Pre-construction Water Quality Monitoring Report

Event 15 2023

Project Number: 22-013

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1. Introduction

In 2020 Snowy Hydro Limited (Snowy Hydro) obtained approval (application number SSI 9208 and EPBC 2018/8322) to expand the existing Snowy Mountains Hydro-electric Scheme (Snowy Scheme), by linking the existing Tantangara and Talbingo reservoirs through a series of underground tunnels and constructing a new underground hydro-electric power station (referred to as 'Snowy 2.0').

To connect Snowy 2.0 to the National Energy Market (NEM), a new transmission connection is required. NSW Electricity Networks Operations Pty Ltd as a trustee for NSW Electricity Operations Trust (known as TransGrid and the Proponent) will construct a substation and overhead transmission lines (the Project) to facilitate the connection of Snowy 2.0 to the existing electrical transmission network. The Project location is approximately 27 kilometres (km) east of Tumbarumba, New South Wales (NSW). UGL has been engaged on behalf of the Proponent to undertake the Project.

The purpose of the pre-construction water quality monitoring is to address the requirements of the Environmental Impact Statement (EIS) (Jacobs 2020) that was prepared by the Proponent under Part 5, Division 5.2 of the NSW *Environmental Planning and Assessment Act 1979* to assess the environmental impacts of the proposed Project. Subsequently, an Amendment Report (TransGrid 2021b) was submitted with the Response to Submissions (TransGrid 2021a) to the Department of Planning and Environment (DPE) with updated mitigation measures for the Project.

The objective of the pre-construction surface water quality monitoring is to collect baseline data prior to Project construction works. Baseline data will be compared to ANZG (2018) guidelines to characterise the existing surface water quality. The data will be compared to the water quality objectives (WQO) for the Project area.

2. Program and methodology

The Pre-construction Water Quality Monitoring Program and Methodology (the Program) (NGH 2022) has been prepared to detail the WQOs for the Project, the location of the monitoring locations and the methodology for water sampling.

The Project area within Kosciuszko National Park is an area of high conservation value. Therefore, the water quality objectives for physical and chemical stressors includes **no change beyond natural variability** (ANZG 2018). The Default Guideline Values (DGV) for Upland Rivers has been provided for physical and chemical stressors and is detailed in the Program (NGH 2022).

The location of the sampling points in relation to the Project footprint is provided in Figure 2-1.
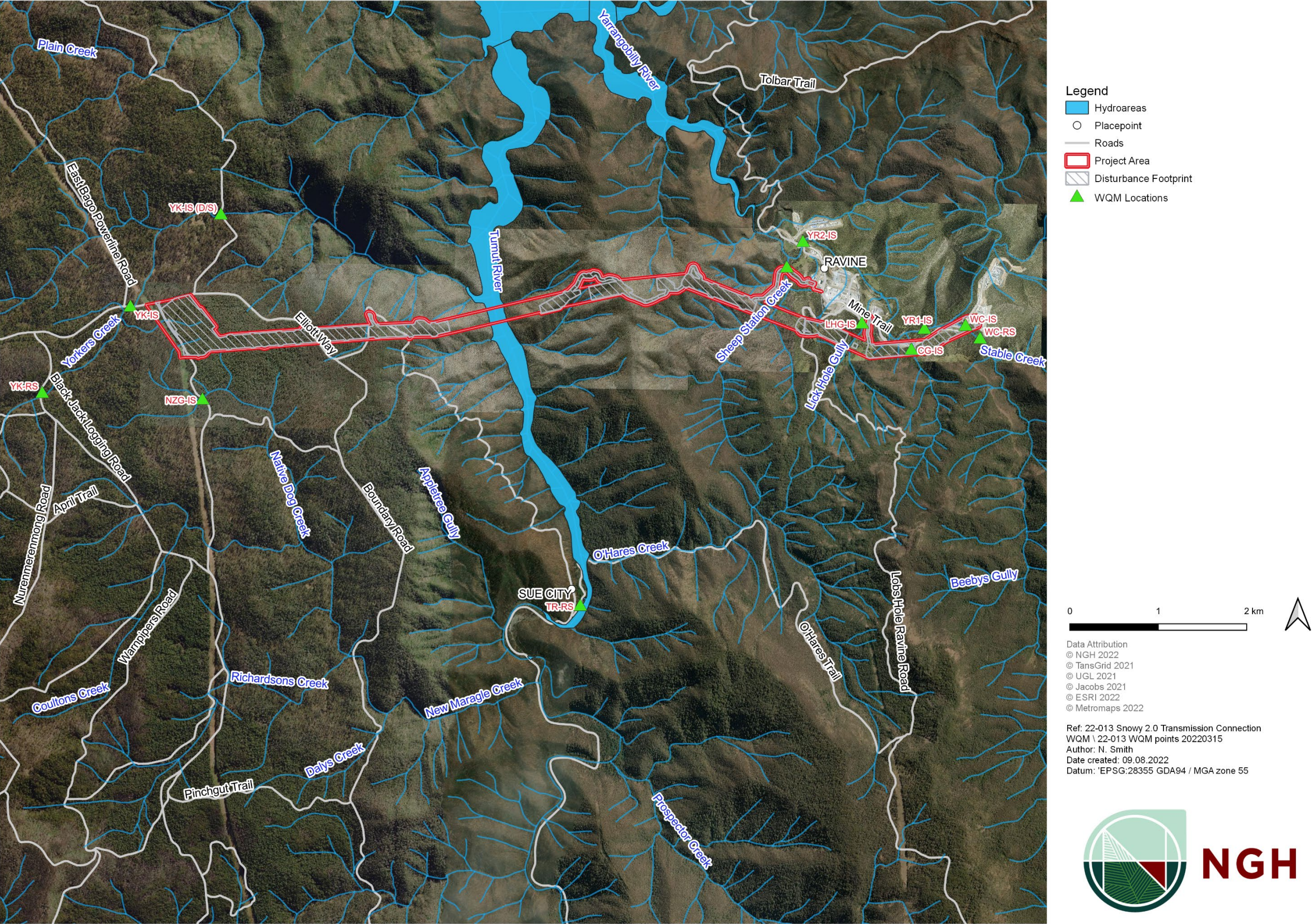
Figure 2-1 WQM locations

3.   Monitoring event observations and results

Images for Cave Gully, Talbingo Reservoir and Yorkers Creek are provided as Figure 3-1 to Figure 3-3. Water quality results for each site are provided in Appendix A. Results are highlighted where they exceed the default guideline value (refer to the Program (NGH 2022)). Table 3-1 identifies exceedances of the DGVs for metals, cyanide and nutrients. Physico-chemical results have been provided in Figure 3-4 to Figure 3-31. Field data and observations are provided in Appendix B.

3.1.   Event 15

NGH has conducted 15 monthly sampling events since March 2022 (Event 1). Reports for each event were prepared following receival of the laboratory results (NGH 2022a; 2022b; 2022c; 2022d; 2022e, 2022f, 2022g, 2022h, 2022i, 2022j, 2023a, 2023b, 2023c and 2023d). The results of Event 1 through to Event 14 have been compared in this report to the results of Event 15.

NGH Environmental Scientist, Claire Hobbs, conducted the Event 15 sampling event with a UGL representative on 6 and 7 June 2023. The weather was partly cloudy with a slight breeze. Data from the Cabramurra SMHEA automatic weather station on 6 June 2023 (Station ID 072161) indicates that winds were from the west southwest, with speeds of 17 km/hr in the morning. Winds trended towards the west northwest in the afternoon, with speeds of 13 km/hr. Temperatures on the day included a low of -1.2°C and a high of 2.2°C. Data from the Tumbarumba weather station for 7 June 2023 (Station ID 072043) indicates that the weather was calm, with temperatures ranging from a low of 3.5°C to a high of 9.5°C.

Generally, shallow, clear water flows were observed. Algae was observed at WC-RS, CG-IS, SSC-IS. No hydrocarbon sheen or odours were noted. The banks of each channel were well vegetated with the vegetation matrix weedier in some locations. Evidence of bank erosion from hooved animals was observed at the New Zealand Gully site, the Yorkers Creek impact site and Yorkers Creek reference site.

Figure 3-1 Algal bloom within Cave Gully (CG-IS)

Figure 3-2 Talbingo Reservoir reference site (TR-RS)

Figure 3-3 Yorkers Creek reference site (YK-RS)

3.1.1. Results

The results indicate that the water quality in the locations where samples were taken generally meets the DGVs for Upland Rivers with a 99% species protection level for toxicants. Locations where a laboratory result was returned for a physical or chemical stressor above the DGV are provided in Table 3-1.

Table 3-1 Results above the DGV for Upland Rivers with 99% species protection level

Site identification	Analyte	DGV	Result	Comment
WC-RS	Aluminium mg/L	0.027	0.11	This is consistent with prior sampling events.
	Total Suspended Solids mg/L	0.2	4	
CG-IS	Total Phosphorous mg/L	0.02	0.1	Result for Zinc is consistent with prior sampling events.
	Zinc mg/L	0.0024	0.004	Always returns a high total dissolved solid result. Total suspended solids have notably increased.
	Total Dissolved Solids (TDS) mg/L		161	
	Total Suspended Solids mg/L	0.2	112	
LHG-IS	Aluminium mg/L	0.027	0.07	Results for Aluminium and Zinc are consistent with prior sampling events.
	Copper mg/L	0.001	0.002	Copper returned a result above LOR, which is atypical of this sampling location.
	Zinc mg/L	0.0024	0.004	Always returns a high total dissolved solid result.
	Total Dissolved Solids (TDS) mg/L		319	
WC-IS	Aluminium mg/L	0.027	0.1	Results for aluminium and total phosphorous are higher than prior sampling events.
	Total Phosphorous mg/L	0.02	0.13	
YK-IS (D/S)	Aluminium mg/L	0.027	0.34	This is consistent with prior sampling events.
	Iron mg/L	0.3	0.31	Located within Bago State Forest and adjacent to an unsealed track. Unknown activities within the State Forest upstream.
	Total Suspended Solids mg/L	0.2	2	Sample taken upstream of culvert.

Site identification	Analyte	DGV	Result	Comment
	Reactive phosphorous mg/L	0.015	0.02	
NZG-IS	Aluminium mg/L	0.027	0.21	Result for Aluminium is consistent with prior sampling events.
	Copper mg/L	0.001	0.004	Copper returned a result above the laboratory limit of reporting (LOR), which is atypical of this sampling location.
				Located within Bago State Forest.
	Reactive phosphorous mg/L	0.015	0.02	Sample taken upstream of timber supported unsealed track bridge. Banks heavily vegetated, shallow channel.
YK-RS	Aluminium mg/L	0.027	0.47	Results for Aluminium and Iron are consistent with prior sampling events.
	Iron mg/L	0.3	0.41	Located within Bago State Forest and adjacent to an unsealed track. Unknown activities within the State Forest upstream.
	Reactive phosphorous mg/L	0.015	0.02	Sample taken downstream of culvert under unsealed track. Flow through culvert is restricted upstream causing a wetland environment.
YK-IS	Aluminium mg/L	0.027	0.42	Located within Bago State Forest and adjacent to Elliott Way (road). Unknown activities within the State Forest upstream.
	Iron mg/L	0.3	0.37	
	Total Suspended Solids mg/L	0.2	6	
	Reactive phosphorous mg/L	0.015	0.02	
YR1-RS	Aluminium mg/L	0.027	0.08	This is consistent with prior sampling events
YR2-IS	Aluminium mg/L	0.027	0.07	This is consistent with prior sampling events
SSC-IS	Aluminium mg/L	0.027	0.11	Result for aluminium is consistent with prior sampling events
	Total Nitrogen mg/L	0.25	1	

CG-IS and LHG-IS displayed elevated values for total dissolved solids compared to the other sampling locations. Total suspended solids (TSS) at YK-IS, YK-IS (D/S), WC-RS and CG-IS were above the 0.2 mg/L assigned DGV (refer to Figure 3-18).

Water temperatures ranged from 7.9 degrees Celsius at YK-IS (D/S) to 10.9 degrees Celsius at SSC-IS.

Many of the results are recorded as below (<) the limit of detection. To enable calculation of the statistics, the *Limit of Detection Divided by Two (LOD/2) Method* (Cohen and Ryan 1989) has been applied. This data is provided in Appendix A.

The following figures, Figure 3-4 to Figure 3-23, display physico-chemical water quality through time for monitoring Event 1 (March 2022) to Event 15 (early June 2023). Where a DGV is available, these values are shown on the graph and have been included for dissolved oxygen (%), conductivity, pH and turbidity.

Although the Talbingo Reservoir is the ultimate catchment for both the Yarrangobilly River and tributaries, and Yorkers Creek and tributaries, the data has been divided into the Talbingo Reservoir catchment, which includes the Talbingo Reservoir reference site and the Yarrangobilly River and its tributaries. These are all located in the Kosciuszko National Park. The Yorkers Creek catchment includes the three sampling locations along Yorkers Creek, and New Zealand Gully, which are all located in the Bago State Forest. The confluence of Yorkers Creek with Tumut River (Talbingo Reservoir) is downstream of sampling location TR-RS but upstream of the confluence of the Yarrangobilly River and Tumut River.

Temperatures within the Talbingo Reservoir catchment have generally decreased since Event 12, refer to Figure 3-4. YR2-RS registered the greatest decrease in temperature from 13.5°C during Event 14 to 9.9°C in Event 14. Temperatures within the Yorkers Creek catchment have generally decreased since Event 13, with the exception of NZG-IS, which registered a slight increase (0.1°C) in temperature, refer to Figure 3-5.
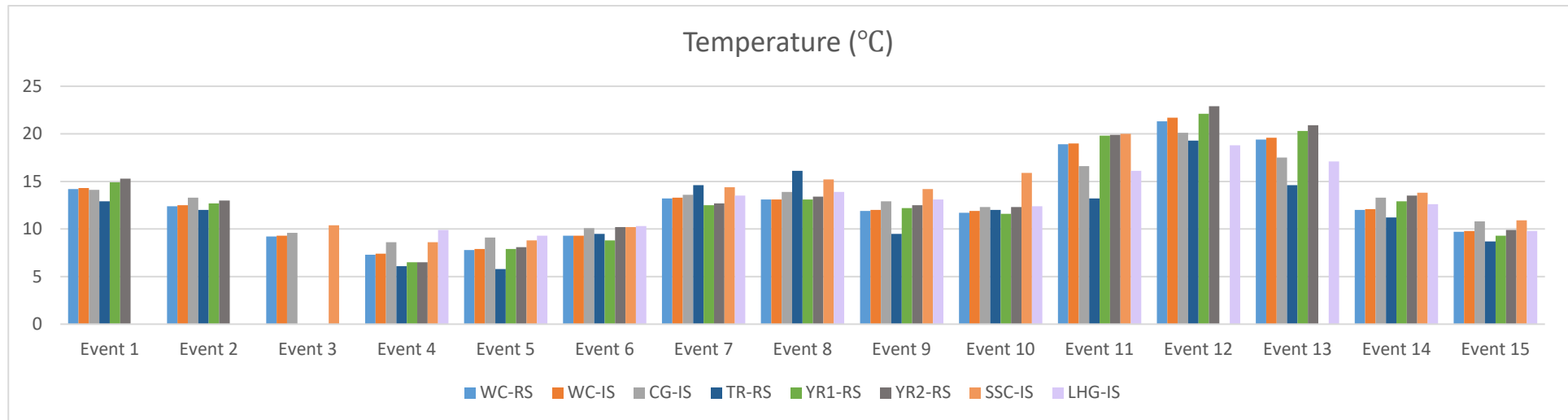
Figure 3-4 Temperature for Talbingo Reservoir catchment
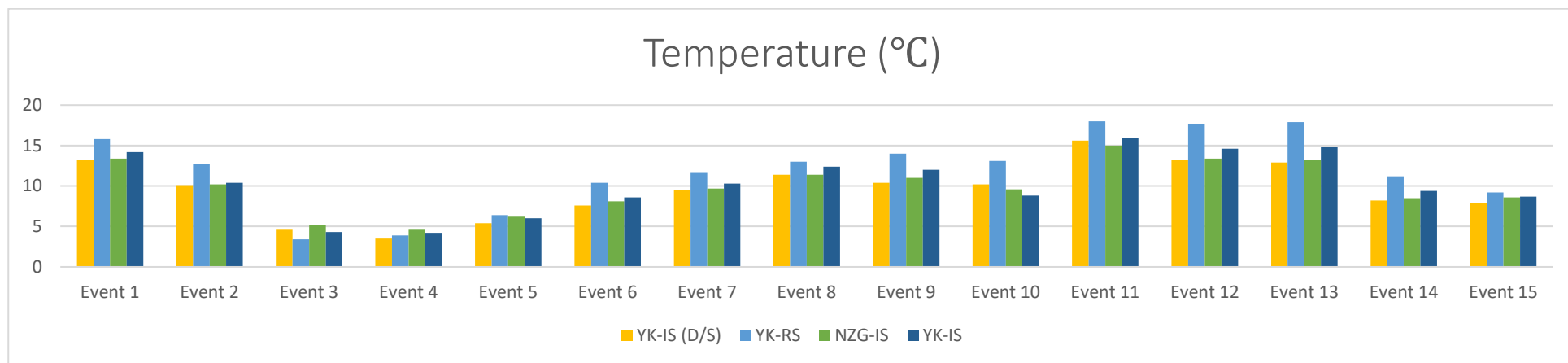
Figure 3-5 Temperature for Yorkers Creek catchment

All DO (%) results for Event 15 were below the lower DGV threshold (90%), refer to Figure 3-6 and Figure 3-7. Results for both catchments have notably decreased since Event 14. It is considered likely that the consistently low readings across both sites are the result of a calibration issue with the water quality meter.
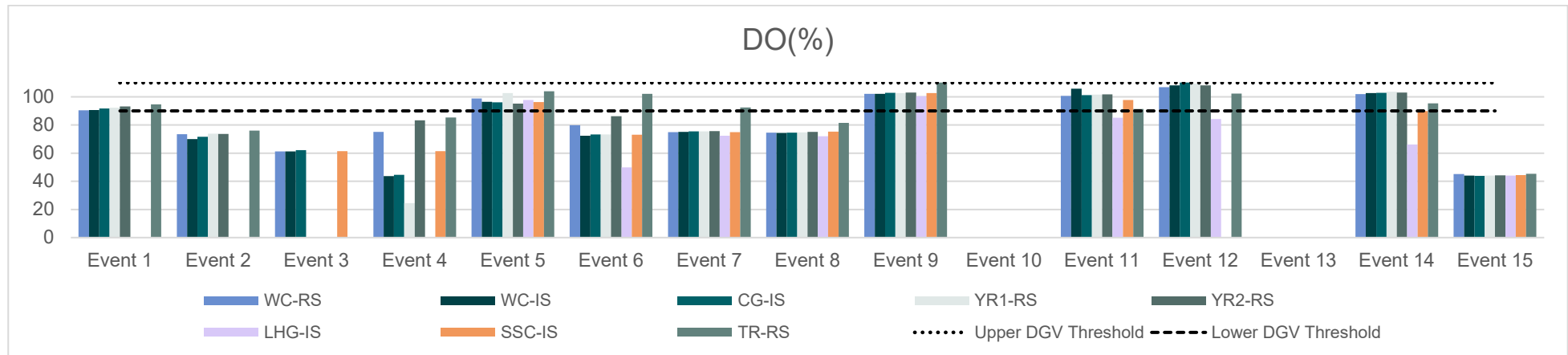
Figure 3-6 Dissolved oxygen (DO%) for Talbingo Reservoir catchment
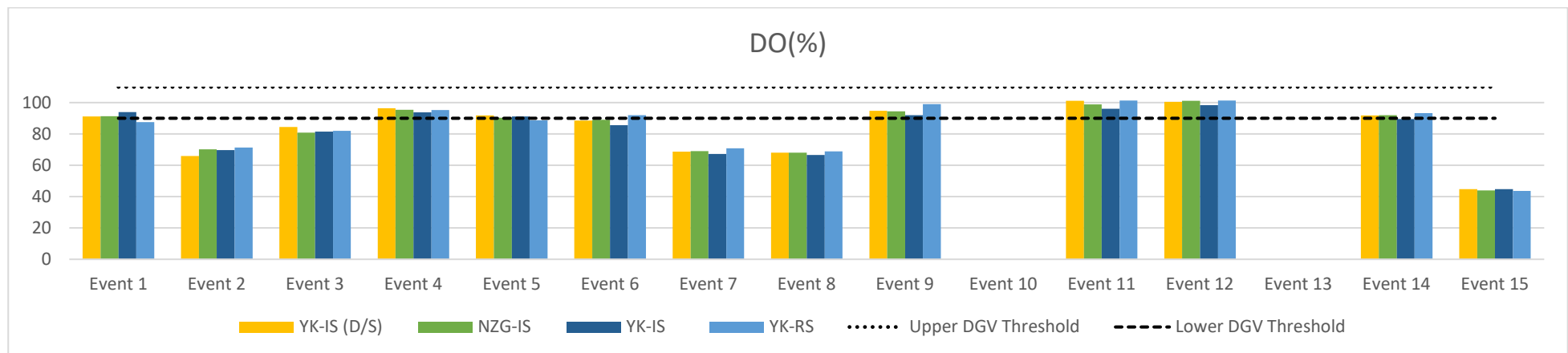
Figure 3-7 Dissolved oxygen (DO%) for Yorkers Creek catchment

The results for DO (ppm) for the Talbingo Reservoir and Yorkers Creek catchments have decreased when compared with results for Event 14, refer to Figure 3-8 and Figure 3-9. As stated above for DO(%), consistently low readings across both sites were likely caused by a calibration issue with the water quality meter.
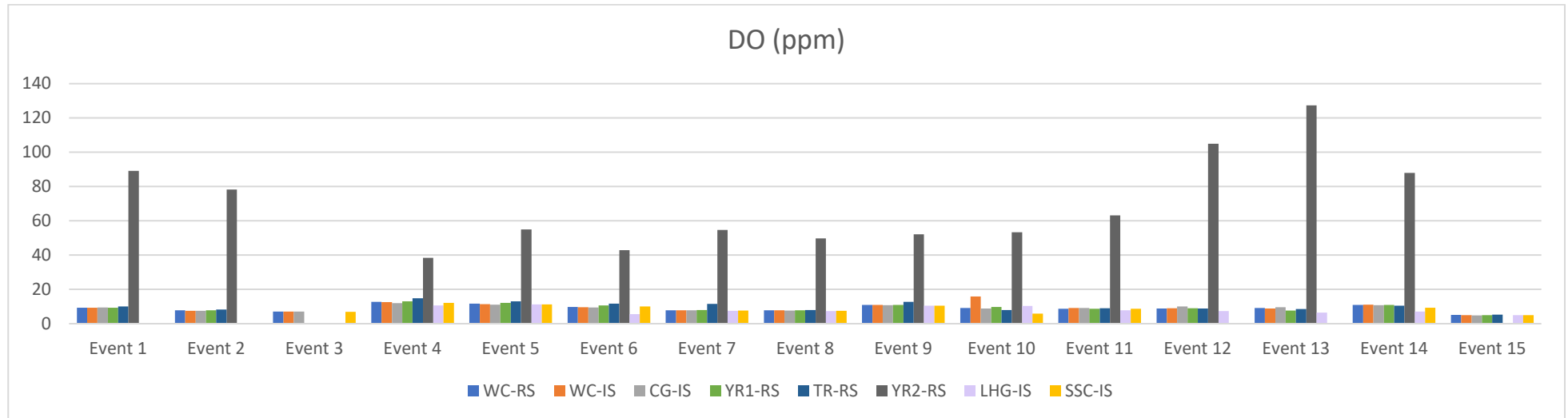
Figure 3-8 Dissolved Oxygen (ppm) for Talbingo Reservoir catchment
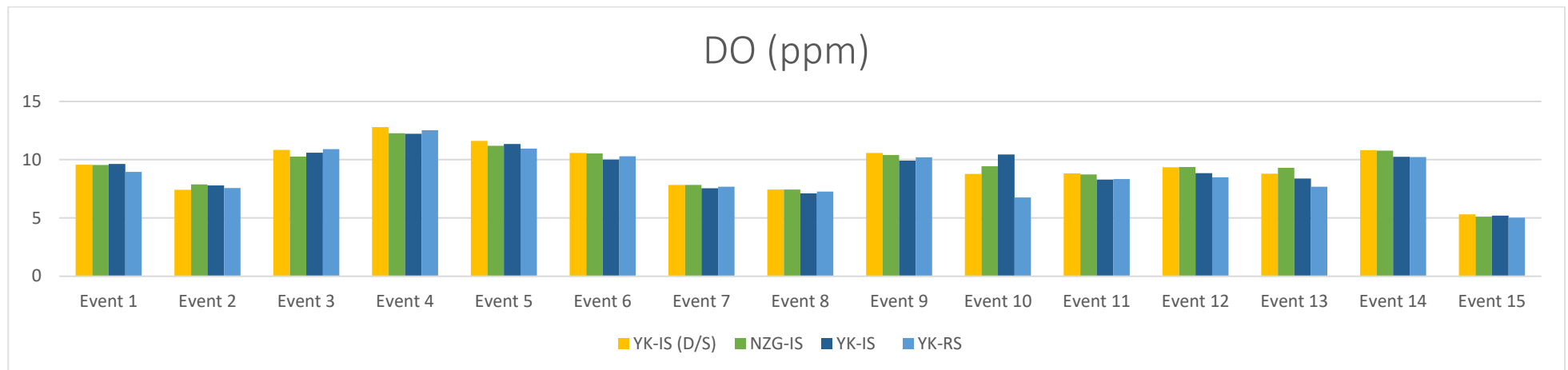
Figure 3-9 Dissolved Oxygen (ppm) for Yorkers Creek catchment

The pattern of results for specific conductance within the Talbingo Reservoir catchment for Event 15 have remained consistent with past events, refer to Figure 3-10. LHG-IS returned a result of 522 µS/cm for Event 15, down from its peak recording of 585 µS/cm during Event 14, refer to Figure 3-10. Results for specific conductance within the Yorkers Creek catchment for Event 15 have marginally decreased, refer to Figure 3-11.
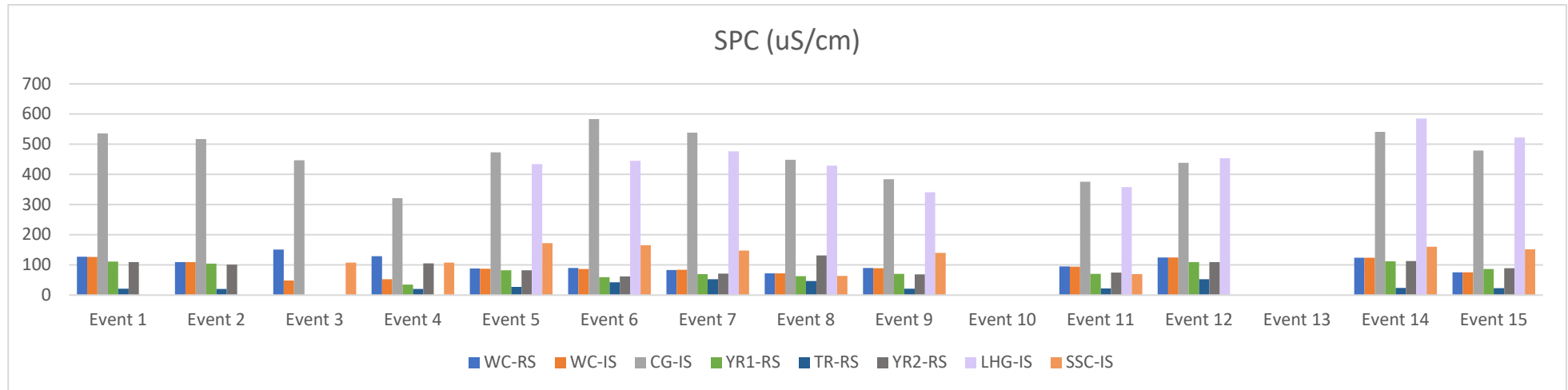
Figure 3-10 Specific Conductance (SPC µS/cm) for Talbingo Reservoir catchment
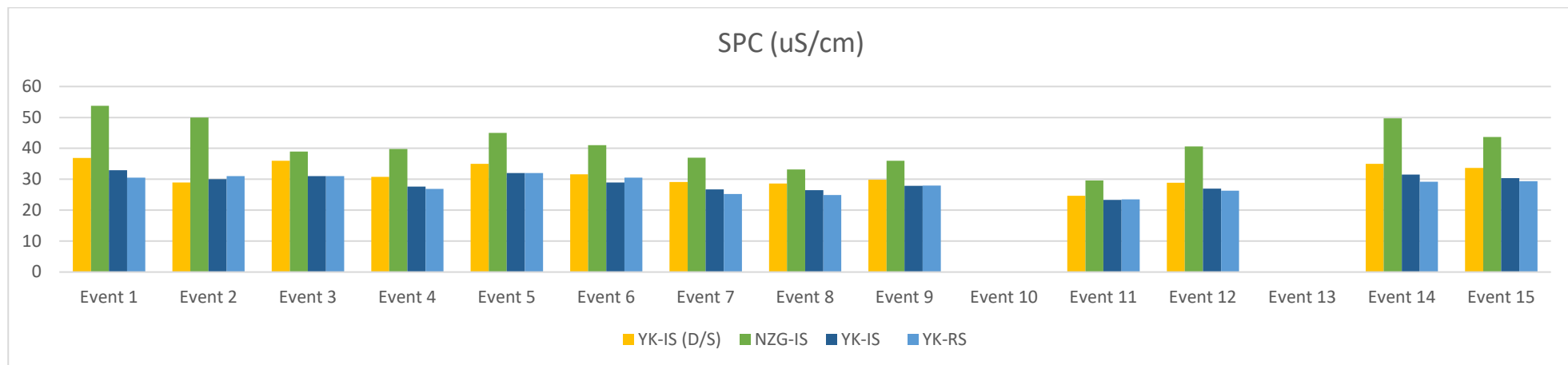
Figure 3-11 Specific Conductance (SPC µS/cm) for Yorkers Creek catchment

Conductivity readings were not obtained within the Talbingo Reservoir catchment for Event 15 (issues with the water quality meter), with the exception of TR-RS, which has remained relatively consistent with Event 14, refer to Figure 3-12. Conductivity readings within the Yorkers Creek catchment were relatively consistent with Event 14, refer to Figure 3-13. Conductivity results for NZG-IS continues to be greater than that recorded at the Yorkers Creek sites. The pattern between sites is mostly reflective of the pattern for specific conductance.
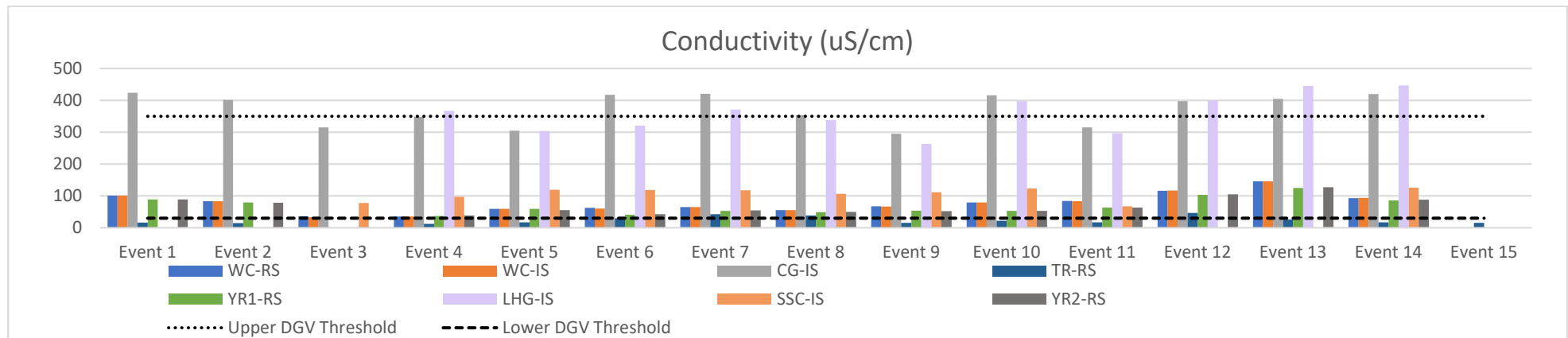
Figure 3-12 Conductivity (µS/cm) for Talbingo Reservoir catchment
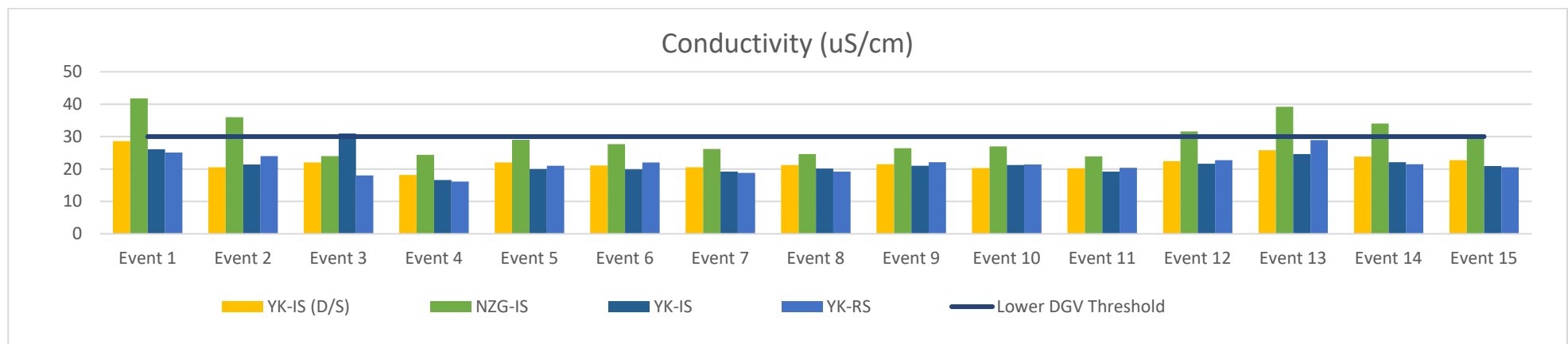
Figure 3-13 Conductivity (µS/cm) for Yorkers Creek catchment

Turbidity values were below the upper DGV threshold (25 NTU) for both catchments during Event 15. Turbidity readings within the Talbingo Reservoir catchment have generally increased since Event 14, refer to Figure 3-14. LHG-IS recorded the largest increase (17.27 NTU) in results, up from 3.65 NTU during Event 14. Note that the results for CG-IS have been provided in Figure 3-15 to more accurately display the other sampling locations in the Talbingo reservoir catchment.

Turbidity readings within the Yorkers Creek catchment have slightly increased when compared to Event 14, refer to Figure 3-16. YK-IS registered the highest reading of 13.88 NTU, up from 4.7 NTU during Event 14.
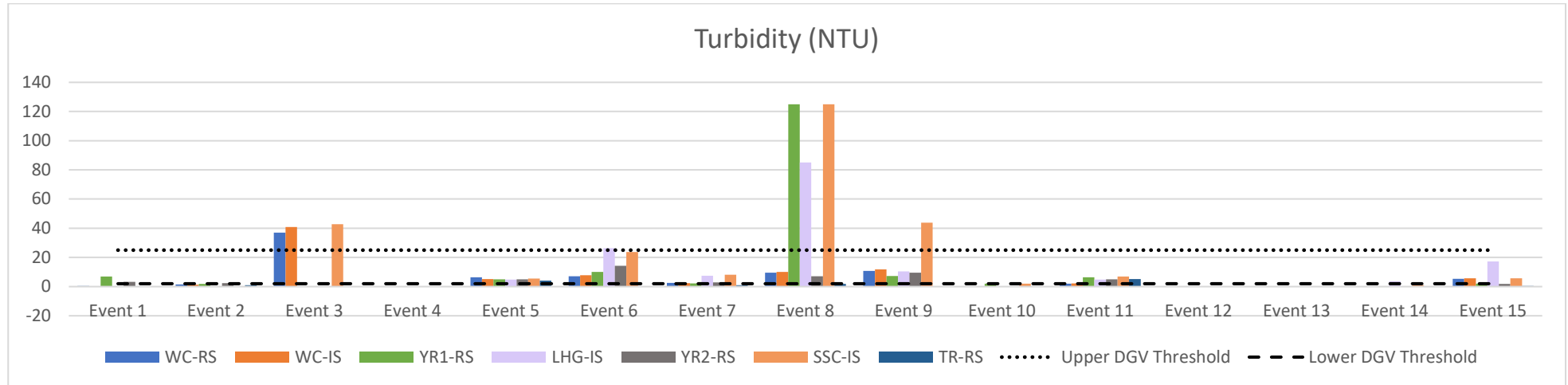
Figure 3-14 Turbidity (NTU) for the Talbingo Reservoir catchment
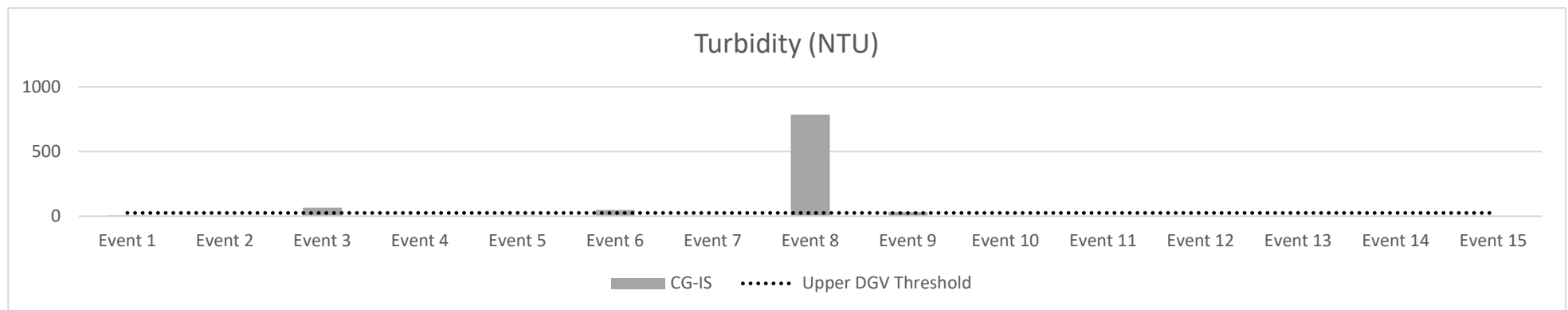
Figure 3-15 Turbidity (NTU) for CG-IS, within the Talbingo Reservoir catchment
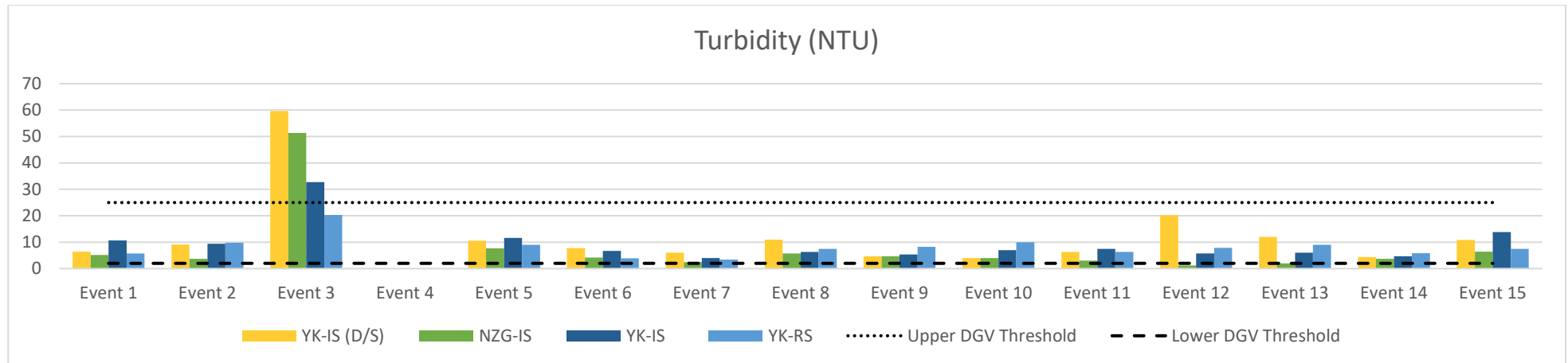
Figure 3-16 Turbidity (NTU) for the Yorkers Creek catchment

Results for total suspended solids (TSS) within the Talbingo Reservoir catchment during Event 15 have remained relatively low and consistent with Event 13 and Event 14, refer to Figure 3-17. Total suspended solids increased at CG-IS (115 mg/L) for Event 15, refer to Figure 3-18. Total suspended solids have remained relatively consistent within the Yorkers Creek catchment, when compared with the results for Event 14, refer to Figure 3-19.
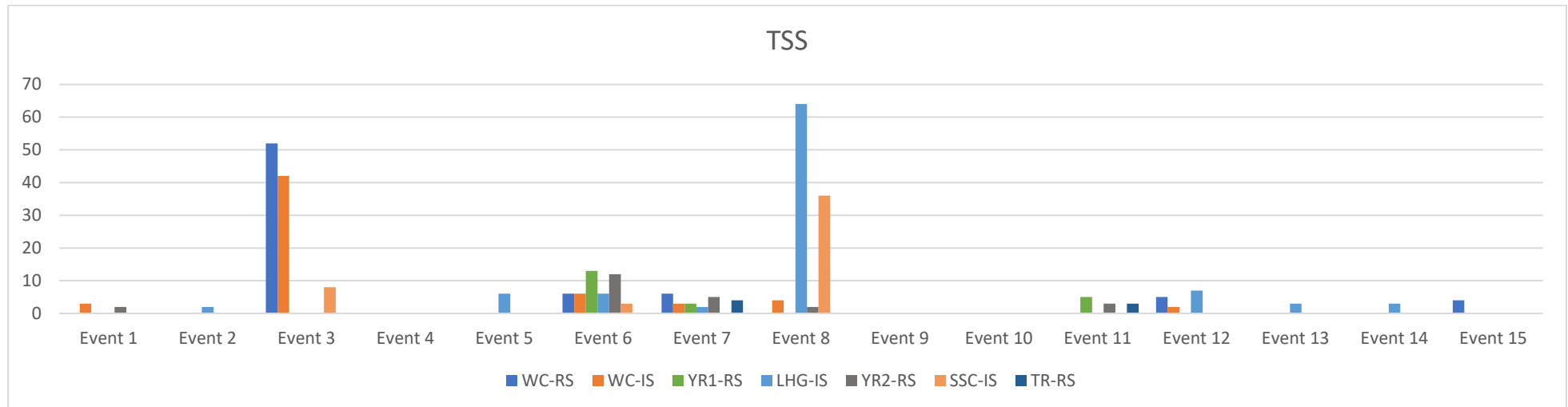
Figure 3-17 Total Suspended Solids for the Talbingo Reservoir catchment
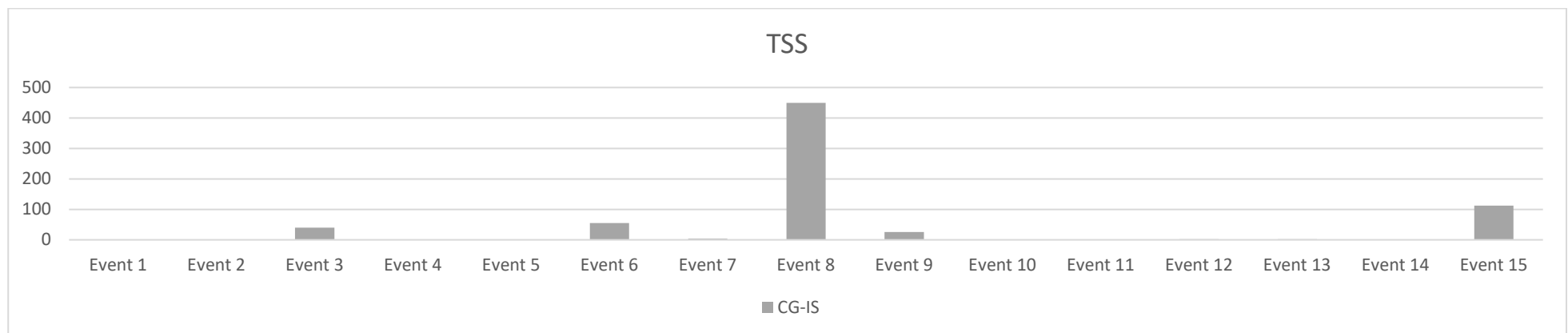
Figure 3-18 Total Suspended Solids for CG-IS, within the Talbingo Reservoir catchment
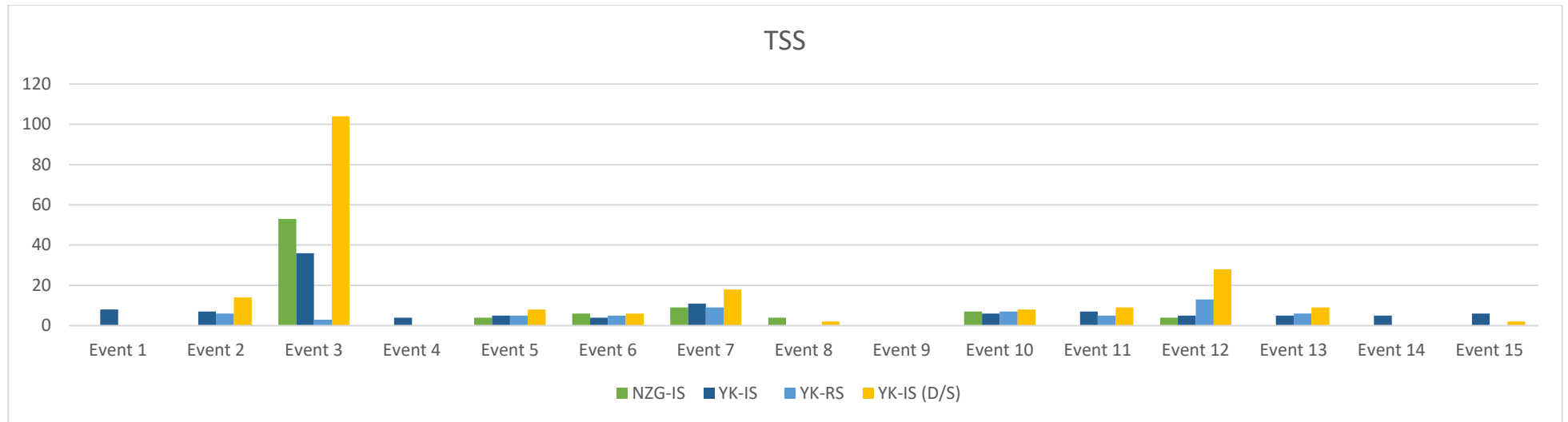
Figure 3-19 Total Suspended Solids for the Yorkers Creek catchment

Values of pH for the Talbingo Reservoir catchment during Event 15 have remained consistent with Event 14. All sites had values of pH within the DGV range (6.5 – 8 pH units), refer to Figure 3-20.

Values of pH for the Yorkers Creek catchment have slightly decreased since Event 14, refer to Figure 3-21. All readings fell within the DGV range.
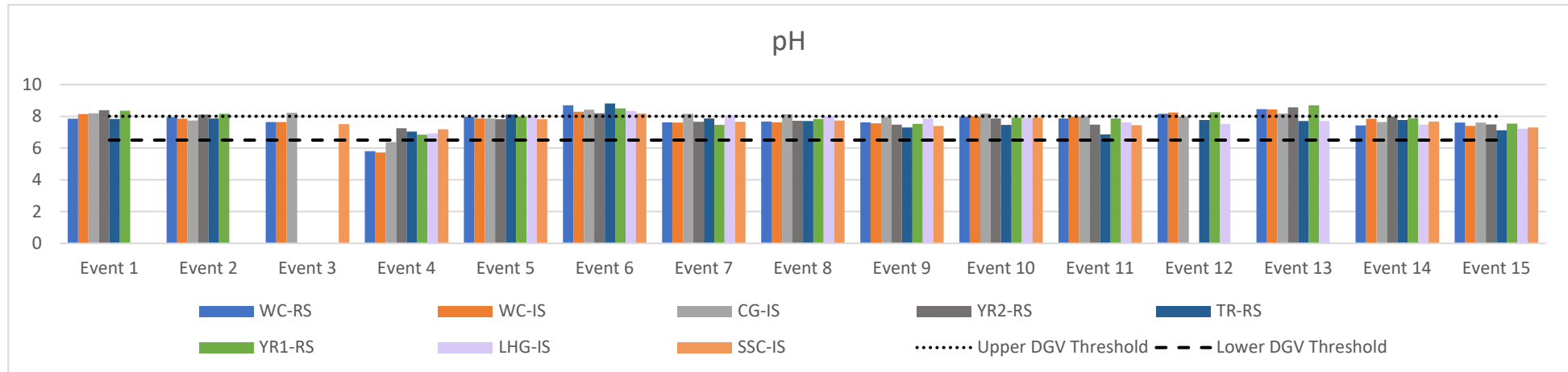
Figure 3-20 Potential of Hydrogen (pH) for Talbingo Reservoir catchment
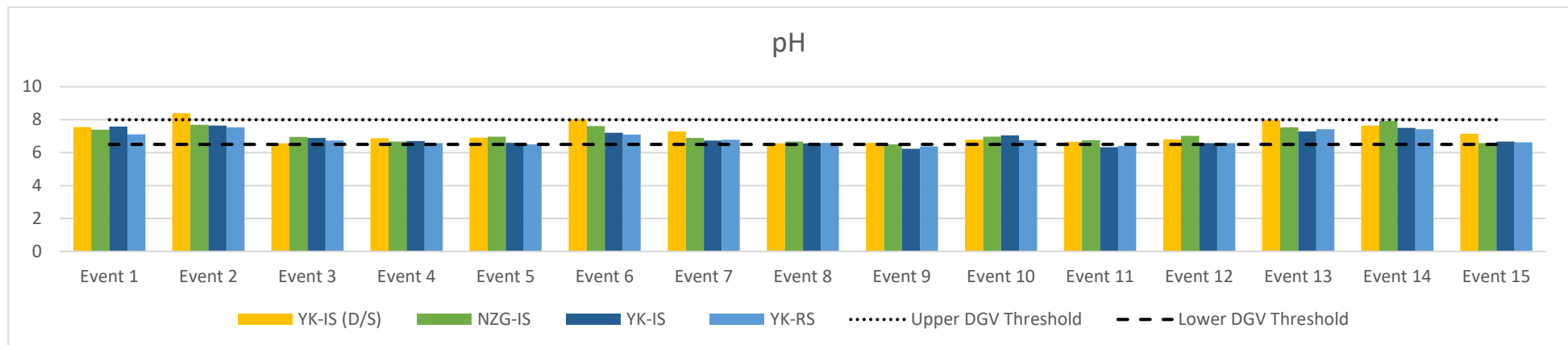
Figure 3-21 Potential of Hydrogen (pH) for Yorkers Creek catchment

The values for oxygen redox potential within the Talbingo Reservoir catchment have slightly increased at all sites with the exception of the result of LHG-IS, which decreased (-43.2 mV) during Event 15, when compared with results from Event 14 (-22.7 mV), refer to Figure 3-22. Oxygen redox potential has increased within the Yorkers Creek catchment, refer to Figure 3-23.
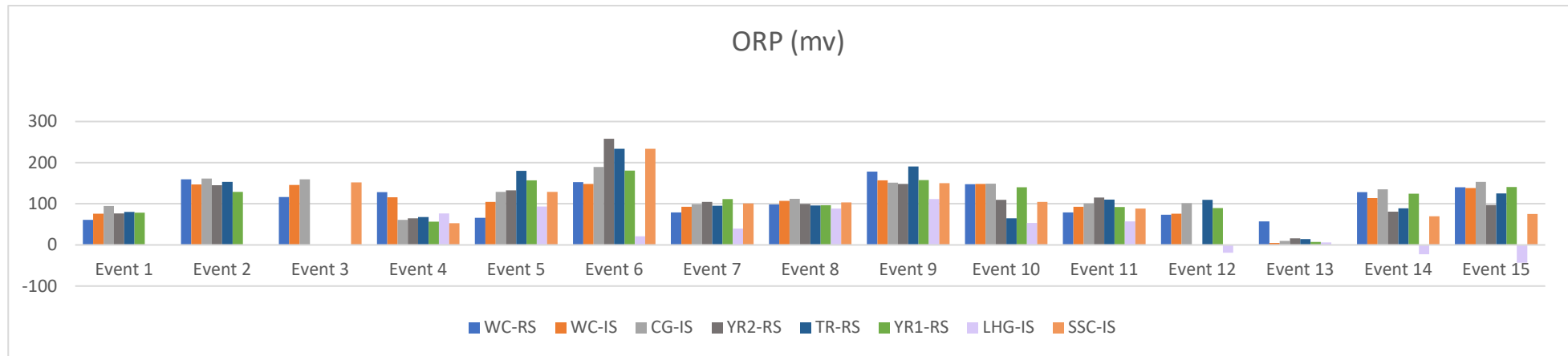
Figure 3-22 Oxygen Redox Potential (ORP) for Talbingo Reservoir catchment
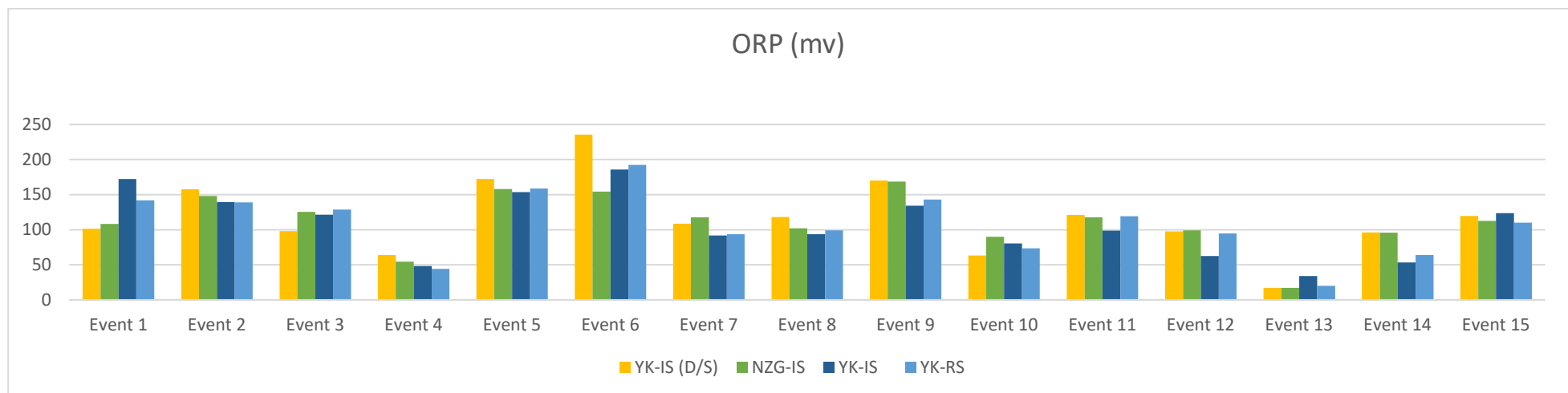
Figure 3-23 Oxygen Redox Potential (ORP) for Yorkers Creek catchment

Nitrogen Oxides (mg/L) were below the LOR for the Talbingo Reservoir and Yorkers Creek catchments, refer to Figure 3-24 and Figure 3-25. This has been a consistent trend since Event 3.
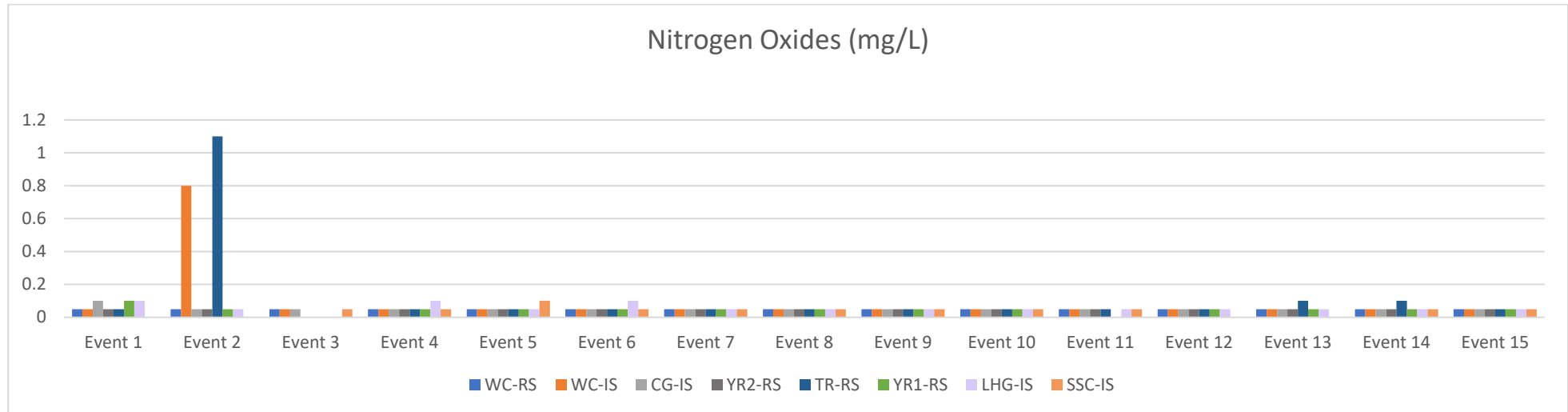
Figure 3-24 Nitrogen Oxides (mg/L) for the Talbingo Reservoir catchment
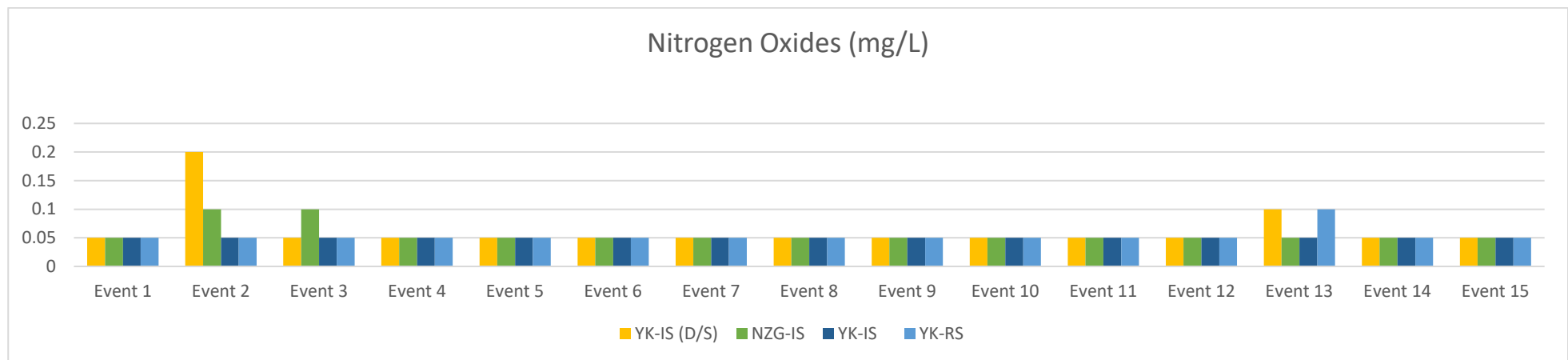
Figure 3-25 Nitrogen Oxides (mg/L) for the Yorkers Creek catchment

Reactive Phosphorous (mg/L) was consistent across the Talbingo Reservoir catchment, with the exception of WC-IS, which decreased from 0.05 mg/L during Event 14 to 0.01 mg/L during Event 15, refer to Figure 3-26. Reactive Phosphorous returned results of 0.02 mg/L at all sites within the Yorkers Creek catchment, refer to Figure 3-27.
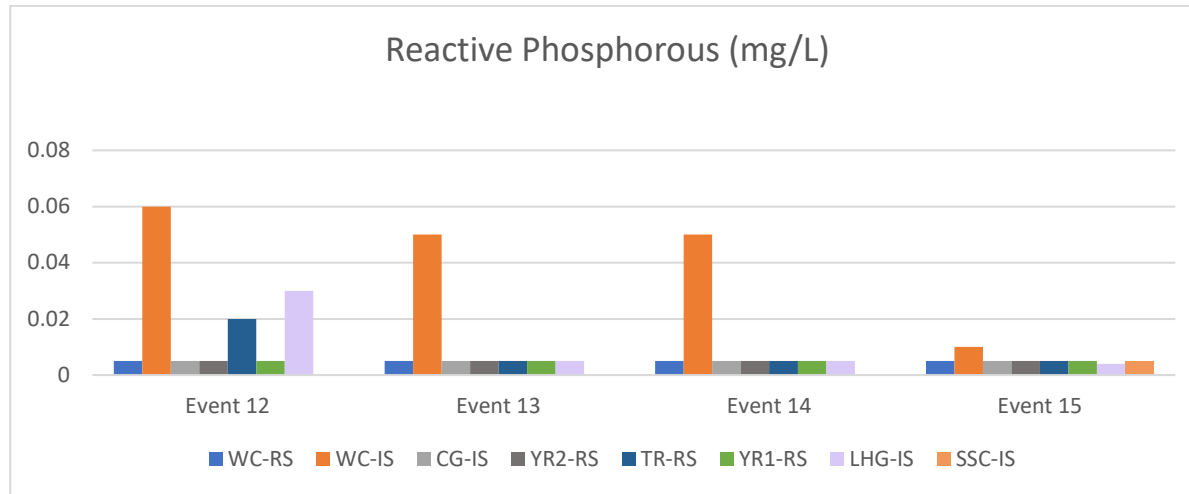
Figure 3-26 Reactive Phosphorous (mg/L) for the Talbingo Reservoir catchment
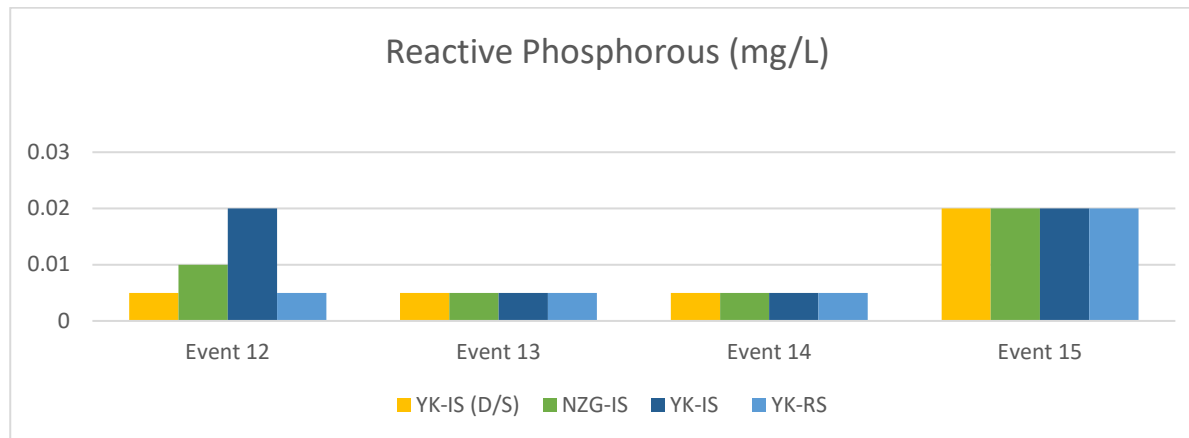
Figure 3-27 Reactive Phosphorous (mg/L) for the Yorkers Creek catchment

Total Hardness (CaCO$_3$, mg/L) within the Talbingo Reservoir catchment for Event 15 varied from very soft at TR-RS (6 mg/L) to hard at LHG-IS (268 mg/L), refer to Figure 3-28. Total Hardness (CaCO$_3$, mg/L) within the Yorkers Creek catchment was generally very soft, ranging from 7 -13 mg/L, refer to Figure 3-29.
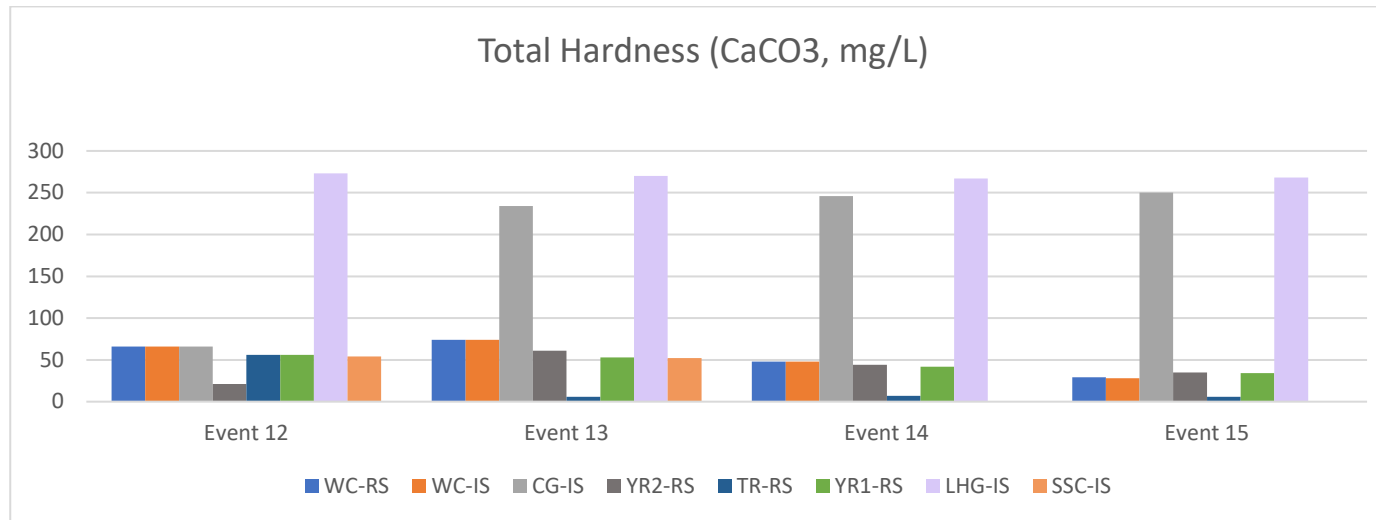
Figure 3-28 Total Hardness (CaCO$_3$) for the Talbingo Reservoir catchment
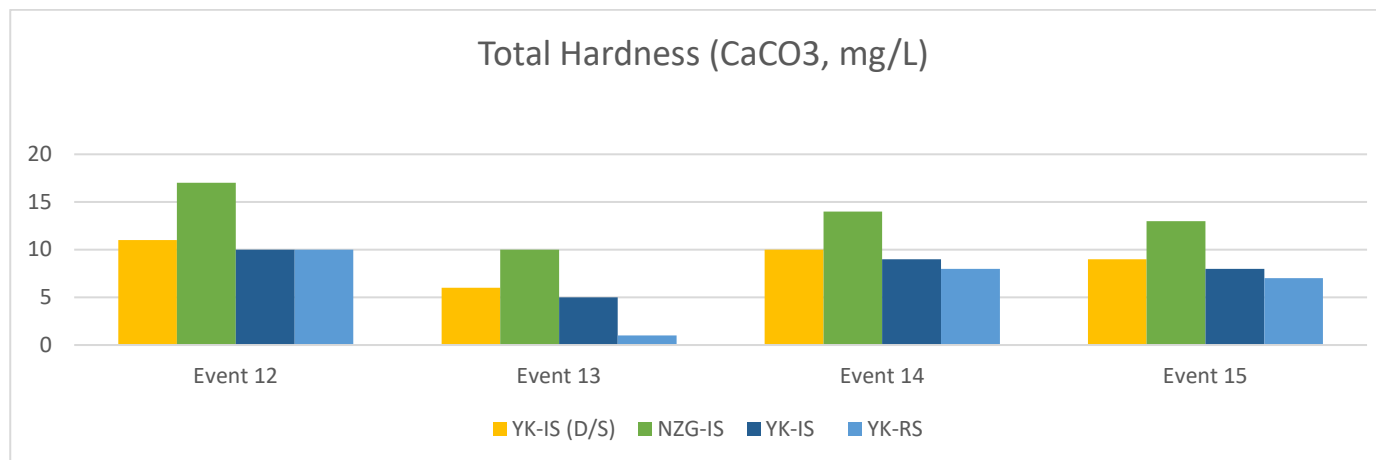
Figure 3-29 Total Hardness (CaCO$_3$) for the Yorkers Creek catchment

Total Kjedahl Nitrogen (TKN, mg/L) has remained relatively consistent for the Talbingo Reservoir and Yorkers Creek catchments, with the exception of SSC-IS, which returned a reading above the LOR of 1 mg/L for Event 15, refer to Figure 3-30 and Figure 3-31
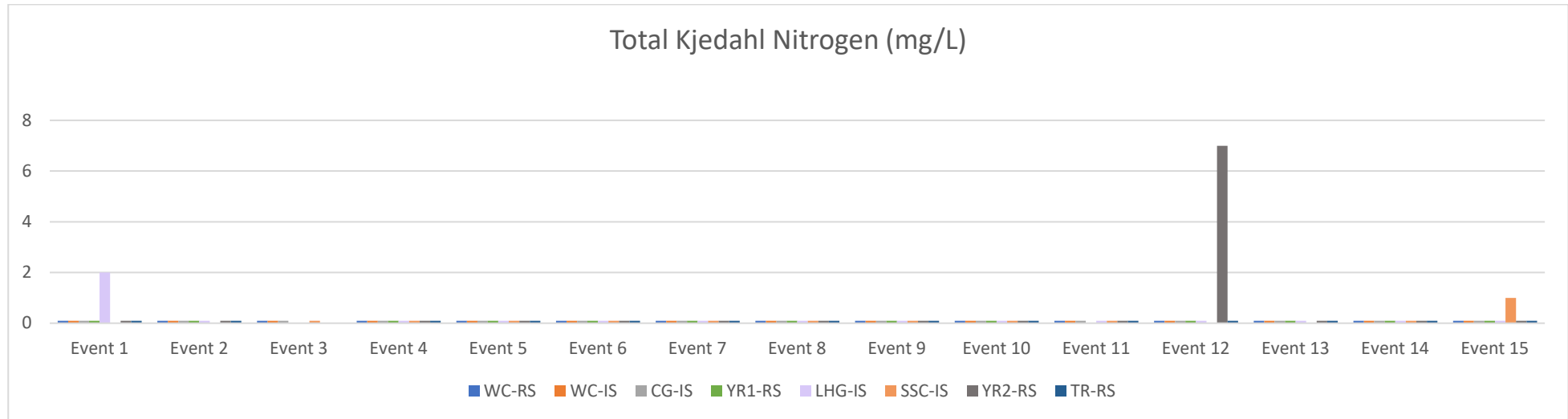
Figure 3-30 Total Kjedahl Nitrogen (TKN) for the Talbingo Reservoir catchment
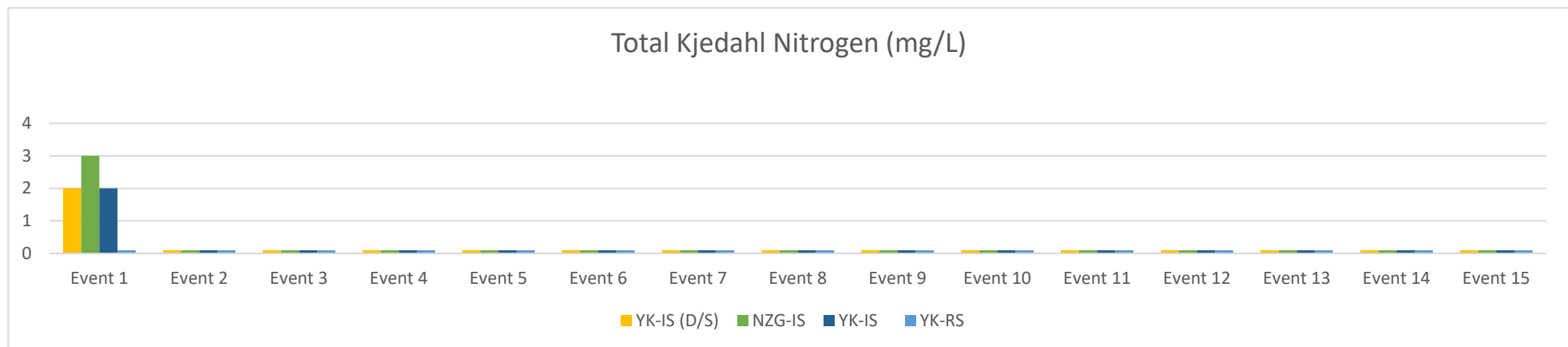
Figure 3-31 Total Kjedahl Nitrogen (TKN) for the Yorkers Creek catchment

Ammonia (mg/L) levels were below the LOR for all sites within the Talbingo and Yorkers Creek catchments for Event 15, refer to Figure 3-32 and Figure 3-33
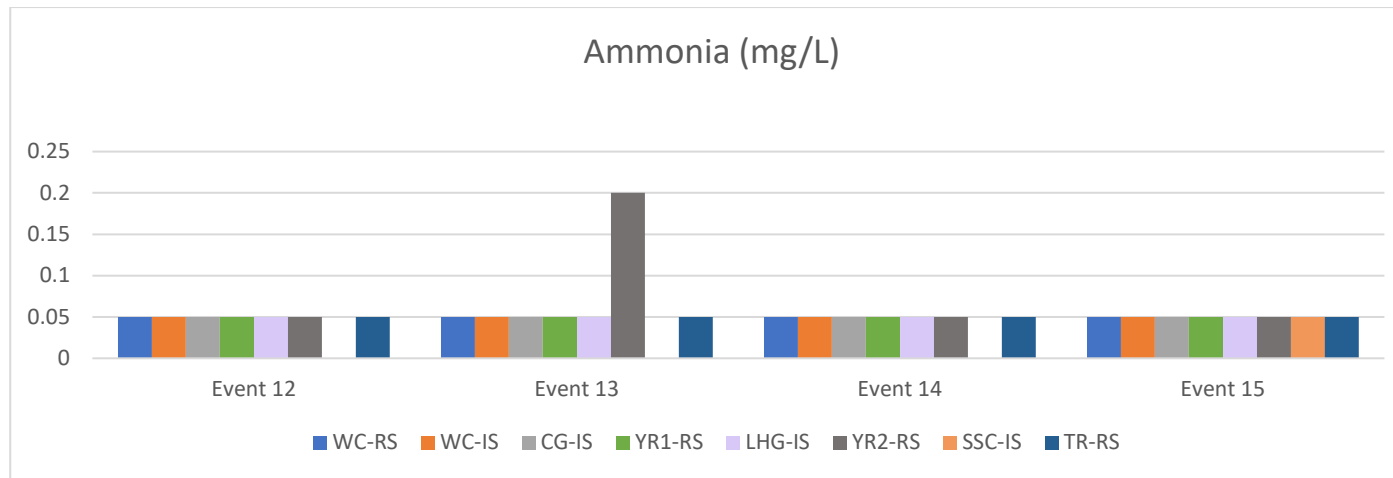
Figure 3-32 Ammonia (mg/L) for the Talbingo Reservoir catchment
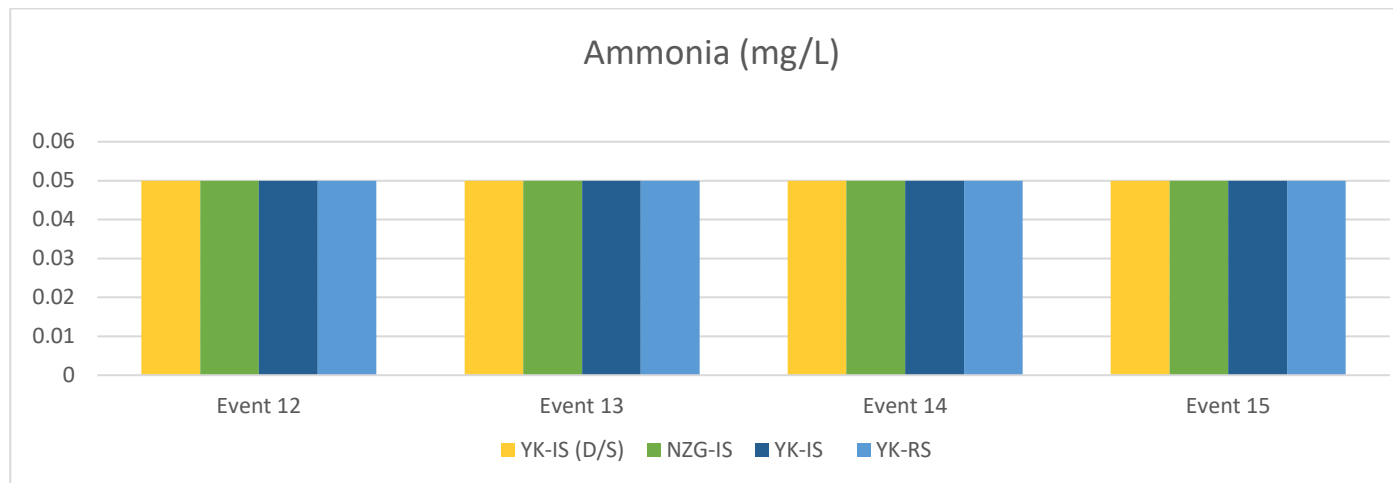
Figure 3-33 Ammonia (mg/L) for the Yorkers Creek catchment

3.1.2. Quality Assurance / Quality Control

A Quality Assurance and Quality Control (QA/QC) program was undertaken as part of this investigation including:

- A field duplicate sample, at a rate of one per 20 samples, was taken (DUP01) from the WQM site WC-RS on 6 June 2023. DUP01 was analysed for metals and metalloids. The duplicate sample has been compared against the WC-RS sample by Relative Percentage Difference (RPD) and has returned within an acceptable range (less than 30% for inorganic or less than 5 times the laboratory LOR.
- A water blank was supplied by the laboratory. The water blank sample was analysed for metals and metalloids. There were no exceedances of the sample results above the LORs.

NGH consider the QA/QC program to have been effective and the data reliable and representative to achieve the objectives of the investigation.

Refer to Appendix C for the laboratory analysis certificate, Appendix D for the RPD Table and Appendix E for the calibration certificates.

4.   Conclusion

Water temperatures for Event 15 have generally decreased across the sites, when compared to water temperatures for Event 14. This is due to seasonal changes.

Results for Event 15 indicate there has been a minor increase in turbidity (NTU) and ORP across both catchments. A negative value for ORP at LHG-IS (-43.2 mV) is consistent with Event 14 and indicates that this is still a reducing environment.

The pH readings for both catchments have decreased during Event 15, with both catchments registering readings within the DGV range (6.50 - 8.0 pH units). Similarly, dissolved oxygen levels have notably decreased across both catchments.

Results for TSS have remained relatively consistent across both catchments, when compared to previous events. Results for Ammonia were below the LOR and consistent across the catchments. Similarly, results for Nitrogen Oxides were below the LOR and consistent across the catchments.

Reactive phosphorous remained consistent within the Talbingo Reservoir catchment and increased within the Yorkers Creek catchment, with results of 0.02 mg/L at all sites.

Total Hardness ($CaCO_3$) remained consistent within the Talbingo Reservoir catchment for Event 15, varying from very soft at TR-RS (6 mg/L) to hard at LHG-IS (268 mg/L). Similarly, total Hardness ($CaCO_3$) remained consistent within the Yorkers Creek catchment, ranging from 7 – 13 mg/L (very soft).

Results for Total Kjedahl Nitrogen (TKN) consistently registered very low readings for Event 15.

Laboratory results for Event 15 were generally consistent with the results of the previous monitoring events, with the majority of analytes reported below the Limit of Reporting. Results exceeded the DGV for:

- Total suspended solids (0.2 mg/L) at WC-RS, CG-IS, YK-IS (D/S) and YK-IS
- Iron (0.3 mg/L) at YK-IS (D/S), YK-IS and YK-RS
- Aluminium (0.027 mg/L) at all sites except for CG-IS and TR-RS
- Zinc (0.0024 mg/L) at CG-IS and LHG-IS
- Copper (0.001 mg/L) at LHG-IS and NZG-IS
- Total Nitrogen (0.25 mg/L) at SSC-IS
- Reactive phosphorous (0.015 mg/L) at YK-IS, YK-RS and NZG-IS
- Total phosphorous (0.02 mg/L) at WC-IS
- Total dissolved solids were elevated at CG-IS and LHG-IS, which is a pattern that has carried through all events.

All results and statistics are provided in Appendix A.

5.   References

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NGH Pty Ltd. 2022c. *Pre-construction Water Quality Monitoring Report: Event 3 May and June 2022.*

NGH Pty Ltd. 2022d. *Pre-construction Water Quality Monitoring Report: Event 4 June 2022.*

NGH Pty Ltd. 2022e. *Pre-construction Water Quality Monitoring Report: Event 5 July 2022.*

NGH Pty Ltd. 2022f. *Pre-construction Water Quality Monitoring Report: Event 6 August 2022.*

NGH Pty Ltd. 2022g. *Pre-construction Water Quality Monitoring Report: Event 7 October 2022.*

NGH Pty Ltd. 2022h. *Pre-construction Water Quality Monitoring Report: Event 8 October 2022.*

NGH Pty Ltd. 2022i. *Pre-construction Water Quality Monitoring Report: Event 9 November 2022.*

NGH Pty Ltd. 2022j. *Pre-construction Water Quality Monitoring Report: Event 10 December 2022.*

NGH Pty Ltd. 2023a. *Pre-construction Water Quality Monitoring Report: Event 11 January 2023.*

NGH Pty Ltd. 2023b. *Pre- construction Water Quality Monitoring Report: Event 12 February 2023.*

NGH Pty Ltd. 2023c. *Pre- construction Water Quality Monitoring Report: Event 13 March 2023.*

NGH Pty Ltd. 2023d. *Pre- construction Water Quality Monitoring Report: Event 14 April 2023.*

TransGrid. 2021a. *Snowy 2.0 Transmission Connection Project Submissions Report.*

TransGrid. 2021b. *Snowy 2.0 Transmission Connection Project Amendment Report*.

APPENDIX A EVENT DATA TABLE

	Sheen/oil grease	Temp (°C)	Dissolved Oxygen (DO %)	DO (ppm)	Specific EC (SPC EC) (uS/cm)	EC (uS/cm)	pH	Redox (mV)	Turbidity (NTU)	Al (mg/L)	As (mg/L)	Cd (mg/L)	Cr (mg/L)	Cu (mg/L)	Cyanide (mg/L)	Fe (mg/L)	Pb (mg/L)	Mn (mg/L)	Hg (mg/L)	Ni (mg/L)	TN (mg/L)	TP (mg/L)	Ag (mg/L)	Zn (mg/L)	Ammonia (mg/L)	Nitrogen Oxides (mg/L)	Reactive Phosphorous (mg/L)	Total Hardness (CaCO3)	Total Kjedahl Nitrogen (TKN)	TDS mg/L	TSS mg/L
DGV (Default Guideline Value)	No	-	90-110	-	-	30-350	6.5-8	-	2-25	0.027	0.0008	0.00006	0.00001	0.001	0.004	0.3	0.001	1.2	0.00006	0.008	0.25	0.02	0.00002	0.0024	0.013	0.015	0.015				0.2

½ of the Limit of reporting for statistical use (LOR/2)

APPENDIX B OBSERVATIONS AND FIELD DATA

22-013 Pre-construction WQM		Grease/oil/sheen	Temperature (°C)	Dissolved Oxygen (%)	Dissolved Oxygen (ppm)	Specific Conductivity (SPC uS/cm)	Conductivity (uS/cm)	pH	Oxidation Reduction Potential (mV)	Turbidity (NTU)
6/6 WC-RS	Month	ND	9.7	45.2%	5.13	75.6		7.60	139.9	5.39
	Comment	Slow Flow Algae present								
6/6 WC-IS	Month	ND	9.8	44%	4.99	75.3		7.39	138.4	5.64
	Comment	Slightly cloudy Slow Flow								
6/6 CG-IS	Month	ND	10.8	43.9%	4.86	479.3		7.60	153.2	0.01
	Comment	Small Flow Algae present on and in water.								
6/6 YR1-RS	Month	ND	9.3	~~44.1%~~ 44.1%	5.00	86.3		7.54	141.0	1.97
	Comment	Clear. Flowing steadily								

22-013 Pre-construction WQM		Grease/oil/ sheen	Temperature (°C)	Dissolved Oxygen (%)	Dissolved Oxygen (ppm)	Specific Conductivity (SPC uS/cm)	Conductivity (uS/cm)	pH	Oxidation Reduction Potential (mV)	Turbidity (NTU)
6/6 LHG-IS	Month	ND.	9.8	44.0%	5.04	522		7.21	-43.2	17.27
	Comment	Slow Flow Alot of vegetation Evidence of kangaroos.								
6/6 YR2-RS	Month	ND	9.9	44.2%	5.00	88.7		7.49	97.2	1.83
	Comment	Steady - Fast Flow water clear								
6/6 SSC-IS	Month	ND	10.9	44.5%	4.92	151.7		7.29	75.4	5.70
	Comment	Algae small stream Low flow								
7/6 TR-RS	Month	NO	8.7	45.3%	5.27	22.7	15.7	7.11	125.3	0.42
	Comment	Level relatively low. Water clear. Access road closed, needed key to get to sample site.								
7/6 YK-IS (D/S)	Month	NO	7.9	44.8%	5.31	33.7	22.7	7.14	119.6	10.85
	Comment	water flowing medium, possible due to recent rain Clear - slightly turbid.								

22-013 Pre-construction WQM		Grease/oil/ sheen	Temperature (°C)	Dissolved Oxygen (%)	Dissolved Oxygen (ppm)	Specific Conductivity (SPC uS/cm)	Conductivity (uS/cm)	pH	Oxidation Reduction Potential (mV)	Turbidity (NTU)
7/6 NZG-IS	Month	NO.	8.6	43.9%	5.12	43.7	30.0	6.58	112.8	6.41
	Comment	Slightly turbid, likely due to recent rain. Signs of horses/deer tracks close to bank + sample point. Access to site through old work area. - works almost complete.								
7/6 YK-IS	Month	NO	8.7	44.7%	5.20	30.A	20.9	6.68	123.8	13.88.
	Comment	Slightly turbid + water flow fast - likely from recent rain. Adjacent to road.								
7/6 YK-RS	Month	NO.	9.2	43.6%	5.02	29.4	20.5	6.63	110.1	7.48.
	Comment	Slightly turbid- likely due to recent rain. Animal (horses or deer) tracks along bank + adjacent to sample point.								

APPENDIX C LABORATORY CERTIFICATES

![Charles Sturt University logo]

NGH Environmental

Suite 1/39 Fitzmaurice Strret

Wagga Wagga   NSW   2650

Attention: Nicole Isles

Thursday, June 29, 2023

NATA Accredited Laboratory Number: 9597

Accredited for compliance with ISO/IEC 17025 - Testing

LABORATORY ANALYSIS REPORT

Report Number:2306-0021
Page 1 of 17
For all enquiries related to this report please quote document number: 2306-0021

Facility:	Order #	Date Analysis Commenced
		08-June-2023

Sample Type	Collected By	Date Received
Water	C, Hobbs	08-June-2023

EAL ID	Client ID. Date/Time sample taken	Test	Result (units)		Method Reference	Limit of Reporting
23Jun-0051	WC-RS 06.06.23 1.30pm					
		Aluminium (dissolved)	0.11	mg/L	APHA 3030 B/3120 B	0.03
		Ammonia as N	<0.1	mg/L	LTM-W-042	0.1
		Arsenic (dissolved)	<0.0003	mg/L	APHA 3030 B/3120 B	0.0003
		Cadmium (dissolved)	<0.00002	mg/L	APHA 3030 B/3120 B	0.0000
		Calcium (dissolved)	9.01	mg/L	APHA 3030 B/3120 B	2
		Chromium (dissolved)	<0.00001	mg/L	APHA 3030 B/3120 B	0.0000
		Copper (dissolved)	<0.002	mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	<0.002	mg/L	* APHA 4500-CN E	0.002
		Total Hardness as CaCO3	29	mg/L	LTM-W-038	2
		Iron (dissolved)	0.09	mg/L	APHA 3030 B/3120 B	0.01
		Lead (dissolved)	<0.001	mg/L	APHA 3030 B/3120 B	0.001
		Magnesium (dissolved)	<2.00	mg/L	APHA 3030 B/3120 B	2
		Manganese (dissolved)	0.001	mg/L	APHA 3030 B/3120 B	0.001
		Mercury (dissolved)	<0.00003	mg/L	APHA 3030 B/3120 B	0.0000
		Nickel (dissolved)	<0.001	mg/L	APHA 3030 B/3120 B	0.001
		Nitrogen, total	<0.2	mg/L	* APHA 4500-Norg B + 4110 B	0.2
		Nitrate/Nitrite as N	<0.1	mg/L	LTM-W-014	0.1
		Ortho-Phosphate as P	<0.01	mg/L	LTM-W-030	0.01
		Phosphorus, Total	0.03	mg/L	LTM-W-030	0.01
		Silver (dissolved)	<0.00002	mg/L	* APHA 3030 B/3120 B	0.0000
		Total Dissolved Solids	<2	mg/L	LTM-W-035	2
		Total Kjeldahl Nitrogen	<0.2	mg/L	LTM-W-034	0.2

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NGH Environmental

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Attention: Nicole Isles

Thursday, June 29, 2023

LABORATORY ANALYSIS REPORT

Facility:	**Order #**	**Date Analysis Commenced**
		08-June-2023

Sample Type	**Collected By**	**Date Received**
Water	C, Hobbs	08-June-2023

EAL ID	**Client ID.** Date/Time sample taken	**Test**	**Result** (units)		**Method Reference**	**Limit of Reporting**
23Jun-0051	**WC-RS** 06.06.23 1.30pm					
		Total Suspended Solids	**4**	mg/L	APHA 2540 D	0.2
		Zinc (dissolved)	**<0.002**	mg/L	APHA 3030 B/3120 B	0.002
23Jun-0052	**WC-IS** 06.06.23 1.30pm					
		Aluminium (dissolved)	**0.10**	mg/L	APHA 3030 B/3120 B	0.03
		Ammonia as N	**<0.1**	mg/L	LTM-W-042	0.1
		Arsenic (dissolved)	**<0.0003**	mg/L	APHA 3030 B/3120 B	0.0003
		Cadmium (dissolved)	**<0.00002**	mg/L	APHA 3030 B/3120 B	0.0000
		Calcium (dissolved)	**8.87**	mg/L	APHA 3030 B/3120 B	2
		Chromium (dissolved)	**<0.00001**	mg/L	APHA 3030 B/3120 B	0.0000
		Copper (dissolved)	**<0.002**	mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	**<0.002**	mg/L	* APHA 4500-CN E	0.002
		Total Hardness as CaCO3	**28**	mg/L	LTM-W-038	2
		Iron (dissolved)	**0.06**	mg/L	APHA 3030 B/3120 B	0.01
		Lead (dissolved)	**<0.001**	mg/L	APHA 3030 B/3120 B	0.001
		Magnesium (dissolved)	**<2.00**	mg/L	APHA 3030 B/3120 B	2
		Manganese (dissolved)	**0.001**	mg/L	APHA 3030 B/3120 B	0.001
		Mercury (dissolved)	**<0.00003**	mg/L	APHA 3030 B/3120 B	0.0000
		Nickel (dissolved)	**<0.001**	mg/L	APHA 3030 B/3120 B	0.001
		Nitrogen, total	**<0.2**	mg/L	* APHA 4500-Norg B + 4110 B	0.2
		Nitrate/Nitrite as N	**<0.1**	mg/L	LTM-W-014	0.1
		Ortho-Phosphate as P	**0.01**	mg/L	LTM-W-030	0.01

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NGH Environmental

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Attention: Nicole Isles

Thursday, June 29, 2023

LABORATORY ANALYSIS REPORT

Report Number:2306-0021
Page 3 of 17
For all enquiries related to this report please quote document number: 2306-0021

Facility:		Order #		Date Analysis Commenced
				08-June-2023
Sample Type		**Collected By**		**Date Received**
Water		C, Hobbs		08-June-2023

EAL ID	Client ID. / Date/Time sample taken	Test	Result (units)		Method Reference	Limit of Reporting
23Jun-0052	**WC-IS** 06.06.23 1.30pm					
		Phosphorus, Total	0.13	mg/L	LTM-W-030	0.01
		Silver (dissolved)	<0.00002	mg/L	* APHA 3030 B/3120 B	0.0000
		Total Dissolved Solids	<2	mg/L	LTM-W-035	2
		Total Kjeldahl Nitrogen	<0.2	mg/L	LTM-W-034	0.2
		Total Suspended Solids	<0.2	mg/L	APHA 2540 D	0.2
		Zinc (dissolved)	<0.002	mg/L	APHA 3030 B/3120 B	0.002
23Jun-0053	**CG-IS** 06.06.23 1.30pm					
		Aluminium (dissolved)	0.05	mg/L	APHA 3030 B/3120 B	0.03
		Ammonia as N	<0.1	mg/L	LTM-W-042	0.1
		Arsenic (dissolved)	<0.0003	mg/L	APHA 3030 B/3120 B	0.0003
		Cadmium (dissolved)	<0.00002	mg/L	APHA 3030 B/3120 B	0.0000
		Calcium (dissolved)	92.2	mg/L	APHA 3030 B/3120 B	2
		Chromium (dissolved)	<0.00001	mg/L	APHA 3030 B/3120 B	0.0000
		Copper (dissolved)	<0.002	mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	<0.002	mg/L	* APHA 4500-CN E	0.002
		Total Hardness as CaCO3	250	mg/L	LTM-W-038	2
		Iron (dissolved)	<0.01	mg/L	APHA 3030 B/3120 B	0.01
		Lead (dissolved)	<0.001	mg/L	APHA 3030 B/3120 B	0.001
		Magnesium (dissolved)	4.85	mg/L	APHA 3030 B/3120 B	2
		Manganese (dissolved)	<0.001	mg/L	APHA 3030 B/3120 B	0.001
		Mercury (dissolved)	<0.00003	mg/L	APHA 3030 B/3120 B	0.0000

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Thursday, June 29, 2023

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LABORATORY ANALYSIS REPORT

For all enquiries related to this report please quote document number: 2306-0021

Facility:	Order #	Date Analysis Commenced
		08-June-2023

Sample Type	Collected By	Date Received
Water	C, Hobbs	08-June-2023

EAL ID	Client ID. Date/Time sample taken	Test	Result (units)		Method Reference	Limit of Reporting
23Jun-0053	**CG-IS** 06.06.23 1.30pm					
		Nickel (dissolved)	<0.001	mg/L	APHA 3030 B/3120 B	0.001
		Nitrogen, total	<0.2	mg/L	* APHA 4500-Norg B + 4110 B	0.2
		Nitrate/Nitrite as N	<0.1	mg/L	LTM-W-014	0.1
		Ortho-Phosphate as P	<0.01	mg/L	LTM-W-030	0.01
		Phosphorus, Total	0.10	mg/L	LTM-W-030	0.01
		Silver (dissolved)	<0.00002	mg/L	* APHA 3030 B/3120 B	0.0000
		Total Dissolved Solids	161	mg/L	LTM-W-035	2
		Total Kjeldahl Nitrogen	<0.2	mg/L	LTM-W-034	0.2
		Total Suspended Solids	112	mg/L	APHA 2540 D	0.2
		Zinc (dissolved)	0.004	mg/L	APHA 3030 B/3120 B	0.002
23Jun-0054	**YR1-IS** 06.06.23 1.30pm					
		Aluminium (dissolved)	0.08	mg/L	APHA 3030 B/3120 B	0.03
		Ammonia as N	<0.1	mg/L	LTM-W-042	0.1
		Arsenic (dissolved)	<0.0003	mg/L	APHA 3030 B/3120 B	0.0003
		Cadmium (dissolved)	<0.00002	mg/L	APHA 3030 B/3120 B	0.0000
		Calcium (dissolved)	11.3	mg/L	APHA 3030 B/3120 B	2
		Chromium (dissolved)	<0.00001	mg/L	APHA 3030 B/3120 B	0.0000
		Copper (dissolved)	<0.002	mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	<0.002	mg/L	* APHA 4500-CN E	0.002
		Total Hardness as CaCO3	34	mg/L	LTM-W-038	2
		Iron (dissolved)	0.05	mg/L	APHA 3030 B/3120 B	0.01

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Facility:	Order #	Date Analysis Commenced
		08-June-2023

Sample Type	Collected By	Date Received
Water	C, Hobbs	08-June-2023

EAL ID	Client ID. Date/Time sample taken	Test	Result (units)		Method Reference	Limit of Reporting
23Jun-0054	**YR1-IS** 06.06.23 1.30pm					
		Lead (dissolved)	**<0.001**	mg/L	APHA 3030 B/3120 B	0.001
		Magnesium (dissolved)	**<2.00**	mg/L	APHA 3030 B/3120 B	2
		Manganese (dissolved)	**0.001**	mg/L	APHA 3030 B/3120 B	0.001
		Mercury (dissolved)	**<0.00003**	mg/L	APHA 3030 B/3120 B	0.0000
		Nickel (dissolved)	**<0.001**	mg/L	APHA 3030 B/3120 B	0.001
		Nitrogen, total	**<0.2**	mg/L	* APHA 4500-Norg B + 4110 B	0.2
		Nitrate/Nitrite as N	**<0.1**	mg/L	LTM-W-014	0.1
		Ortho-Phosphate as P	**<0.01**	mg/L	LTM-W-030	0.01
		Phosphorus, Total	**0.03**	mg/L	LTM-W-030	0.01
		Silver (dissolved)	**<0.00002**	mg/L	* APHA 3030 B/3120 B	0.0000
		Total Dissolved Solids	**21**	mg/L	LTM-W-035	2
		Total Kjeldahl Nitrogen	**<0.2**	mg/L	LTM-W-034	0.2
		Total Suspended Solids	**<0.2**	mg/L	APHA 2540 D	0.2
		Zinc (dissolved)	**<0.002**	mg/L	APHA 3030 B/3120 B	0.002
23Jun-0055	**LHG-IS** 06.06.23 1.30pm					
		Aluminium (dissolved)	**0.07**	mg/L	APHA 3030 B/3120 B	0.03
		Ammonia as N	**<0.1**	mg/L	LTM-W-042	0.1
		Arsenic (dissolved)	**<0.0003**	mg/L	APHA 3030 B/3120 B	0.0003
		Cadmium (dissolved)	**<0.00002**	mg/L	APHA 3030 B/3120 B	0.0000
		Calcium (dissolved)	**98.5**	mg/L	APHA 3030 B/3120 B	2
		Chromium (dissolved)	**<0.00001**	mg/L	APHA 3030 B/3120 B	0.0000

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LABORATORY ANALYSIS REPORT

Report Number:2306-0021
Page 6 of 17
For all enquiries related to this report please quote document number: 2306-0021

Facility:	Order #	Date Analysis Commenced
		08-June-2023

Sample Type	Collected By	Date Received
Water	C, Hobbs	08-June-2023

EAL ID	Client ID. Date/Time sample taken	Test	Result (units)		Method Reference	Limit of Reporting
23Jun-0055	**LHG-IS** 06.06.23 1.30pm					
		Copper (dissolved)	0.002	mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	<0.002	mg/L	* APHA 4500-CN E	0.002
		Total Hardness as CaCO3	268	mg/L	LTM-W-038	2
		Iron (dissolved)	0.04	mg/L	APHA 3030 B/3120 B	0.01
		Lead (dissolved)	<0.001	mg/L	APHA 3030 B/3120 B	0.001
		Magnesium (dissolved)	5.47	mg/L	APHA 3030 B/3120 B	2
		Manganese (dissolved)	0.007	mg/L	APHA 3030 B/3120 B	0.001
		Mercury (dissolved)	<0.00003	mg/L	APHA 3030 B/3120 B	0.0000
		Nickel (dissolved)	<0.001	mg/L	APHA 3030 B/3120 B	0.001
		Nitrogen, total	<0.2	mg/L	* APHA 4500-Norg B + 4110 B	0.2
		Nitrate/Nitrite as N	<0.1	mg/L	LTM-W-014	0.1
		Ortho-Phosphate as P	0.04	mg/L	LTM-W-030	0.01
		Phosphorus, Total	0.03	mg/L	LTM-W-030	0.01
		Silver (dissolved)	<0.00002	mg/L	* APHA 3030 B/3120 B	0.0000
		Total Dissolved Solids	316	mg/L	LTM-W-035	2
		Total Kjeldahl Nitrogen	<0.2	mg/L	LTM-W-034	0.2
		Total Suspended Solids	<0.2	mg/L	APHA 2540 D	0.2
		Zinc (dissolved)	0.004	mg/L	APHA 3030 B/3120 B	0.002
23Jun-0056	**YR2-IS** 06.06.23 1.30pm					
		Aluminium (dissolved)	0.07	mg/L	APHA 3030 B/3120 B	0.03
		Ammonia as N	<0.1	mg/L	LTM-W-042	0.1

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LABORATORY ANALYSIS REPORT

Report Number:2306-0021

For all enquiries related to this report please quote document number: 2306-0021

Facility:	**Order #**	**Date Analysis Commenced**
		08-June-2023

Sample Type	**Collected By**	**Date Received**
Water	C, Hobbs	08-June-2023

EAL ID	Client ID. Date/Time sample taken	Test	Result (units)		Method Reference	Limit of Reporting
23Jun-0056	**YR2-IS** 06.06.23 1.30pm					
		Arsenic (dissolved)	**<0.0003**	mg/L	APHA 3030 B/3120 B	0.0003
		Cadmium (dissolved)	**<0.00002**	mg/L	APHA 3030 B/3120 B	0.0000
		Calcium (dissolved)	**11.5**	mg/L	APHA 3030 B/3120 B	2
		Chromium (dissolved)	**<0.00001**	mg/L	APHA 3030 B/3120 B	0.0000
		Copper (dissolved)	**<0.002**	mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	**<0.002**	mg/L	* APHA 4500-CN E	0.002
		Total Hardness as CaCO3	**35**	mg/L	LTM-W-038	2
		Iron (dissolved)	**0.05**	mg/L	APHA 3030 B/3120 B	0.01
		Lead (dissolved)	**<0.001**	mg/L	APHA 3030 B/3120 B	0.001
		Magnesium (dissolved)	**<2.00**	mg/L	APHA 3030 B/3120 B	2
		Manganese (dissolved)	**0.001**	mg/L	APHA 3030 B/3120 B	0.001
		Mercury (dissolved)	**<0.00003**	mg/L	APHA 3030 B/3120 B	0.0000
		Nickel (dissolved)	**<0.001**	mg/L	APHA 3030 B/3120 B	0.001
		Nitrogen, total	**<0.2**	mg/L	* APHA 4500-Norg B + 4110 B	0.2
		Nitrate/Nitrite as N	**<0.1**	mg/L	LTM-W-014	0.1
		Ortho-Phosphate as P	**<0.01**	mg/L	LTM-W-030	0.01
		Phosphorus, Total	**<0.01**	mg/L	LTM-W-030	0.01
		Silver (dissolved)	**<0.00002**	mg/L	* APHA 3030 B/3120 B	0.0000
		Total Dissolved Solids	**56**	mg/L	LTM-W-035	2
		Total Kjeldahl Nitrogen	**<0.2**	mg/L	LTM-W-034	0.2
		Total Suspended Solids	**<0.2**	mg/L	APHA 2540 D	0.2
		Zinc (dissolved)	**<0.002**	mg/L	APHA 3030 B/3120 B	0.002

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CRICOS Provider Numbers for Charles Sturt University are 00005F (NSW), 01947G (VIC) and 02960B (ACT). ABN: 83 878 708 551

NGH Environmental

Suite 1/39 Fitzmaurice Strret

Wagga Wagga   NSW   2650

Attention: Nicole Isles

Thursday, June 29, 2023

NATA Accredited Laboratory Number: 9597

Accredited for compliance with ISO/IEC 17025 - Testing

LABORATORY ANALYSIS REPORT

For all enquiries related to this report please quote document number: 2306-0021

Facility:	Order #	Date Analysis Commenced
		08-June-2023

Sample Type	Collected By	Date Received
Water	C, Hobbs	08-June-2023

EAL ID	Client ID. Date/Time sample taken	Test	Result (units)		Method Reference	Limit of Reporting
23Jun-0057	**SSC-IS** 06.06.23 1.30pm					
		Aluminium (dissolved)	0.11	mg/L	APHA 3030 B/3120 B	0.03
		Ammonia as N	<0.1	mg/L	LTM-W-042	0.1
		Arsenic (dissolved)	<0.0003	mg/L	APHA 3030 B/3120 B	0.0003
		Cadmium (dissolved)	<0.00002	mg/L	APHA 3030 B/3120 B	0.0000
		Calcium (dissolved)	13.0	mg/L	APHA 3030 B/3120 B	2
		Chromium (dissolved)	<0.00001	mg/L	APHA 3030 B/3120 B	0.0000
		Copper (dissolved)	<0.002	mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	<0.002	mg/L	* APHA 4500-CN E	0.002
		Total Hardness as CaCO3	52	mg/L	LTM-W-038	2
		Iron (dissolved)	0.05	mg/L	APHA 3030 B/3120 B	0.01
		Lead (dissolved)	<0.001	mg/L	APHA 3030 B/3120 B	0.001
		Magnesium (dissolved)	4.87	mg/L	APHA 3030 B/3120 B	2
		Manganese (dissolved)	<0.001	mg/L	APHA 3030 B/3120 B	0.001
		Mercury (dissolved)	<0.00003	mg/L	APHA 3030 B/3120 B	0.0000
		Nickel (dissolved)	<0.001	mg/L	APHA 3030 B/3120 B	0.001
		Nitrogen, total	1.0	mg/L	* APHA 4500-Norg B + 4110 B	0.2
		Nitrate/Nitrite as N	<0.1	mg/L	LTM-W-014	0.1
		Ortho-Phosphate as P	0.01	mg/L	LTM-W-030	0.01
		Phosphorus, Total	0.01	mg/L	LTM-W-030	0.01
		Silver (dissolved)	<0.00002	mg/L	* APHA 3030 B/3120 B	0.0000
		Total Dissolved Solids	83	mg/L	LTM-W-035	2
		Total Kjeldahl Nitrogen	1.0	mg/L	LTM-W-034	0.2

Charles Sturt University

NGH Environmental

Suite 1/39 Fitzmaurice Strret

Wagga Wagga   NSW   2650

Attention: Nicole Isles

Thursday, June 29, 2023

NATA Accredited Laboratory Number: 9597

Accredited for compliance with ISO/IEC 17025 - Testing

LABORATORY ANALYSIS REPORT

Report Number:2306-0021

For all enquiries related to this report please quote document number: 2306-0021

Facility:	Order #	Date Analysis Commenced
		08-June-2023

Sample Type	Collected By	Date Received
Water	C, Hobbs	08-June-2023

EAL ID	Client ID. Date/Time sample taken	Test	Result (units)		Method Reference	Limit of Reporting
23Jun-0057	**SSC-IS** 06.06.23 1.30pm					
		Total Suspended Solids	<0.2	mg/L	APHA 2540 D	0.2
		Zinc (dissolved)	<0.002	mg/L	APHA 3030 B/3120 B	0.002
23Jun-0058	**TR-RS** 07.06.23 1.30pm					
		Aluminium (dissolved)	<0.03	mg/L	APHA 3030 B/3120 B	0.03
		Ammonia as N	<0.1	mg/L	LTM-W-042	0.1
		Arsenic (dissolved)	<0.0003	mg/L	APHA 3030 B/3120 B	0.0003
		Cadmium (dissolved)	<0.00002	mg/L	APHA 3030 B/3120 B	0.0000
		Calcium (dissolved)	<2.00	mg/L	APHA 3030 B/3120 B	2
		Chromium (dissolved)	<0.00001	mg/L	APHA 3030 B/3120 B	0.0000
		Copper (dissolved)	<0.002	mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	<0.002	mg/L	* APHA 4500-CN E	0.002
		Total Hardness as CaCO3	6	mg/L	LTM-W-038	2
		Iron (dissolved)	0.04	mg/L	APHA 3030 B/3120 B	0.01
		Lead (dissolved)	<0.001	mg/L	APHA 3030 B/3120 B	0.001
		Magnesium (dissolved)	<2.00	mg/L	APHA 3030 B/3120 B	2
		Manganese (dissolved)	0.002	mg/L	APHA 3030 B/3120 B	0.001
		Mercury (dissolved)	<0.00003	mg/L	APHA 3030 B/3120 B	0.0000
		Nickel (dissolved)	<0.001	mg/L	APHA 3030 B/3120 B	0.001
		Nitrogen, total	<0.2	mg/L	* APHA 4500-Norg B + 4110 B	0.2
		Nitrate/Nitrite as N	<0.1	mg/L	LTM-W-014	0.1
		Ortho-Phosphate as P	<0.01	mg/L	LTM-W-030	0.01

Charles Sturt University

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Thursday, June 29, 2023

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Accredited for compliance with ISO/IEC 17025 - Testing

LABORATORY ANALYSIS REPORT

Facility:	**Order #**	**Date Analysis Commenced**
		08-June-2023

Sample Type	**Collected By**	**Date Received**
Water	C, Hobbs	08-June-2023

EAL ID	**Client ID.** Date/Time sample taken	**Test**	**Result** (units)		**Method Reference**	**Limit of Reporting**
23Jun-0058	**TR-RS** 07.06.23 1.30pm					
		Phosphorus, Total	0.02	mg/L	LTM-W-030	0.01
		Silver (dissolved)	<0.00002	mg/L	* APHA 3030 B/3120 B	0.0000
		Total Dissolved Solids	<2	mg/L	LTM-W-035	2
		Total Kjeldahl Nitrogen	<0.2	mg/L	LTM-W-034	0.2
		Total Suspended Solids	<0.2	mg/L	APHA 2540 D	0.2
		Zinc (dissolved)	<0.002	mg/L	APHA 3030 B/3120 B	0.002
23Jun-0059	**YK-IS(d/s)** 07.06.23 1.30pm					
		Aluminium (dissolved)	0.34	mg/L	APHA 3030 B/3120 B	0.03
		Ammonia as N	<0.1	mg/L	LTM-W-042	0.1
		Arsenic (dissolved)	<0.0003	mg/L	APHA 3030 B/3120 B	0.0003
		Cadmium (dissolved)	<0.00002	mg/L	APHA 3030 B/3120 B	0.0000
		Calcium (dissolved)	<2.00	mg/L	APHA 3030 B/3120 B	2
		Chromium (dissolved)	<0.00001	mg/L	APHA 3030 B/3120 B	0.0000
		Copper (dissolved)	<0.002	mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	<0.002	mg/L	* APHA 4500-CN E	0.002
		Total Hardness as CaCO3	9	mg/L	LTM-W-038	2
		Iron (dissolved)	0.31	mg/L	APHA 3030 B/3120 B	0.01
		Lead (dissolved)	<0.001	mg/L	APHA 3030 B/3120 B	0.001
		Magnesium (dissolved)	<2.00	mg/L	APHA 3030 B/3120 B	2
		Manganese (dissolved)	0.005	mg/L	APHA 3030 B/3120 B	0.001
		Mercury (dissolved)	<0.00003	mg/L	APHA 3030 B/3120 B	0.0000

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Thursday, June 29, 2023

NATA Accredited Laboratory Number: 9597

Accredited for compliance with ISO/IEC 17025 - Testing

LABORATORY ANALYSIS REPORT

For all enquiries related to this report please quote document number: 2306-0021

Facility:		Order #		Date Analysis Commenced
				08-June-2023
Sample Type		**Collected By**		**Date Received**
Water		C. Hobbs		08-June-2023

EAL ID	Client ID. Date/Time sample taken	Test	Result (units)		Method Reference	Limit of Reporting
23Jun-0059	**YK-IS(d/s)** 07.06.23 1.30pm					
		Nickel (dissolved)	<0.001	mg/L	APHA 3030 B/3120 B	0.001
		Nitrogen, total	<0.2	mg/L	* APHA 4500-Norg B + 4110 B	0.2
		Nitrate/Nitrite as N	<0.1	mg/L	LTM-W-014	0.1
		Ortho-Phosphate as P	0.02	mg/L	LTM-W-030	0.01
		Phosphorus, Total	0.06	mg/L	LTM-W-030	0.01
		Silver (dissolved)	<0.00002	mg/L	* APHA 3030 B/3120 B	0.0000
		Total Dissolved Solids	<2	mg/L	LTM-W-035	2
		Total Kjeldahl Nitrogen	<0.2	mg/L	LTM-W-034	0.2
		Total Suspended Solids	2	mg/L	APHA 2540 D	0.2
		Zinc (dissolved)	<0.002	mg/L	APHA 3030 B/3120 B	0.002
23Jun-0060	**NZG-IS** 07.06.23 1.30pm					
		Aluminium (dissolved)	0.21	mg/L	APHA 3030 B/3120 B	0.03
		Ammonia as N	<0.1	mg/L	LTM-W-042	0.1
		Arsenic (dissolved)	<0.0003	mg/L	APHA 3030 B/3120 B	0.0003
		Cadmium (dissolved)	<0.00002	mg/L	APHA 3030 B/3120 B	0.0000
		Calcium (dissolved)	3.07	mg/L	APHA 3030 B/3120 B	2
		Chromium (dissolved)	<0.00001	mg/L	APHA 3030 B/3120 B	0.0000
		Copper (dissolved)	0.004	mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	<0.002	mg/L	* APHA 4500-CN E	0.002
		Total Hardness as CaCO3	13	mg/L	LTM-W-038	2
		Iron (dissolved)	0.18	mg/L	APHA 3030 B/3120 B	0.01

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ENVIRONMENTAL AND ANALYTICAL LABORATORIES

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NGH Environmental

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Wagga Wagga NSW   2650

Attention: Nicole Isles

Thursday, June 29, 2023

LABORATORY ANALYSIS REPORT

Facility:	Order #	Date Analysis Commenced
		08-June-2023

Sample Type	Collected By	Date Received
Water	C. Hobbs	08-June-2023

EAL ID	Client ID. Date/Time sample taken	Test	Result (units)		Method Reference	Limit of Reporting
23Jun-0060	**NZG-IS** 07.06.23 1.30pm					
		Lead (dissolved)	**<0.001**	mg/L	APHA 3030 B/3120 B	0.001
		Magnesium (dissolved)	**<2.00**	mg/L	APHA 3030 B/3120 B	2
		Manganese (dissolved)	**0.003**	mg/L	APHA 3030 B/3120 B	0.001
		Mercury (dissolved)	**<0.00003**	mg/L	APHA 3030 B/3120 B	0.0000
		Nickel (dissolved)	**<0.001**	mg/L	APHA 3030 B/3120 B	0.001
		Nitrogen, total	**<0.2**	mg/L	* APHA 4500-Norg B + 4110 B	0.2
		Nitrate/Nitrite as N	**<0.1**	mg/L	LTM-W-014	0.1
		Ortho-Phosphate as P	**0.02**	mg/L	LTM-W-030	0.01
		Phosphorus, Total	**0.03**	mg/L	LTM-W-030	0.01
		Silver (dissolved)	**<0.00002**	mg/L	* APHA 3030 B/3120 B	0.0000
		Total Dissolved Solids	**8**	mg/L	LTM-W-035	2
		Total Kjeldahl Nitrogen	**<0.2**	mg/L	LTM-W-034	0.2
		Total Suspended Solids	**<0.2**	mg/L	APHA 2540 D	0.2
		Zinc (dissolved)	**<0.002**	mg/L	APHA 3030 B/3120 B	0.002
23Jun-0061	**YK-IS** 07.06.23 1.30pm					
		Aluminium (dissolved)	**0.42**	mg/L	APHA 3030 B/3120 B	0.03
		Ammonia as N	**<0.1**	mg/L	LTM-W-042	0.1
		Arsenic (dissolved)	**<0.0003**	mg/L	APHA 3030 B/3120 B	0.0003
		Cadmium (dissolved)	**<0.00002**	mg/L	APHA 3030 B/3120 B	0.0000
		Calcium (dissolved)	**<2.00**	mg/L	APHA 3030 B/3120 B	2
		Chromium (dissolved)	**<0.00001**	mg/L	APHA 3030 B/3120 B	0.0000

Charles Sturt University

NGH Environmental

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Wagga Wagga   NSW   2650

Attention: Nicole Isles

Thursday, June 29, 2023

NATA Accredited Laboratory Number: 9597

Accredited for compliance with ISO/IEC 17025 - Testing

LABORATORY ANALYSIS REPORT

Facility:	Order #	Date Analysis Commenced
		08-June-2023

Sample Type	Collected By	Date Received
Water	C. Hobbs	08-June-2023

EAL ID	Client ID. Date/Time sample taken	Test	Result (units)		Method Reference	Limit of Reporting
23Jun-0061	**YK-IS** 07.06.23 1.30pm					
		Copper (dissolved)	**<0.002**	mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	**<0.002**	mg/L	* APHA 4500-CN E	0.002
		Total Hardness as CaCO3	**8**	mg/L	LTM-W-038	2
		Iron (dissolved)	**0.37**	mg/L	APHA 3030 B/3120 B	0.01
		Lead (dissolved)	**<0.001**	mg/L	APHA 3030 B/3120 B	0.001
		Magnesium (dissolved)	**<2.00**	mg/L	APHA 3030 B/3120 B	2
		Manganese (dissolved)	**0.006**	mg/L	APHA 3030 B/3120 B	0.001
		Mercury (dissolved)	**<0.00003**	mg/L	APHA 3030 B/3120 B	0.0000
		Nickel (dissolved)	**<0.001**	mg/L	APHA 3030 B/3120 B	0.001
		Nitrogen, total	**<0.2**	mg/L	* APHA 4500-Norg B + 4110 B	0.2
		Nitrate/Nitrite as N	**<0.1**	mg/L	LTM-W-014	0.1
		Ortho-Phosphate as P	**0.02**	mg/L	LTM-W-030	0.01
		Phosphorus, Total	**0.03**	mg/L	LTM-W-030	0.01
		Silver (dissolved)	**<0.00002**	mg/L	* APHA 3030 B/3120 B	0.0000
		Total Dissolved Solids	**<2**	mg/L	LTM-W-035	2
		Total Kjeldahl Nitrogen	**<0.2**	mg/L	LTM-W-034	0.2
		Total Suspended Solids	**6**	mg/L	APHA 2540 D	0.2
		Zinc (dissolved)	**<0.002**	mg/L	APHA 3030 B/3120 B	0.002
23Jun-0062	**YK-RS** 07.06.23 1.30pm					
		Aluminium (dissolved)	**0.47**	mg/L	APHA 3030 B/3120 B	0.03
		Ammonia as N	**<0.1**	mg/L	LTM-W-042	0.1

Charles Sturt University

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Attention: Nicole Isles

Thursday, June 29, 2023

NATA Accredited Laboratory Number: 9597

Accredited for compliance with ISO/IEC 17025 - Testing

LABORATORY ANALYSIS REPORT

Report Number:2306-0021
Page 14 of 17
For all enquiries related to this report please quote document number: 2306-0021

Facility:	Order #		Date Analysis Commenced
			08-June-2023
Sample Type	**Collected By**		**Date Received**
Water	C. Hobbs		08-June-2023

EAL ID	Client ID. Date/Time sample taken	Test	Result (units)		Method Reference	Limit of Reporting
23Jun-0062	**YK-RS** 07.06.23 1.30pm					
		Arsenic (dissolved)	**<0.0003**	mg/L	APHA 3030 B/3120 B	0.0003
		Cadmium (dissolved)	**<0.00002**	mg/L	APHA 3030 B/3120 B	0.0000
		Calcium (dissolved)	**<2.00**	mg/L	APHA 3030 B/3120 B	2
		Chromium (dissolved)	**<0.00001**	mg/L	APHA 3030 B/3120 B	0.0000
		Copper (dissolved)	**<0.002**	mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	**<0.002**	mg/L	* APHA 4500-CN E	0.002
		Total Hardness as CaCO3	**7**	mg/L	LTM-W-038	2
		Iron (dissolved)	**0.41**	mg/L	APHA 3030 B/3120 B	0.01
		Lead (dissolved)	**<0.001**	mg/L	APHA 3030 B/3120 B	0.001
		Magnesium (dissolved)	**<2.00**	mg/L	APHA 3030 B/3120 B	2
		Manganese (dissolved)	**0.012**	mg/L	APHA 3030 B/3120 B	0.001
		Mercury (dissolved)	**<0.00003**	mg/L	APHA 3030 B/3120 B	0.0000
		Nickel (dissolved)	**<0.001**	mg/L	APHA 3030 B/3120 B	0.001
		Nitrogen, total	**<0.2**	mg/L	* APHA 4500-Norg B + 4110 B	0.2
		Nitrate/Nitrite as N	**<0.1**	mg/L	LTM-W-014	0.1
		Ortho-Phosphate as P	**0.02**	mg/L	LTM-W-030	0.01
		Phosphorus, Total	**0.06**	mg/L	LTM-W-030	0.01
		Silver (dissolved)	**<0.00002**	mg/L	* APHA 3030 B/3120 B	0.0000
		Total Dissolved Solids	**10**	mg/L	LTM-W-035	2
		Total Kjeldahl Nitrogen	**<0.2**	mg/L	LTM-W-034	0.2
		Total Suspended Solids	**<0.2**	mg/L	APHA 2540 D	0.2
		Zinc (dissolved)	**<0.002**	mg/L	APHA 3030 B/3120 B	0.002

![Charles Sturt University logo]

**ENVIRONMENTAL AND ANALYTICAL
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Attention: Nicole Isles

Thursday, June 29, 2023

LABORATORY ANALYSIS REPORT

For all enquiries related to this report please quote document number: 2306-0021

Facility:		Order #		Date Analysis Commenced
				08-June-2023
Sample Type		**Collected By**		**Date Received**
Water		C. Hobbs		08-June-2023

EAL ID	Client ID. Date/Time sample taken	Test	Result (units)		Method Reference	Limit of Reporting
23Jun-0063	**DUP01** 06.06.23 1.30pm					
		Aluminium (dissolved)	**0.08**	mg/L	APHA 3030 B/3120 B	0.03
		Arsenic (dissolved)	**<0.0003**	mg/L	APHA 3030 B/3120 B	0.0003
		Cadmium (dissolved)	**<0.00002**	mg/L	APHA 3030 B/3120 B	0.0000
		Chromium (dissolved)	**<0.00001**	mg/L	APHA 3030 B/3120 B	0.0000
		Copper (dissolved)	**<0.002**	mg/L	APHA 3030 B/3120 B	0.002
		Iron (dissolved)	**0.06**	mg/L	APHA 3030 B/3120 B	0.01
		Lead (dissolved)	**<0.001**	mg/L	APHA 3030 B/3120 B	0.001
		Manganese (dissolved)	**0.001**	mg/L	APHA 3030 B/3120 B	0.001
		Mercury (dissolved)	**<0.00003**	mg/L	APHA 3030 B/3120 B	0.0000
		Nickel (dissolved)	**<0.001**	mg/L	APHA 3030 B/3120 B	0.001
		Silver (dissolved)	**<0.00002**	mg/L	* APHA 3030 B/3120 B	0.0000
		Zinc (dissolved)	**<0.002**	mg/L	APHA 3030 B/3120 B	0.002
23Jun-0064	**Water Blank**					
		Aluminium (dissolved)	**<0.03**	mg/L	APHA 3030 B/3120 B	0.03
		Ammonia as N	**<0.1**	mg/L	LTM-W-042	0.1
		Arsenic (dissolved)	**<0.0003**	mg/L	APHA 3030 B/3120 B	0.0003
		Cadmium (dissolved)	**<0.00002**	mg/L	APHA 3030 B/3120 B	0.0000
		Calcium (dissolved)	**<2.00**	mg/L	APHA 3030 B/3120 B	2
		Chromium (dissolved)	**<0.00001**	mg/L	APHA 3030 B/3120 B	0.0000
		Copper (dissolved)	**<0.002**	mg/L	APHA 3030 B/3120 B	0.002
		Cyanide	**<0.002**	mg/L	* APHA 4500-CN E	0.002

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LABORATORY ANALYSIS REPORT

For all enquiries related to this report please quote document number: 2306-0021

Facility:	Order #		Date Analysis Commenced
			08-June-2023
Sample Type	**Collected By**		**Date Received**
Water	C. Hobbs		08-June-2023

EAL ID	Client ID. Date/Time sample taken	Test	Result (units)		Method Reference	Limit of Reporting
23Jun-0064	**Water Blank**					
		Total Hardness as CaCO3	<2	mg/L	LTM-W-038	2
		Iron (dissolved)	<0.01	mg/L	APHA 3030 B/3120 B	0.01
		Lead (dissolved)	<0.001	mg/L	APHA 3030 B/3120 B	0.001
		Magnesium (dissolved)	<2.00	mg/L	APHA 3030 B/3120 B	2
		Manganese (dissolved)	<0.001	mg/L	APHA 3030 B/3120 B	0.001
		Mercury (dissolved)	<0.00003	mg/L	APHA 3030 B/3120 B	0.0000
		Nickel (dissolved)	<0.001	mg/L	APHA 3030 B/3120 B	0.001
		Nitrogen, total	<0.2	mg/L	* APHA 4500-Norg B + 4110 B	0.2
		Nitrate/Nitrite as N	<0.1	mg/L	LTM-W-014	0.1
		Ortho-Phosphate as P	0.01	mg/L	LTM-W-030	0.01
		Phosphorus, Total	0.01	mg/L	LTM-W-030	0.01
		Silver (dissolved)	<0.00002	mg/L	* APHA 3030 B/3120 B	0.0000
		Total Dissolved Solids	<2	mg/L	LTM-W-035	2
		Total Kjeldahl Nitrogen	<0.2	mg/L	LTM-W-034	0.2
		Total Suspended Solids	<0.2	mg/L	APHA 2540 D	0.2
		Zinc (dissolved)	<0.002	mg/L	APHA 3030 B/3120 B	0.002

Note:

* NATA Accreditation does not cover the performance of this service.

# Charles Sturt University

ENVIRONMENTAL AND ANALYTICAL LABORATORIES

Locked Bag 588
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Tel: +61 2 6933 2849
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Email: eal@csu.edu.au
http://science-health.csu.edu.au/eal

NGH Environmental

Suite 1/39 Fitzmaurice Strret

Wagga Wagga   NSW   2650

Attention: Nicole Isles

Thursday, June 29, 2023

NATA Accredited Laboratory Number: 9597

Accredited for compliance with ISO/IEC 17025 - Testing

LABORATORY ANALYSIS REPORT

For all enquiries related to this report please quote document number: 2306-0021

Facility:		Order #		Date Analysis Commenced
				08-June-2023
Sample Type		**Collected By**		**Date Received**
Water		C. Hobbs		08-June-2023

EAL ID	Client ID. Date/Time sample taken	Test	Result (units)	Method Reference	Limit of Reporting

Signed .... Michael Glazier, Laboratory Manager.

APPENDIX D RPD TABLE

	Event	Sample	Al (mg/L)	As (mg/L)	Cd (mg/L)	Cr (mg/L)	Cu (mg/L)	Cyanide (mg/L)	Fe (mg/L)	Pb (mg/L)	Mn (mg/L)	Hg (mg/L)	Ni (mg/L)	Ag (mg/L)	Zn (mg/L)
DUP01	Event 1	DUP01	0.03	0.00015	0.00001	0.000005	0.0001	0.001	0.06	0.0005	0.003	0.000015	0.0005	0.00001	0.001
		YR1-IS	0.03	0.00015	0.00001	0.000005	0.0001	0.001	0.06	0.0005	0.003	0.000015	0.0005	0.00001	0.001
		RPD% - Acceptable Range	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Event 2	DUP01	<0.03	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.001	0.000015	0.0005	0.00001	0.001
		WC-IS	<0.03	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.002	0.000015	0.0005	0.00001	0.001
		RPD% - Acceptable Range except Mn	0%	0%	0%	0%	0%	0%	0%	0%	67%	0%	0%	0%	0%
	Event 3	DUP01	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.00001	0.001
		Yk-IS (D/S)	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.00001	0.001
		RPD% - Acceptable Range	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
		DUP01	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.00001	0.001
		WC-RS	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.00001	0.001
		RPD% - Acceptable Range	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Event 4	DUP01	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.00001	0.001
		WC-RS	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.00001	0.001
		RPD% - Acceptable Range	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Event 5	DUP01	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.00001	0.001
		WC-RS	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.00001	0.001
		RPD% - Acceptable Range	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Event 6	DUP01	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.00001	0.001
		WC-RS	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.00001	0.001
		RPD% - Acceptable Range	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Event 7	DUP01	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.00001	0.001
		WC-RS	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.00001	0.001
		RPD% - Acceptable Range	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Event 8	DUP01	1.79	0.00015	0.00001	0.000005	0.0001	0.001	0.73	0.0005	0.011	0.000015	0.0005	0.00001	0.002
		SSC-IS	1.73	0.00015	0.00001	0.000005	0.0001	0.001	0.69	0.0005	0.011	0.000015	0.0005	0.00001	0.002
		RPD% - Acceptable Range	3.409090909	0%	0%	0%	0%	0%	5.633802817	0%	0%	0%	0%	0%	0%
	Event 9	DUP01	0.35	0.00015	0.00001	0.000005	0.0001	0.001	0.06	0.0005	0.003	0.000015	0.0005	0.00001	0.001
		WC-RS	0.36	0.00015	0.00001	0.000005	0.0001	0.001	0.08	0.0005	0.004	0.000015	0.0005	0.00001	0.001
		RPD% - Acceptable Range	2.82	0%	0%	0%	0%	0%	28.57	0%	0%	0%	0%	0%	0%
	Event 10	DUP01	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.09	0.0005	0.005	0.000015	0.0005	0.00001	0.006
		WC-RS	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.08	0.0005	0.004	0.000015	0.0005	0.00001	0.019
		RPD% - Acceptable Range	0%	0%	0%	0%	0%	0%	11.76	0%	0%	0%	0%	0%	0%
	Event 11	DUP01	0.03	0.00015	0.00001	0.000005	0.0001	0.001	0.02	0.0005	0.0005	0.000015	0.0005	0.00001	0.001
		WC-RS	0.03	0.00015	0.00001	0.000005	0.0001	0.001	0.02	0.0005	0.0005	0.000015	0.0005	0.00001	0.001
		RPD% - Acceptable Range	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Event 12	DUP01	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.02	0.0005	0.006	0.000015	0.0005	0.00001	0.002
		WC-RS	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.005	0.0005	0.0005	0.000015	0.0005	0.00001	0.001
		RPD% - Acceptable Range	0%	0%	0%	0%	0%	0%	60%	0%	85%	0%	0%	0%	33%
	Event 13	DUP01	0.03	0.00015	0.00001	0.000005	0.0001	0.001	0.02	0.0005	0.0005	0.000015	0.0005	0.00001	0.002
		WC-IS	0.015	0.00015	0.00001	0.000005	0.0001	0.001	0.02	0.0005	0.0005	0.000015	0.0005	0.00001	0.003
		RPD% - Acceptable Range	33%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	20%
	Event 14	DUP01	0.04	0.00015	0.00001	0.000005	0.0001	0.001	0.02	0.0005	0.0005	0.000015	0.0005	0.00001	0.002
		WC-RS	0.04	0.00015	0.00001	0.000005	0.0001	0.001	0.03	0.0005	0.0005	0.000015	0.0005	0.00001	0.05
		RPD% - Acceptable Range	0%	0%	0%	0%	0%	0%	20%	0%	0%	0%	0%	0%	92%
	Event 15	DUP01	0.08	0.00015	0.00001	0.000005	0.0001	0.001	0.06	0.0005	0.001	0.000015	0.0005	0.00001	0.001
		WC-RS	0.11	0.00015	0.00001	0.000005	0.0001	0.001	0.09	0.0005	0.001	0.000015	0.0005	0.00001	0.001
		RPD% - Acceptable Range	16%	0%	0%	0%	0%	0%	20%	0%	0%	0%	0%	0%	0%
Water Blank	Event 1	Nothing above LOR	<0.02	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001	<0.00002	<0.002
	Event 2	Nothing above LOR	<0.03	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001	<0.00002	<0.002
	Event 3	Nothing above LOR	<0.03	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001	<0.00002	<0.002
	Event 4	Nothing above LOR	<0.03	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001	<0.00002	<0.002
	Event 5	Nothing above LOR	<0.03	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001	<0.00002	<0.002
	Event 6	Nothing above LOR	<0.03	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001	<0.00002	<0.002
	Event 7	Nothing above LOR	<0.03	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001	<0.00002	<0.002
	Event 8	Nothing above LOR	<0.03	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001	<0.00002	<0.002
	Event 9	Nothing above LOR	<0.03	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001	<0.00002	<0.002
	Event 10	Nothing above LOR	<0.03	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001	<0.00002	<0.002
	Event 11	Nothing above LOR	<0.03	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001	<0.00002	<0.002
	Event 12	Nothing above LOR	<0.03	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001	<0.00002	<0.002
	Event 13	Nothing above LOR	<0.03	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001	<0.00002	<0.002
	Event 14	Nothing above LOR	<0.03	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001	<0.00002	<0.002
	Event 15	Nothing above LOR	<0.03	<0.0003	<0.00002	<0.00001	<0.0002	<0.002	<0.01	<0.001	<0.001	<0.00003	<0.001	<0.00002	<0.002

RPD % $|(x_2 - x_1)|/((x_2 + x_1)/2)$

How to calculate the Relative Percent Difference (RPD)

The basic equation for RPD is
$$RPD = \frac{|R1 - R2|}{\left(\frac{R1 + R2}{2}\right)} \times 100.$$

where

$R1$ is sample 1, and

$R2$ is sample 2

R1 and R2 are your sample and duplicate values. Basically, this equation has you calculate the RPD by dividing the difference between the sample and duplicate by the average of the two. Using absolute value signs ensures the RPD doesn't end up as a negative percentage, which wouldn't make sense when looking for a percent difference.

The equation you plug into Excel looks like this:

=ABS((B3-C3)/AVERAGE(B3:C3)*100)

ABS stands for Absolute Value. Using the cell labels in the equation, as seen above (B3, C3), allows you to use the equation down for all your sample/duplicate pairs so you don't have to write a new equation each time. You can do this by clicking on the cell with the equation in it, then click and drag the bottom right corner of the cell down for the rest of your samples.

APPENDIX E CALIBRATION CERTIFICATES

Multi Parameter Water Meter

Instrument	**YSI Pro DSS**
Serial No.	**15J100066**

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
	Recharge OK?	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. Turbidity	✓	
	3. Conductivity	✓	
	4. D.O	✓	
	5. Temp	✓	
	6. Depth	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. EC		2.760mS		401089	2.762mS
2. Temp		20.6°C		Testo	20.6°C
3. pH 4		pH 4.00		399527	pH 3.91
4. pH 7		pH 7.00		399304	pH 6.92
6. DO		0%		12110	-0.1%
7. Turbidity		100 NTU		396426	102 NTU
8. mV		238.68mV		A393379/B402268	238.4mV

Calibrated by: **Jesse Stenroos**

Calibration date: **25/05/2023**

Next calibration due: **24/06/2023**