Ellen Brook) was selected as the site at which to collect quality control samples. No problems with the sampling equipment used to collect the chemical samples were recorded.

Blank Sample

A field blank sample was collected.

Table 46 Results of blank QC sample analysis

Parameter	LOR (mg/L)	Blank sample (mg/L)
SWN3 DOC	1.000	**<1**
SWN3 DON	0.025	**<0.025**
SWN3 NO_x-N	0.010	**<0.010**
SWN3 TN-N	0.025	**<0.025**
SWN3 NH_3-N	0.010	**<0.010**
SWN3 TP	0.005	**<0.005**
SWN3 FRP	0.005	**<0.005**
SWN3 TSS	**1.000**	**<1**

All parameters recorded concentrations below their LORs.

Replicate Sample

A replicate sample was collected for all chemical parameters monitored in this program; results are shown in Table 47, below.

Table 47 Results of Replicate QC sample analysis

Parameter	LOR (mg/L)	Original Sample (mg/L)	Replicate Sample (mg/L)	RPD
SWN3 DOC	1.000	36.000	39.000	**8**
SWN3 DON	0.025	1.500	1.500	**0**

SWN3 NO_x-N	0.010	0.016	0.012	**29**
SWN3 TN-N	0.025	1.700	1.700	**0**
SWN3 NH_3-N	0.010	0.039	0.038	**3**
SWN3 TP	0.005	0.410	0.380	**8**
SWN3 FRP	0.005	0.320	0.300	**7**
SWN3 TSS	**1.000**	**11.000**	**11.000**	**0**

The maximum acceptable RPD is 44% where the concentration is greater than 5 times the LOR. All the RPD's returned were within this range.

Duplicate Sample

A duplicate sample was collected for all chemical parameters monitored in this program; results are shown in Table 48, below.

Table 48 Results of Duplicate QC sample analysis

Parameter	LOR (mg/L)	Duplicate Sample #1 (mg/L)	Duplicate Sample #2 (mg/L)	RPD
SWN3 DOC	1.000	38.000	38.000	**0**
SWN3 DON	0.025	1.600	1.600	**0**
SWN3 NO_x-N	0.0100	0.020	0.017	**16**
SWN3 TN-N	0.025	1.900	1.900	**0**
SWN3 NH_3-N	0.010	0.047	0.046	**2**
SWN3 TP	0.005	0.430	0.440	**2**
SWN3 FRP	0.005	0.320	0.330	**3**
SWN3 TSS	**1.000**	**15.000**	**17.000**	**13**

The maximum acceptable RPD is 44% where the concentration is greater than 5 times the LOR. All the RPD's returned were within this range.

Summary

All the QC samples collected in October 2019 were acceptable.

Appendix B: Swan-Canning Catchment Monitoring Program Quality Control Sampling Report SG-C-SCWQIP 2019

Background

As part of the SG-C-SCWQIP sampling program quality control samples are collected quarterly. These comprise of a field blank, a field replicate and a field duplicate sample collected from a randomly selected site.

The field blank was collected by taking deionised (DI) water into the field and, at the randomly selected site, filling a full set of sample bottles with the DI water using standard sampling protocols (e.g. parameters that would ordinarily be filtered prior to analysis were filtered).

The field replicate was collected by taking a second set of samples directly after the routine sample at the randomly selected site.

The field duplicate was collected by taking a large, clean, container into the field. At the randomly selected site it is rinsed with sample water and filled. It was then inverted several times to homogenise the sample after which the sample bottles are filled (with parameters requiring filtering being filtered).

Quality Control Data 13th February 2019

Using a random site selection strategy, CSMDREID – Chapman Street Main Drain in the Upper Swan catchment was selected as the site at which to collect quality control samples. No problems with the sampling equipment used to collect the chemical samples were recorded.

Blank Sample

A blank sample was collected.

Table 49 Results of blank QC sample analysis

Parameter	LOR (mg/L)	Blank sample (mg/L)
CB13 DOC	1.000	**<1**
CB13 DON	0.025	**<0.025**
CB13 NO_x-N	0.010	**<0.01**
CB13 TN-N	0.025	**<0.025**
CB13 NH_3-N	0.010	**<0.01**
CB13 TP	0.005	**<0.005**
CB13 FRP	0.005	**<0.005**
CB13 TSS	**1.000**	**<1**

All readings were below the limits of reporting (LOR).

Replicate Sample

A replicate sample was collected for all chemical parameters monitored in this program; results are shown in Table 50, below.

Table 50 Results of Replicate QC sample analysis

Parameter	LOR (mg/L)	Original Sample (mg/L)	Replicate Sample (mg/L)	RPD
CB13 DOC	1.000	13.000	13.000	**0**
CB13 DON	0.025	0.520	0.500	**4**
CB13 NO_x-N	0.010	0.130	0.130	**0**
CB13 TN-N	0.025	0.940	0.900	**4**
CB13 NH_3-N	0.010	0.150	0.160	**6**
CB13 TP	0.005	0.180	0.160	**12**
CB13 FRP	0.005	0.074	0.071	**4**
CB13 TSS	**1.000**	**14.000**	**11.000**	**24**

The maximum acceptable RPD is 44% where the concentration is greater than 5 times the LOR. All the RPD's returned were within this range.

Duplicate Sample

A duplicate sample was collected for all chemical parameters monitored in this program; results are shown in Table 51, below.

Table 51 Results of Duplicate QC sample analysis

Parameter	LOR (mg/L)	Duplicate Sample #1 (mg/L)	Duplicate Sample #2 (mg/L)	RPD
CB13 DOC	1.000	13.000	13.000	**0**
CB13 DON	0.025	0.530	0.530	**0**
CB13 NO_x-N	0.010	0.130	0.130	**0**
CB13 TN-N	0.025	0.840	0.860	**2**
CB13 NH_3-N	0.010	0.130	0.130	**0**
CB13 TP	0.005	0.130	0.130	**0**
CB13 FRP	0.005	0.062	0.062	**0**
CB13 TSS	**1.000**	**7.000**	**7.000**	**0**

The maximum acceptable RPD is 44% where the concentration is greater than 5 times the LOR. All the RPD's returned were within this range.

Summary

The QC samples collected during February 2019 were acceptable.

Quality Control Data 10th April 2019

Using a random site selection strategy, SCCIS2 – Modillion Ave Main Drain (Holmes St access) in the Bull Creek drainage catchment was selected as the site at which to collect quality control samples. No problems with the sampling equipment used to collect the chemical samples were recorded.

Blank Sample

A blank sample was collected.

Table 52 Results of blank QC sample analysis

Parameter	LOR (mg/L)	Blank sample (mg/L)
SCCIS2 DOC	1.000	**<1**
SCCIS2 DON	0.025	**<0.025**
SCCIS2 NO_x-N	0.010	**<0.01**
SCCIS2 TN-N	0.025	**<0.025**
SCCIS2 NH_3-N	0.010	**<0.01**
SCCIS2 TP	0.005	**<0.005**
SCCIS2 FRP	0.005	**<0.005**
SCCIS2 TSS	**1.000**	**<1**

All readings were below the limits of reporting (LOR).

Replicate Sample

A replicate sample was collected for all chemical parameters monitored in this program; results are shown in Table 53, below.

Table 53 Results of Replicate QC sample analysis

Parameter	LOR (mg/L)	Original Sample (mg/L)	Replicate Sample (mg/L)	RPD
SCCIS2 DOC	1.000	21.000	20.000	**5**
SCCIS2 DON	0.025	0.680	0.660	**3**
SCCIS2 NO_x-N	0.010	0.011	0.019	**53**
SCCIS2 TN-N	0.025	0.850	0.870	**2**
SCCIS2 NH_3-N	0.010	0.110	0.110	**0**
SCCIS2 TP	0.005	0.120	0.120	**0**
SCCIS2 FRP	0.005	0.078	0.076	**3**
SCCIS2 TSS	**1.000**	**4.000**	**4.000**	**0**

The maximum acceptable RPD is 44% where the concentration is greater than 5 times the LOR. All the RPD's returned were within this range, except for NO_x-N (53%

RPD), but in this case the concentrations of both the standard and replicate samples were less than five times the LOR, so the result is not considered valid and the replicate samples are deemed acceptable.

Duplicate Sample

A duplicate sample was collected for all chemical parameters monitored in this program; results are shown in Table 54, below.

Table 54 Results of Duplicate QC sample analysis

Parameter	LOR (mg/L)	Duplicate Sample #1 (mg/L)	Duplicate Sample #2 (mg/L)	RPD
SCCIS2 DOC	1.000	20.000	20.000	**0**
SCCIS2 DON	0.025	0.670	0.680	**1**
SCCIS2 NO_x-N	0.010	0.013	0.013	**0**
SCCIS2 TN-N	0.025	0.850	0.860	**1**
SCCIS2 NH_3-N	0.010	0.100	0.099	**1**
SCCIS2 TP	0.005	0.110	0.120	**9**
SCCIS2 FRP	0.005	0.078	0.080	**3**
SCCIS2 TSS	**1.000**	**3.000**	**3.000**	**0**

The maximum acceptable RPD is 44% where the concentration is greater than 5 times the LOR. All the RPD's returned were within this range.

Summary

The QC samples collected during April 2019 were acceptable.

Quality Control Data 31st July 2019

Using a random site selection strategy, SCCIS2 – Modillion Ave Main Drain (Holmes St access) in the Bull Creek drainage catchment was selected as the site at which to collect quality control samples. No problems with the sampling equipment used to collect the chemical samples were recorded.

Blank Sample

A blank sample was collected.

Table 55 Results of blank QC sample analysis

Parameter	LOR (mg/L)	Blank sample (mg/L)
KANAV DOC	1.000	**<0.025**
KANAV DON	0.025	**<0.010**
KANAV NO_x-N	0.010	**<0.025**

KANAV TN-N	0.025	**<0.01**
KANAV NH_3-N	0.010	**<0.005**
KANAV TP	0.005	**<0.005**
KANAV FRP	0.005	**<1**
KANAV TSS	**1.000**	**<0.025**

All readings were below the limits of reporting (LOR).

Replicate Sample

A replicate sample was collected for all chemical parameters monitored in this program; results are shown in Table 56, below.

Table 56 Results of Replicate QC sample analysis

Parameter	LOR (mg/L)	Original Sample (mg/L)	Replicate Sample (mg/L)	RPD
KANAV DOC	1.000	19.000	19.000	**0**
KANAV DON	0.025	0.580	0.580	**0**
KANAV NO_x-N	0.010	0.300	0.310	**3**
KANAV TN-N	0.025	0.910	0.920	**1**
KANAV NH_3-N	0.010	0.010	0.018	**57**
KANAV TP	0.005	0.027	0.026	**4**
KANAV FRP	0.005	0.011	0.007	**44**
KANAV TSS	**1.000**	**6.000**	**6.000**	**0**

The maximum acceptable RPD is 44% where the concentration is greater than 5 times the LOR. All the RPD's returned were within this range, except for NH_3-N (57.1% RPD) and FRP (44.4% RPD).

Duplicate Sample

A duplicate sample was collected for all chemical parameters monitored in this program; results are shown in Table 57, below.

Table 57 Results of Duplicate QC sample analysis

Parameter	LOR (mg/L)	Duplicate Sample #1 (mg/L)	Duplicate Sample #2 (mg/L)	RPD
KANAV DOC	1.000	19.000	19.000	**0**
KANAV DON	0.025	0.600	0.610	**2**
KANAV NO_x-N	0.010	0.290	0.290	**0**
KANAV TN-N	0.025	0.910	0.920	**1**
KANAV NH_3-N	0.010	0.013	0.012	**8**

KANAV TP	0.005	0.026	0.026	**0**
KANAV FRP	0.005	0.009	0.010	**11**
KANAV TSS	**1.000**	**5.000**	**5.000**	**0**

The maximum acceptable RPD is 44% where the concentration is greater than 5 times the LOR. All the RPD's returned were within this range.

Summary

The QC samples collected during April 2019 were acceptable, except for NH_3-N (57.1% RPD) and FRP (44.4% RPD) replicate samples.

Quality Control Data 9th October 2019

Using a random site selection strategy, SCCIS2 – Modillion Ave Main Drain (Holmes St access) in the Bull Creek drainage catchment was selected as the site at which to collect quality control samples. No problems with the sampling equipment used to collect the chemical samples were recorded.

Blank Sample

A blank sample was collected.

Table 58 Results of blank QC sample analysis

Parameter	LOR (mg/L)	Blank sample (mg/L)
SCCIS1 DOC	1.000	**<1**
SCCIS1 DON	0.025	**<0.025**
SCCIS1 NO_x-N	0.010	**<0.010**
SCCIS1 TN-N	0.025	**<0.025**
SCCIS1 NH_3-N	0.010	**<0.010**
SCCIS1 TP	0.005	**<0.005**
SCCIS1 FRP	0.005	**<0.005**
SCCIS1 TSS	**1.000**	**<1**

All readings were below the limits of reporting (LOR).

Replicate Sample

A replicate sample was collected for all chemical parameters monitored in this program; results are shown in Table 59, below.

Table 59 Results of Replicate QC sample analysis

Parameter	LOR (mg/L)	Original Sample (mg/L)	Replicate Sample (mg/L)	RPD
SCCIS1 DOC	1.000	11.000	12.000	**9**
SCCIS1 DON	0.025	0.370	0.350	**6**
SCCIS1 NO_x-N	0.010	0.057	0.058	**2**
SCCIS1 TN-N	0.025	0.550	0.530	**4**
SCCIS1 NH_3-N	0.010	0.059	0.065	**10**
SCCIS1 TP	0.005	0.006	0.025	**123**
SCCIS1 FRP	0.005	0.025	0.025	**0**
SCCIS1 TSS	**1.000**	**6.000**	**6.000**	**0**

The maximum acceptable RPD is 44% where the concentration is greater than 5 times the LOR. All the RPD's returned were within this range, except for TP in the replicate sample (122.6% RPD).

Duplicate Sample

A duplicate sample was collected for all chemical parameters monitored in this program; results are shown in Table 60, below.

Table 60 Results of Duplicate QC sample analysis

Parameter	LOR (mg/L)	Duplicate Sample #1 (mg/L)	Duplicate Sample #2 (mg/L)	RPD
SCCIS1 DOC	1.000	12.000	11.000	**9**
SCCIS1 DON	0.025	0.360	0.350	**3**
SCCIS1 NO_x-N	0.010	0.055	0.054	**2**
SCCIS1 TN-N	0.025	0.530	0.530	**0**
SCCIS1 NH_3-N	0.010	0.062	0.059	**5**
SCCIS1 TP	0.005	0.010	0.009	**11**
SCCIS1 FRP	0.005	0.025	0.025	**0**
SCCIS1 TSS	**1.000**	**6.000**	**6.000**	**0**

The maximum acceptable RPD is 44% where the concentration is greater than 5 times the LOR. All the RPD's returned were within this range.

Summary

The QC samples collected during April 2019 were acceptable except for the TP (122.6%) replicate sample.

Appendix C: Abbreviations used

DI water - De-ionised water
DOC - Dissolved organic carbon
DON - Dissolved organic nitrogen
FRP - Filterable reactive phosphorus
LOR - Limit of reporting
NH_3-N – Ammoniacal nitrogen
NO_x-N - Nitrogen oxides (sum of nitrite and nitrate)
QC - Quality control
RPD - Relative percent difference
TN - Total nitrogen
TOC - Total organic carbon
TP - Total phosphorus
TSS - Total suspended solids